A MICRO BASED STUDY ON BANK CREDIT AND ECONOMIC GROWTH: MANUFACTURING SUB-SECTORS ANALYSIS

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Abstract

This study examines the relationship between bank credits and performance and growth of manufacturing sub-sectors. Industrial Production Index was used for a different approach as a dependent variable. Indications of the autoregressive distributed lag (ARDL) bound co-integration test support the theory that bank credits are more effective than loan rates on industrial production of sub-sectors. Moreover, the increase in bank credit leads to the rise of industrial production in all the sub-sectors, except Machinery. According to the Toda Yomamato causality test results, there are different degrees of causalities in means of the importance of bank loans for industrial production. On the other hand, in all sub-sectors except machinery and chemical sub-sectors, causality relations were observed at different grades beginning from loan interest rates to industrial production. As a result, this study concludes with the evidence of supply leading hypothesis via the financial sector leads and causes economic growth.

Keywords: Economic Growth; Bank Credit; Manufacturing Sector

Jel classification: E59, L69, O47

1. INTRODUCTION

The manufacturing sector plays an important role in the development of modern economy all over the world. Manufacturing - as a sub - sector of the industry-refers to the production of raw materials and other factors of production, such as labor, land and capital, or goods and services through the production process. With the multiplier effect, the share of the manufacturing industry sectors in the world value added is around 20%. Similarly, the sector also covers about 1 in 9 of the total employment in the world (UNIDO, 2017). As to put it, the share of the sector in GDP is also very high and crucial. For example, in Turkey, the average manufacturing industry share in total GDP is 40% but it varies yearly. While the shares of agriculture and service sectors in GDP were declining in years recently, the share of the industrial sector was increasing (BAT, 2017).

To fully realize the importance of the industry in evaluating the above figures, the interaction between the other sectors of the industrial sector and other economic activities on the economy scale has been examined for many years. In the 1920s, British economist Allyn Young suggested that network-type connections between sectors of this type were the

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main source of increasing returns on the scale of the economy. Industrial activities could have a synergistic effect on economic growth, even if it creates a scale effect in the sense that Allyn Young has mentioned, or even if these returns cannot be observed or qualitative parsed (Arisoy, 2008). Another well-known British economist Nicholas Kaldor (1968), who was inspired by Allyn Young's views, confirmed the existence of such an influence and concluded the industrial sector as the propulsive power of economic growth and laid the first law known as its own name.

According to first law of Kaldor, the issue is existence of a positive relationship between the growth rate of the manufacturing industry and the rate of economic growth. According to this law, productivity in the manufacturing industry increases faster than in the other sectors because of the increasing returns in the manufacturing industry, and consequently, the economy grows rapidly. The second law of Kaldor, also known as the Verdoorn law, poses a positive relationship between labor productivity and manufacturing industry production in the manufacturing industry sector, while the third law argues that the increase in production in the manufacturing industry increases productivity in other sectors and ultimately increases the efficiency in the whole economy. (Mamgain, 1999; Pons-Novell and Viladecans-Marsal, 1998).

The importance of the manufacturing industry in terms of the country's economy raises the financing status of companies operating in the sector. In this sense, developing countries undertake the most important roles of this play. Apart from bank loans, it is seen that the manufacturing sector has extremely scarce resources in the financial market for developing countries, plus the use of other financial resources is very limited.

The development of any sector depends largely on the funding of the country's financial system. Currently, the Turkish financial systems provide sector companies with funding in three main ways: first, capital financing from the capital markets; second, debt financing by issuing commercial bonds; third, debt financing from the bank loans. (Duan, 2008) In fact, as on Turkey extend, because commercial bond issuance and capital financing from the capital market are limited to some super-large enterprises, companies cannot benefit enough from the capital markets. Therefore, manufacturing sector companies are forced to use bank loans. As a result, the dependence degree of bank credits on Turkish firms is becoming too much.
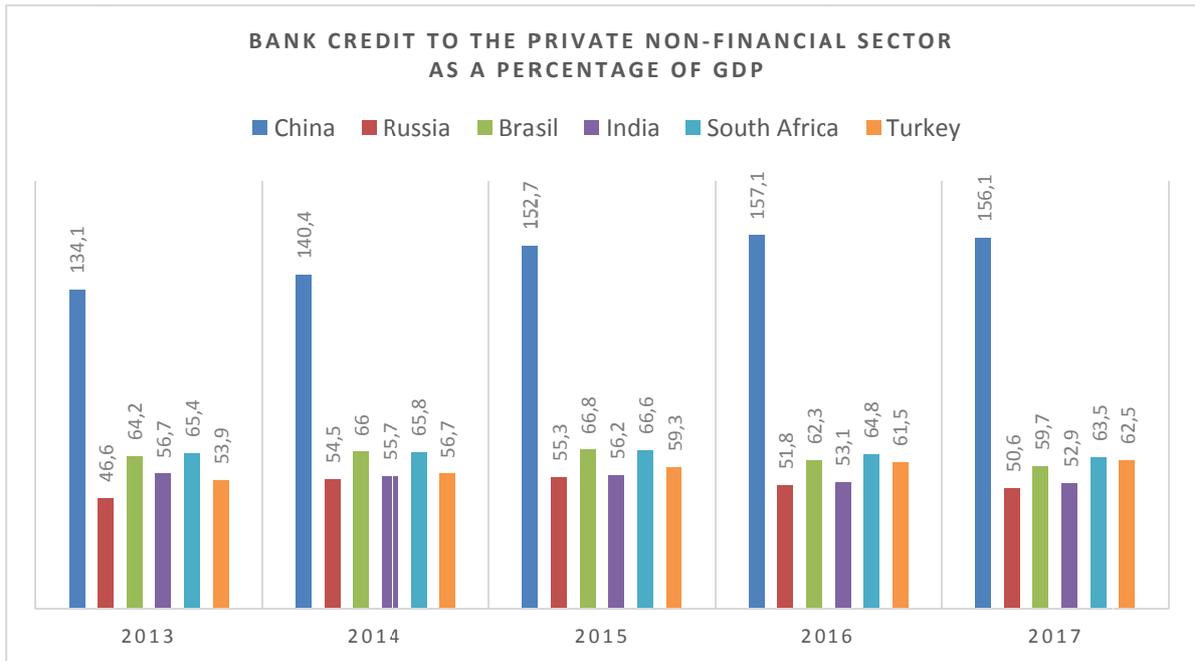
As in many developing countries, the level of bank loan usage is quite high, as a result, companies in Turkey are not able to benefit from the capital markets

