Counter-cyclical substitution between trade credit and bank credit

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Abstract

This paper explores the substitution relationship between trade credit and bank credit, and its counter-cyclical dynamic pattern through economic cycles. We propose a new theoretical model, using a mechanism design method, which predicts the substitution between the two credits and its counter-cyclic behavior, subject to the condition of technological efficiency not less than one. This model also helps explain the somewhat contradictory evidence in the literature, on the relationship between the two credits. We present empirical evidence on the substitution effect and its counter-cyclic behavior, by using a balanced panel data set of 284 listed Chinese companies for the period 1998–2006. We further find that the substitution behaves counter-cyclically with respect to the coincident macroeconomic indicator, namely, GDP. Our empirical analysis also has some new features such as treating endogeneity carefully and incorporating the lag-effect of trade credit coherently.

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1. Introduction

The existence of a bank credit channel and a trade credit channel of monetary transmission, and the substitution effect between the two, have been examined in a large body of literature. Despite the extensive empirical research on the relationship between these two channels, previous studies have left at least two major gaps. First, the empirical studies on the relationship between the two channels provide somewhat contradictory evidence, with most supporting the notion of substitution, while a few support that of complementariness. We therefore need a unifying theory to consider whether it is possible for such substitutability and complementariness to coexist and why substitution dominates complementariness. Second, the dynamic behavior of the relationship between trade credit and bank credit through different cycles should be exposed explicitly. It has been more than a decade since the issue was raised by Biais and Gollier (1997). Unfortunately, there remains minimal literature on this issue. Dealing with it, however, would not only reveal how interaction between these two channels reacts to the changing business cycle, but also shed new light on policy implications for both macroeconomic monetary policy and microenterprise management. Moreover, existing evidence on the relationship between these two channels mainly comes from the developed countries. More evidence from emerging markets is needed to enrich the literature and deepen our understanding of this relationship. In order to fill these research gaps, in this paper, we model the relationship between trade and bank credits, using a mechanism design method, and provide evidence on the substitution effect between these two channels and the associated counter-cyclic behavior, using a balanced panel dataset of listed companies from China. This country is, after all, a large, emerging and transitional economy and one which relies heavily on trade credit (Ge and Qiu, 2007).

Theoretically, we model the relationship between trade and bank credits using a mechanism design method. Our model is novel in two respects. Firstly, it is capable of explaining the seemingly contradictory evidence on the relationship between the two credits. Our model reveals that it is the technological efficiency of the manufacturer, or of the credit receiver, that largely determines whether trade and bank credits are substitutes or complements. When the efficiency exceeds a small threshold value, which is an easy criterion to meet, substitution holds. Complementariness only exists when the efficiency is very low, which constitutes a somewhat rare case. Our model thus presents a viable explanation of the co-existence of substitution.
and complementariness, but with the evidence in favor of substitution
dominating. Secondly and more importantly, our model predicts the counter-cyclical pattern of the substitution effect when production efficiency is greater than one, which is also quite com-
mon in the real world. Furthermore, the pro-cyclical pattern of substitution is also shown to be possible, but very infrequent.

Empirically, the unique data set used in this study, with a long
sample period including both a slow-growth period and one of ra-
pid-growth, as well as some novel features of our econometric mod-
eling, yield several advantages over existing studies. Our econometric modeling treats the endogeneity issue carefully, and incorporates the lag-effect of trade credit explored in Benishay (1968), but largely neglected in empirical investigations ever since.

Our fixed-effect model estimates the substitution ratio between
trade credit and bank credit as 14.27% through the course of cycles. However, the dynamic panel model, which incorporates the lag-eff-
fect of trade credit, yields a substitution ratio which declines to
12.05%. With the advantage of including both rapid-growth and slow-growth periods in our data set, we find sound evidence of the counter-cyclical pattern of the substitution, by estimating the time-varying coefficients model and the dynamic panel model with a cross term of the central regressor and economic-cycle indi-
cator. We further find that the substitution behaves counter-cycli-
cally with respect to the coincident macroeconomic indicator, namely, GDP, by means of a graphic illustration and non-paramet-
ric tests. Moreover, our empirical results are relatively robust with
respect to different scaling methods for the dependent variable, different panel model specifications, and different industries. Fur-
thermore, restricting our sample to companies with relatively sta-
ble corporate governance or with less access to bank credit,
strengthens our empirical results. We also relate real output with
trade credit and provide evidence to preclude concerns of a spuri-
ous substitution between trade and bank credits, which merely
indicates the accumulation of accounts payable due to financial
distress. We show that the substitution between trade and bank
credits is economically significant. Sales decline further during
bank credit shrinkage by around half of the size of the bank credit
decline, if a firm cannot substitute trade credit for bank credit.

