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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-cyclic 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.

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).[1] 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, and below the small threshold value, which constitutes a somewhat rare case. Our model thus presents a viable explanation of the co-existence of substitution

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[1] It is stated in the last paragraph of Biais and Gollier (1997) that "Avenues of further research include an analysis of the macroeconomic implications of trade credit. For example, one could study further how the interaction between information-motivated bank credit rationing and trade credit varies with the business cycle".

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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 common 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 *rapid-growth*,[2] as well as some novel features of our econometric modeling, 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-effect 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 indicator. We further find that the substitution behaves counter-cyclically with respect to the coincident macroeconomic indicator, namely, GDP, by means of a graphic illustration and non-parametric 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. Furthermore, restricting our sample to companies with relatively stable 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 *spurious* 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 respects. First, our theoretical model unifies the somewhat contradictory 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 elements to the literature. We present sound evidence on the counter-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 manufacturing companies, covering the period 1998–2003, with information 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 Academy 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 differentiate our empirical analysis from these two papers. First, we use a data set of China's listed companies[3] covering the period 1998–2006, which is longer than the above two studies. Cull et al. (2009) cover the period 1998–2003, and Ge and Qiu (2007) cover 1994–1999. 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 studies. 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 explored 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 mechanism-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 empirical 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, Schwartz (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. During 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 receiver. Such a viewpoint is largely pursued in recent theoretical literature, 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 economies 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] During our sample period, China's economic growth rates range from 7.6% to 11.6%, they are nowhere near an economic recession. We hence replace the usually words "expansionary" and "contractionary" describing business cycles, with "rapid-growth" and "slow-growth" throughout this paper except in the literature survey. We thank the referee pointing this out.

[3] 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.