sufficiently. In a conducted survey, 48% of companies consult the use of bank loans in Turkey (Demirci, 2017). According to the numbers taken from the official authorities, 20% of all credits used by manufacturing industry sector in 2011. This figure was at a 17% level in 2016 with a small depreciation. The mentioned amount used in the manufacturing sector and the indication increased to ₺378,680,695 out of the total amount loan of ₺2,102,789,474 in 2017. As can be seen from the figures, approximately around 20% of total cash loans are usually given to firms in Turkish manufacturing industry (BRSA, 2017). The downtrend in capacity utilization rates seen since end-2017 has had a dampening effect on the demand for new investments in the Turkish manufacturing industry (CBRT, 2018). On 2018, the growth of the Turkish manufacturing sector, which is the most strategic one and very important for the country's economy, using approximately 24% of the cash loans where construction sector using 12%, wholesale and retail trade sector using 15%, general service sector using 13%, energy sector using 10% (CBRT, 2018).

In Turkey, various reasons have been motivated to conduct a survey on the impact of bank loans on industrial production. Turkey is a popular country in Europe and Asia region. The country has great potential in many sectors of the economy, including manufacturing, agriculture and tourism. The GDP numeral of Turkey in 2016 was 857 billion US Dollars. Thanks to this figure, Turkey is the 17th largest country in the world (T24, 2017). As a result of the growth in economic activity, the ratio of the total financial debt of firms to GDP remained at 60 percent during 2017 (CBRT, 2018). Even though aggregate corporate financial leverage has increased to around 65 percent since the beginning of 2018 due to exchange rate developments, the ratio of corporate loans to GDP remains below global, G20 and EME (emerging economies) averages. (BIS, 2018). Graphic 1 shows a comparison of the ratio of corporate loans to GDP in some emerging economies with Turkey.
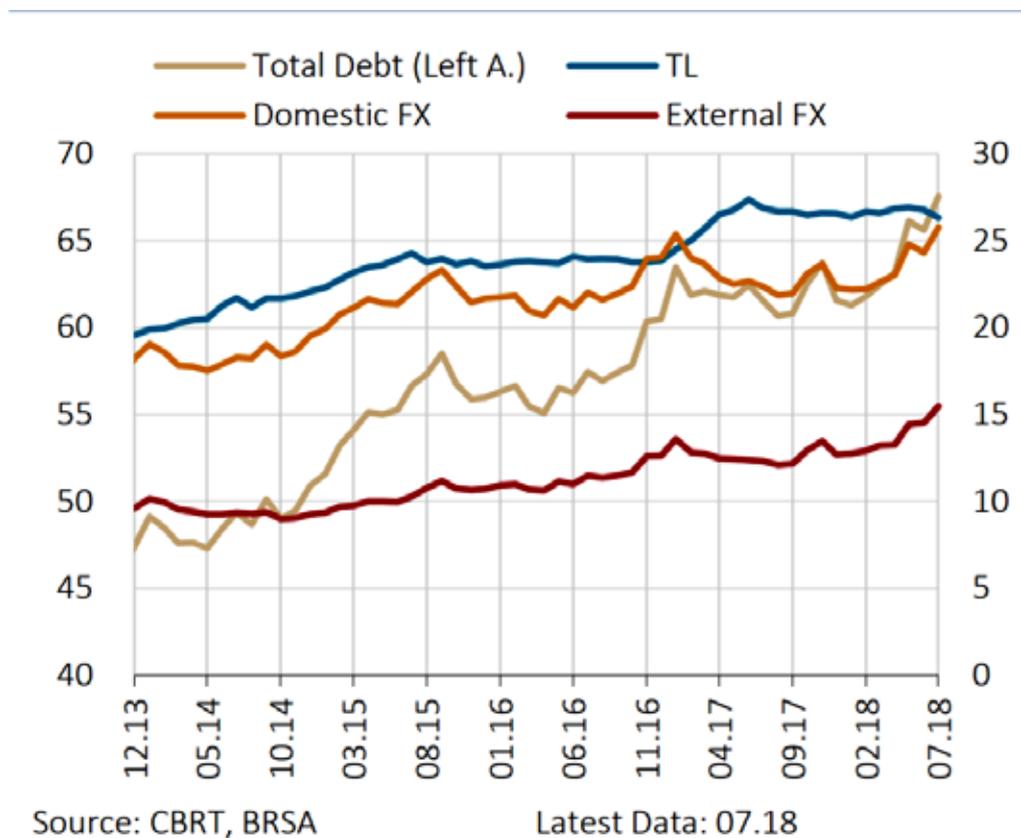
The contribution of bank credits to economic growth is highly related to the sectors where credits are available and the added value created by these sectors. Lending to high value-added and high-productivity sectors contributes to the growth of GDP, and enables the use of resources in the financial sector effectively, allowing for more new resources to be created. Gross value added can be used to analyze the sector's contribution to GDP by analyzing the efficiency of the sector's credit usage on a production basis. In this context, the manufacturing industry is the sector that contributed most to GDP in Turkey is also the highest share in total loans. Despite the fact that the