Our paper makes a contribution to the literature in two re-
spects. First, our theoretical model unifies the somewhat contra-
dictory empirical evidence in the field and answers the question
raised by Biais and Gollier (1997) a decade ago, by demonstrating
the counter-cyclical relationship between trade and bank credits
through economic cycles.

Second, the empirical part of this paper adds some new ele-
ments to the literature. We present sound evidence on the coun-
ter-cyclical pattern of substitution, by using a unique data set
from China. Ours is not the first study on the trade credit of Chinese
firms. Cull et al. (2009) also analyze a data set of China’s manufact-
uring companies, covering the period 1998–2003, with informa-
tion obtained from National Bureau of Statistics of China. They
find that trade credit is a substitute for bank borrowing for those
who find it difficult to obtain finance from banks. Another study
from Ge and Qiu (2007) presents similar evidence, with an analysis
of survey data of 2000 Chinese firms obtained from Chinese Acad-
emy of Social Science. They show that those non-state-owned
enterprises which encounter difficulty in obtaining financing from
banks rely heavily on trade credit. This provides indirect evidence
on substitution hypotheses. The following salient features different-
iate our empirical analysis from these two papers. First, we use a

data set of China’s listed companies2 covering the period 1998–
2006, which is longer than the above two studies. Cull et al. (2009)
1999. Ours covers exactly one slow-growth and one rapid-growth
cycle of the Chinese economy, which makes it possible to analyze
the pattern of substitution through economic cycles. However, this
is hard to accomplish within the time frame of the former two stud-
ies. Second, the endogeneity issue has been treated appropriately in
this paper, while it was not dealt with explicitly in the former two
studies. Thirdly, we pay special attention to the lag feature of trade
credit by estimating dynamic panel models. Such a feature was ex-
plored by Benishay (1968), but has received little attention in the
empirical literature ever since. We are among the first to re-activate
this legacy and find that the lag component does exert a significant
impact on the estimation results.

The remainder of this paper is organized as follows. Section 2
surveys the relevant literature and Section 3 presents a mecha-
nism-design model of the relationship between trade and bank
credits. Section 4 describes our data set, econometric models and
estimation strategies. Section 5 presents and interprets the empiri-
cal results and Section 6 concludes.

2. Literature survey

The study of the substitution effect between trade and bank
credits, may have started with Meltzer (1960), who points out that,
during a contractionary period, those firms with an abundant cash
flow will extend longer trade credit terms to downstream firms
which are suffering from bank credit rationing. Subsequently, Sch-
wertz (1974) extends Meltzer’s theory and states more clearly
those firms with relatively low financing costs will borrow more
from the bank during a contractionary period, in order to extend
trade credit to downstream firms with higher financing costs and
which encounter greater difficulty in borrowing from banks. Dur-
ing such a period, the downstream firms rely more heavily on trade
credit, which actually a substitute for bank borrowing. Thus,
according to these two classic papers, trade credit and bank credit
substitute for one another, from the perspective of a credit recei-
ver. Such a viewpoint is largely pursued in recent theoretical liter-
ature, e.g., Biais and Gollier (1997), Burkart and Ellingsen (2004),
and Mateut et al. (2006). Bougheas et al. (2009) is another recent
theoretical paper.

The available empirical evidence on relationship between trade
and bank credits supports the above theoretical prediction in most
cases. However, such evidence comes mainly from developed
economies such as the USA and the UK. It is only very recently that
researchers have begun to devote attention to emerging market
and transitional economies, such as Russia (Cook, 1999), China
(Ge and Qiu, 2007; Cull et al., 2009) and a group of emerging eco-
nomies in which financial crises have taken place, e.g., Indonesia,
Malaysia, Mexico, Philippines (Love et al., 2007).

In almost all cases, empirical evidence from the USA and UK
supports the notion of a substitution between trade credit and
bank credit. Peterson and Rajan (1997) obtain evidence on using
trade credit to substitute bank borrowing by small US companies
subject to bank credit rationing. In Nilsen (2002), the pulse analysis
of Quarterly Financial Reports (QFR) of the US manufacturing
industry and the microanalysis of COMPUSTAT companies are
combined to provide evidence that small companies use more
trade credit to maintain stable financing when monetary policy is

2 It has been argued by some authors that data sets of small companies are more
suitable for testing theories about trade credit. However, we argue that the data set of
relatively large and efficient companies, such as listed companies in China’s case, is
more consistent with our theoretical results. We substantiate this claim in Section
4.1.
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