Graphic 1: Bank Credit to the Private Non-Financial Sector As a Percentage of GDP

BANK CREDIT TO THE PRIVATE NON-FINANCIAL SECTOR
AS A PERCENTAGE OF GDP

■ China ■ Russia ■ Brasil ■ India ■ South Africa ■ Turkey

Source: https://stats.bis.org/statx/srs/table/f2.4

Graphic 2: Share of Corporate Sector's Financial Debt in GDP (%)

Source: CBRT, BRSA   Latest Data: 07.18

Source: CBRT, 2018, Financial Stability Report-II. http://www.tcmb.gov.tr/

Table1: Value Added and Productivity with Credit Share of Manufacturing Sector in GDP

Sector	Gross Value Added (Contribution to GDP, %)			Value Added Per Hour Worked (at prices of 2005 TL)	Share in Commercial Loans (%)			
	2007	2012	2017	Ave. 2009-15	2007	2012	2017	Change 2007-2017
Manufacturing Sector	19,5	18,6	20,6	12,4	37,7	32,4	26,6	-11,1

Source: CBRT, 2018, Financial Stability Report-II. http://www.tcmb.gov.tr/

Turkish manufacturing industry has largely used credit, the share of total credits has fallen over time (CBRT, 2018).

According to Turkish foreign trade data, the share of high-tech manufacturing industry products in imports corresponds to five times the share of exports and makes a structural contribution to the current account deficit (CBRT, 2018). Therefore, the financial support of sub-sectors with high technology will have positive reflections on both macroeconomic terms such as GDP and current account balance in terms of productivity and micro-level production and employment decisions. Increasing competitiveness of the real sector in the global technology products market will increase the level of development of the country in the medium-long term. From here, as an indicator of the growth of the country and the sector, the relationship between industrial production and bank loans need to be analyzed.

Bank loans are indispensable for the realization of economic growth and for the completion of development. In the case of the transfer of this principle to the sectors which will be produced through financial institutions, especially in the manufacturing sector and agriculture sector, efficiency is realized and leads to development. In fact, although there are publications on this transmission mechanism applied to agriculture in many places, such studies are not being carried out for manufacturing sub-sectors.

In this study, it is aimed to investigate the productivity of the manufacturing industry sector, and see how much the sector companies are related to the use of bank loans. In this respect, the effects of foreign financing sources in the increase of production can be determined on the sub-sector basis and the industrial policies to be implemented can be highlighted. Usage of sub-sector Industrial Production Index data in countries, such as Turkey, those are not published in the industrial production index, is bringing a different perspective. Thus, this study is different from other studies and it contributes to the literature while it is addressing the sub-sectors. In particular, the lack of

work done for sub-sectors in Turkey for the production of goods and services is remarkable. Our new point of view will also help to cover this gap in the sub-sectors. The rest of the work will be divided into four:

Part one: the review of literature, part two: materials and methods, part three: empirical results, and finally part four is the conclusion and policy implications.

2. THEORY

Banking constitutes a bank credit channel, and the credit channel[2] mechanisms. Bank credit channel; as a result of monetary policy practices, affects the overall country's output by changing the amount of credit given to the firm. For example, a restrictive monetary policy reduces the amount of credits that banks give to firms by reducing bank reserves and deposits. The decrease in credits affects the investment expenditures in a negative direction and causes decrescent national income. (Mishkin, 1995).

On the other hand, it is assumed that banks' lending requests will increase with the expansion of monetary policy of increased bank deposits and reserves. Therefore, increasing the investment demand of firms increases the consumption level and ultimately the total production level. This mechanism, in which the full functionality of the credit channel is provided, can be broken in some cases. Companies that have a less expensive bond, securities or more return to the sale of goods will negatively affect the processing of the bank credit channel. In this case, the bank credit channel will try to reduce the impact of monetary policy on the real economy (Romer, 1990; Oliner and Rudebusch, 1996; Meltzer, 1995; Kashyap et al., 1996; Çamoğlu and Akıncı, 2012; Ümit, 2016).

Another failure in the mechanism of credit channel will occur in case of an imbalance between the return of the lender banks and the cost of the borrowers that will have to endure. Bernanke and Gertler (1995) said that monetary policy does not affect only the real interest rates, but also the foreign financing premium,

which expresses the difference between the firms› own internal resources and external resources. In addition to the changes in monetary policy, Bernanke and Gertler (1995) emphasized that both short-term interest rates and foreign financing premiums need to be managed properly, additionally real expense and activities will run smoothly through a credit channel that operates properly in a suitable monetary policy.

Investigating the factors that affect the efficiency and proper functioning of the bank credit channel, the relationship between bank credit and economic growth has been an important and extensive subject. Schumpeter was the pioneer of the subject and he stated the importance of technological innovation in long-run economic growth by bank credits (Gurgul and Lach, 2012). Schumpeter mentioned the importance of banking system in facilitating capital outlays in productive investment. Thereafter, the Schumpeterian aspect has really improved and became a supply-leading hypothesis. Today, advocates of supply-side hypothesis believe that the productivity of financial institutions, financial activities and especially the economies that bring these two components together will increase. Moreover, the supply-side hypothesis advocates of countries with more developed financial systems say they grow faster and develop their economies faster. On the other hand, the demand-side hypothesis argues that as the economy grows, the financial system will strengthen and financial development will be possible. Advocates of demand-side hypothesis says that economic growth is an important factor for financial development. In this respect, economic growth stimulates growth in the real sector, and it stimulates the financial sector.

3. LITERATURE

It is observed that studies on bank credits and economic growth are concentrated in two groups. In the first group, macroeconomic studies of bank credits and economic growth issues were observed. A significant correlation was observed between bank loans and economic growth in some of the related studies that began with Schumpeter in 1912 (Gurgul and Lach, 2012). Patrick (1966), Greenwood and Jovanovic (1990) , King and Levine (1993), Demetriades and Hussein (1996), De Gregorio and Guidotti (1995), Rajan and Zingales (1998), Das and Maiti (1998), Levine et al. (2000), Beck et al., (2000), Christopoulos and Tsionas (2004), Demirguc-Kunt and Levine (2008), Mishra et. al. (2009a) and (2009b), Pradhan (2010a), Hassan et. al. (2011), Banerjee (2012), Iyoboyi (2013), Ebi and Emmanuel (2014), Sehrawat and Giri (2015), Mohanty

et al. (2016) concluded that increase in bank credit (or financial development) leads to higher economic growth. All these studies found significant evidence and consequently supported the supply leading hypothesis. However, Boyreau-Debray (2003), Guariglia and Poncet (2008), Leitao (2012), Sehrawat and Giri (2016) and Chow et al. (2018) found that bank credits showed a negative impact on economic growth. Some, in addition, found significant evidence that economic growth will create demand for the various financial services that the financial system will provide. Supporters of demand leading hypothesis were Robinson (1952), Kar and Pentecost (2000), Ansari (2002), Favara (2006), Kandir et. al. (2007), Chakraborty (2008), Ceylan and Durkaya (2010), Pradhan (2010b), Oluitan (2012) and Ak et. al. (2016). There are also a considerable number of studies in the literature that cannot observe the relationship between bank credits and economic growth: Odedokun (1998), Wa (2002), Aziz and Duenwald (2002), Bloch and Tang (2003) Demetriades and Andrianova (2003), Chen (2006) Shan and Jianhong (2006), Loayza and Ranciere (2006), Estrada et al. (2010), Onder and Ozyıldırım (2010), Kumar (2011), Demetriades and James (2011), and Lu and Shen (2012).

The second group was micro-studies; it observed the examining bank credits and sector or firm performances. Like macro-studies, micro-studies have reached various results. Some studies have claimed that bank loans are positive or vice versa to industrial sector growth, meanwhile some other researchers have found a weak or no relationship between bank lending and sector growth.

Studies examining the effect of bank credit to the public sector in the past literature have found weak interaction. King and Levine, (1993), Odedokun, (1998), Levine, (2002), and Beck et al., (2005) are examples of these studies. Researchers have found that bank loans are delivered with political motivation and idle areas. Some other past studies Gurley and Shaw (1955) and Adve (1980), favored positive effect of bank credits on industrial growth. In other respect, Ajayi (2000), Wa (2002), Bloch and Tang (2003) argued that the inexpressive positive and negative relation between bank loans and the growth of the sector was widespread in time.

After examining past literature on micro-studies -bank credits and sector or firm performances- it came to an end of concentrating on more details of recent studies. It has been taken a closer look at the sector-based manufacturing and credit relationships that constitute the basis for this study.

Kelly and Everett (2004) examined Irish private sector bank credits. Although they warned about

inflationary economic policies and financial crises, the growth of Manufacturing, Building and Construction, Hotels and Catering and Education positively affected from bank loans. As a result, they helped in order to resume stable and reliable real growth in the economy. If the bank loans are similar to a useful drug for companies, it can be said that Larrain (2006) used this drug in three main indicators. Larrain (2006) stated that the first drug in the industrial production was bank loans. Later, this drug, which caused idiosyncratic volatility reduction, also caused the reduction of volatility. Therefore, the links between sectors and GDP are increasing with the bank loan drug. Larrain (2006) emphasized that short-term debt is more negatively associated with firm activity when you increase the dose of the drug. Izhar and Tariq (2009), which examined the efficiency of the Indian agricultural sector between 1992-2005, found that bank loans did not grow at the rate in which the aggregate agricultural output grew. Moreover, according to the research, credits did not determine agricultural output in India.

Tawose (2012), who tries to measure the performance of the industrial sector, compared the loans and advances of commercial banks to the industrial sector and total savings, interest rate and inflation rates. Finding a long-term relationship between these variables, Tawose (2012) found that the variables considered in the short term had a positive effect on the performance of the industrial sector. On the contrary, it was emphasized that loans and advances of long-term banks extended to the industry sector had an insignificant negative impact on sector performance. One of the studies conducted between the growth of the agricultural sector and commercial bank loans is Toby and Peterside (2014). Although there was a significant weak relationship between commercial bank loans and the contribution of agriculture to GDP, there was a significant positive relationship between bank loans and agricultural contribution to GDP. In the same study, Toby and Peterside (2014) looked at relations with commercial bank loans on the manufacturing sector, and found that the manufacturing contribution to GDP was in a significant inverse relationship with bank loans. According to Buono and Formai (2014), bank credit was positively and significantly correlated with export incomes. Higher initial levels of productivity, collateral and credit rating is associated with a higher export growth were examined in order to estimate the structural OLS within firm leveled controls such as size and productivity. The analysis strongly suggested that there is a positive and causal link between access to bank credit and total revenues and consequent firm growth.

Ebi and Emmanuel (2014) showed that bank credits impacted the manufacturing sub-sector positively and significantly. Sub-sector borrowers' (mining and quarry firms) the output was positively correlated and determined by bank credits. Moreover, contrary to expectations, they could not determine an important relationship between interest rate and industy and its sub-sector outputs. Chisasa (2014), who studies in South Africa, found that the bank's loan reduced agricultural output in the short term and emphasized that the uncertainties in the country's corporate loan should be eliminated. Chisasa (2014) reached different results at macro and micro level. He stated that supply-side findings are predominant on agricultural sector basis, but that there is a causal relationship between economic growth and finance at macro level and therefore there is a demand-side relationship. In another study examining the level of agricultural output, Nnamocha and Eke (2015) discovered that although long-term bank credit and industrial output had a positive effect, only industrial output influenced the level of agricultural output in the short term. According to the research results, low agricultural investment will lead to low agricultural output, which is due to low credit opportunity or high lending rate. Adeola and Ikpesu (2016) showed that agricultural output, trade credit and money supply were not cointegrated. After sharing that the money supply and the loans used for agriculture increased the agricultural sector and the level of agricultural output in Nigeria, they showed that the effects of the loans at this point were very weak by the method of decomposition of the variance they applied. Sogules and Nkoro (2016) claimed that a long run relationship exists between bank credits and manufacturing sector output.

In their study on the manufacturing sector in Nigeria, John and Therhemba (2016) found that bank loans, advances and large money supply had an impact on the output of the manufacturing sector. However, they stated that the output of the manufacturing sector is declining by being affected by high inflation and high interest rates. Using quarterly data of syndicated loans given by Italian banks, Dörr et. al. (2017) stated that increases in the borrowing costs and default rates of firms have led to severe decreases in the assets side of the banks' balance sheets. Strong international banks have hesitated to lend money to Italian firms with distressed balance sheets. The decline in the productivity of the country led to a reduction in the country's productivity, resulting from the credit restrictions experienced as a result of this hesitation. Companies that could not provide enough credit from banks faced a decline in productivity as well as investment and employment. Dörr et. al. (2017), who revealed this situation with their findings, found that

the reason why Italian firms could not achieve the desired level of productivity was troubled banks and credit supply shocks.

Ume et. al. (2017) in their study on the manufacturing sector identified each explanatory variable (commercial bank loans, total savings, interest rate and inflation rate) and subsequent lags as important functions at 5%, excluding foreign exchange rates and lags in the output of the sector. They argues that the output of the manufacturing sector has a set rate in order to reach equilibrium the behavior of the short-term shocks in the long-term, has reached the conclusion that this period is about 3 years. Vovchak (2017) examined the relationships of the firms with the bank during the crisis and the credit situation, stated that it was very difficult for the firms to work with healthier banks by changing their banks during the crisis. It has determined that banks applying core deposit financing provided firms with a lower credit rating than other loans during the crisis. Ramcharran (2017) indicated increasing productivity (output elasticity) of bank credit from 0.76 to 1.23 to small and medium size industries sector. The sector's efficiency improved from returns to scale of −0.89 to 0.607. The main reason for the increase in efficiency was the increase in the productivity of the bank loan Dimelis et. al. (2017) claims that the growth of firms over 2075 firms in the euro zone before the crisis (2008 before the mortgage crisis) is directly related to bank loans and moves in the same direction. For the post-crisis period, it has revealed that this relationship did not last long, and that bank loans contributed only to the slow-growing companies. However, for firms with a high growth rate, this relationship has disappeared and no contribution has been observed. Diallo (2018) analyzes and shows that the bank's productivity loosens credit restrictions and increases the growth rate of financially hooked industries during the 2008 crisis.

As can be seen in the literature studies, it is found that the industrial manufacturing sector is generally taken into consideration in comparison with other sectors. Besides, the only micro-based research in which the manufacturing industry and bank loans are handled in Turkey is the study of Demirci (2017). However in this study, the manufacturing industry was considered as a whole. In the econometric analysis of Demirci (2017), which determined that the production in the manufacturing industry sector acted together with bank loans, monthly manufacturing industry production index data were used between 1999-2015. The monthly cash loan volume of the manufacturing industry sector, which was given by domestic banks, was included in the analysis and causality test application was made. In the long term, the causality from the production to the bank loan was determined and it was emphasized that the financial sector followed the real economy. The macro findings of the study showed that the demand leading hypothesis supports the results.

The existing studies show that bank credit has an important and significant role in increasing economic growth and increasing importance of bank credit. Therefore, finding the determinants of bank credit is an issue that attracts attention all over the world. The increasing use rate of bank loans by companies today is an important issue that should be discussed in the interaction with world economies. However, what kind of a policy is to be applied for the world economies and the effect of bank loans on the manufacturing sector is unfortunately a questioned answer with an insufficient number of literatures. Although Kaldor (1968) has already confirmed the existence of such an influence and saw the industrial sector as the driving force of economic growth, there are few studies on the manufacturing sub-sectors. (Ajayi, 2000; Tawose, 2012; Sogules and Nkoro, 2016) This study will help to cover this gap in the existing literature especially for emerging markets.

4. MATERIALS AND METHODS

4.1. Model Specification and Data Estimation Procedure

In studies examining the effect of bank credit with economic growth, Johansen Method was used by Chisasa (2014), Chisasa and Makina (2015), Olokoyo et al. (2016), Sogules and Nkoro (2016); OLS Method was used by Chisasa and Makina (2013) VAR analysis was used by Adeola and Ikpesu, (2016), and The Generalised Method of Moments (GMM) estimation was used by Nkurunziza (2010), Petkovski and Kjosevski (2014). Following the studies; Ang, (2007); Ma and Jalil, (2008); Hasanov and Huseynov, (2013); Iyoboyi, (2013); Tripathi and Kumar, (2015); Abubakar and Kassim, (2016); Ume at al., (2017) we prefer ARDL approach due to its specific advantages over other techniques.

In the application section of the study, two frequently used methods were exercised in time series analysis in literature. Firstly, to examine the long and short-run impact of bank credits on manufacturing sub-sectors, ARDL Bounds Testing Approach (ARDL) applied. Although the equation based ARDL method, which has different properties from the other cointegration methods presented by Pesaran et. al. (2001) in literature, does not take into account the number of co-integrating relationships between the basic

variables and the weak exogeneity problem, it comes with many advantages. It is an important advantage that it allows estimation of short and long-term coefficients simultaneously while making estimation with least squares method. The most important advantage of this is that it is independent of whether the regressors are I (0) or I (1) or both, with the bouncing endogeneity problems and preference for studying variables with small time series data samples. (Hasanov and Huseynov, 2013).

The choice of the ARDL test was based on the advantages listed above. Due to the counted advantages of the ARDL method, residual-based technique by Engle and Granger, and the Full-Maximum Likelihood (FML) test based on Johansen and on Johansen and Juselius could not be preferred. (Nyasha and Odhiambo 2017). Especially, for this study, less data and small sample size are the main reasons for choosing ARDL method according to other cointegration methods.

After implementing ARDL method, diagnostic tests are also checked out. Moreover, after the estimation, the overall stability of the empirical model is checked by using cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) methods by Brown et al. (1975). The CUSUM and CUSUMSQ tests do not require the determination of break points as it is in the Chow test. Therefore, there is no need to determine the breaking dates in advance.

Co-integration does not imply the direction of causality between two variables. Hence, after ensuring the co-integration between bank credits and manufacturing industry index, their causal relationship is examined onward. In this sense, Toda-Yamamoto (TY) causality test was applied to investigate the causal relationship between these two variables.

The reason for choosing Toda-Yamamoto causality method is that the lag lengths do not change, the maximum lag with VAR technique is taken and therefore the results are more reliable. The traditional Granger causality method causes data loss in long lags by changing the lag length. In this manner, Toda-Yamamoto causality method provides superiority over traditional Granger causality method. (Leshoro, 2017). In addition, TY technique removes the problem of power and size property in estimating unit root test for long-run relationship (Rahman et al., 2017). The main difference of this method from the others is; there is not a requirement for the variables to be stationary.

For utilization of the bounds test procedure, the following regressions are estimated for each sub-sector:

$$LIPI = f\ (LCRD, LLR)$$

LIPI refers to the industrial production index of each sub-sector. In previous studies (e.g., Demetriades and Hussein, 1996; Levine, 2002; Aslan and Kucukaksoy, 2006; Ang, 2008; Jalil et al., 2010; Hasanov and Huseynov, 2013) it was stated that commercial bank loans to the private sector were a method to accelerate economic growth compared to other types of funding. Consequently, the principle independent variable is LCRD, the total commercial bank loans opened by the banking sector to the manufacturing industry sub-sectors (Kelly and Everett, 2004; Larrain, 2006; Izhar and Tariq, 2009; Tawose, 2012; Buono and Formai, 2014; Ebi and Emmanuel, 2014; Nnamocha and Eke, 2015; Adeola and Ikpesu, 2016; Vovchak, 2017; Ramcharran, 2017). In the literature, other independent variable, lending rate (LLR), which is used commonly in related studies (Ma and Jalil, 2008; Oni et. al., 2014; Bayar and Tokpunar, 2014; Nnamocha and Eke, 2015; Ume et al., 2017) expresses interest rates that banks apply to commercial loans.

It is observed that many of the micro-studies on the effects of bank loans have used sector GDP as a dependent variable (Rajan and Zingales, 1998; Nnamocha and Eke, 2015; Toby and Peterside, 2014; Diallo, 2018). These measures can be seen as sum of firm credit/GDP, private credit/GDP or stock market capitalization/GDP. In addition, to show relationship between credits and sector GDP growth, few empirical studies use either sales growth or employment growth or both (Bottazzi et al., 2001; Audretsch et al., 2004; Covin et al., 2006; Coad and Rao, 2008; Giotopoulos and Fotopoulos, 2010; Dimelis et al., 2016; Dimelis et al., 2017). Moreover, Pham (2014) used the change in R&D spending to measure the sector GDP growth instead by scaling it over total assets and net sales.

Almost all micro studies on the effects of bank credits in Turkey can be observed to have used GDP as dependent variable (Kar and Pentecost, 2000; Aslan and Kucukaksoy, 2006; Onder and Ozyıldırım, 2010; Kaya et al., 2013; Bayar and Tokpunar, 2014). It is clear that GDP is a very general concept and is under the influence of all other sectors. In this regard, it is thought that in countries that do not publish their sectoral GDP like Turkey, by bringing a different viewpoint, using Industrial Production Index as Sub-sector Industrial Production Index data in micro-based studies is more appropriate.

The selection of the Industrial Production Index as a dependent variable instead of GDP is also in line with Kaldor's first law that shows that the industrial sector is the "engine of growth". According to Kaldor (1968), the growth of the industrial sector increases the level of efficiency not only in its own but also in other sectors with its wide division of labor. It

is more appropriate to measure the development of the industry with the added contribution made to the industry sector. For this purpose, the Industrial Production Index is used to represent industrial development in Turkey. This index gives the production from various sub-sectors (Arisoy, 2008). This production is the trigger of economic growth according to Kaldor. According to his law, there is a positive relationship between the growth of the industrial sector and economic growth from the first to the second. In other words, the faster the industrial sector grows, the faster the economy will grow. Therefore, the course of the Industrial Production Index is very important and chosen as the dependent variable. Very few studies were found which take the same approach, Bahmani and Saha (2016) and Demirci (2017), while the review was taking place in the literature. However, Demirci (2017) is only used Industrial Production Index just for manufacturing industry sector in general. In this respect, this research is different from other studies and it is a contribution to the literature.

Moreover, Costantini (2013) explains the importance of the Industrial Production Index in his study. According to Costantini (2013), industrial production is the most important indicator used to explain total business cycle fluctuations. In this point of view, cyclical indicators of the manufacturing sector -such as sector-GDP- can be obtained from the Industrial Production Index Series. In fact, industrial production is an index that has been researched and estimated by many previous studies.

Independent variable, LCRD (the total commercial bank loans opened by the banking sector), is the main source of funding for the country's economy, manufacturing industry and the private sector, especially in developing countries. For instance, the credit volume allocated to the sub-sectors of the manufacturing industry is an important variable that can demonstrate the sector's financial intermediation services and the transfer of such activities to other productive sectors through investment expenditure. According to Nkurunziza (2010), the use of bank loans can affect firm growth in two ways, positive and negative. Adverse economic conditions, instability and macroeconomic fluctuations have a negative effect on the firm's ability to repay its loans. However, if the loans allow the firm to solve its liquidity problem, increase its profitability and expand its expansion, the use of bank loans will positively affect its growth.

Using bank loans as explanatory variable, Chisasa (2014) explains that liquidity-enhancing loans will allow for relaxation, particularly in input payments. Development of new technologies can be helpful with the use of credit, increasing the technical equipment

and production technology can be achieved. Finally, by increasing the density of fixed inputs of loans, more efficient use of resources will increase production output and increase profitability. All these reasons are considered as the reason why bank loans are explanatory variable by Chisasa (2014).

In terms of showing financial costs, Lending Rate (LLR) that banks apply to commercial loans can be considered an important variable. Since the high lending rate will increase financial costs, it also affects the savings to be transferred directly to the investment. Low rate, low cost, high savings, high investment and consequently, it leads to an increase in economic growth. Otherwise, a negative relationship among growth and interest rates could occur in manufacturing sub-sectors. (John and Therhemba, 2016; Ume et al., 2017)

Banks' lending rate (LLR) is an important variable that affects the decision of firms. Will the company borrow from the banking sector or explore other sources of finance? LLR is the most important argument for this decision.

King and Levine (1993) suggest a positive relationship among growth, interest rates and financial depth. Inspired by McKinnon and Shaw, Ma and Jalil (2008) highlighted the importance of savings. They emphasized that investments will increase with the effective distribution of the resources caused by the savings. Ma and Jalil (2008) pointed out that governments should pursue policies to implement high interest rates to increase savings incentive. They emphasized that the acceleration of economic growth will be through the transfer of savings to be collected by the high interest rate. They argued that financial depth would come with a well-managed interest rate policy and positive interest rate, and consequently increase economic growth.

The model is estimated using monthly time-series of Turkish data between 01/2010 and 09/2017. Data are taken from Banking Regulation and Supervision Agency (BRSA) and the Central Bank of the Republic of Turkey (CBRT) websites. In this study, sub-sectors of industrial production indices, which can be found as well as credit numbers, were investigated. The sub-sectors studied in this matching are Mining and Quarrying (MQ), Food and Beverage (FB), Textile and Clothing (TC), Wood and Furniture (WF), Paper (PP), Chemistry (CH) and Machinery (MC).

As the study uses monthly time series, it optimized to a maximum lag length of 12 periods. The optimal lag length of each variable that enters the model is chosen based on the Schwarz-Bayesian selection criterion.

Turkish industrial production index data are

provided in the form of 2010 = 100. Accordingly, other two variables also were brought to the 2010 = 100 levels. Before analysis, the data were brought to logarithmic form and seasonally adjusted by the Census X12 procedure.

5. EMPIRICAL RESULTS

Following the standard procedures for variables with time series properties, it is considered that first step should be the statistical features of the series starting with the descriptive statistics (see Table 2).

ARDL bound test is based on one of the F-statistic tests, Wald Test. Pesaran et al., (2001) has claimed two critical values, called lower and upper critical values, for testing co-integrating relationship among the variables examined in researches. According to this argument, the lower bound critical values assume no co-integrating relationship. Thus all variables included in

the analysis are I(0).On the other hand upper bound critical values reject null of no co-integration and therefore all variables are I(1). Null of no co-integration is rejected, in case the calculated Wald test (F-statistic) is greater than upper bound critical value .Null of no co-integration is not rejected if calculated F-statistic is less than lower critical bound value. Pesaran et al., (2001) concludes that results are inconclusive if calculated F-statistic falls between upper and lower bound critical values. It's been used the Schwarz-Bayesian selection criterion for selecting optimal lag length because it is useful for small sample size. The F-statistic bound test results are shown in Table 3.

Schwarz Bayesian Criteria used in order to determine appropriate lag structure of ARDL procedure. Appropriate ARDL Model for Machinery is (2, 0, 0) and F-statistic is 5.649 which exceed upper bound critical value at %5 level. Estimated ARDL model are (1,1,0), (1,4,2), (2,0,1), (5,0,7), (2,2,2) and (2,0,0) with F statistics are 18.719, 34.107, 6.764, 6.263, 9.406 and 7.505 for

Table 2: Descriptive Statistic and Correlations

Sectors		Descriptive Statistic					Correlation Matrix			
		Mean	Std.Dev.	Min.	Max.			LLR	LIPI	LCRD
MQ	LCRD	232.6776	108.557	91.29	422.29		LLR	1.000	.413	.706
	LIPI	112.3896	14.708	73.4	142.94		LIPI		1.000	.470
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000
FB	LCRD	216.681	80.815	81.63	383.69		LLR	1.000	.496	.718
	LIPI	114.0635	14.568	81.69	138.26		LIPI		1.000	.584
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000
TC	LCRD	245.743	104.247	85.79	436.66		LLR	1.000	.418	.709
	LIPI	106.761	7.483	90.78	121.75		LIPI		1.000	.477
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000
WF	LCRD	261.0549	105.188	82.64	462.83		LLR	1.000	.480	.708
	LIPI	118.5874	15.004	85.38	150.82		LIPI		1.000	.673
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000
PP	LCRD	169.4937	50.425	88.35	289.3		LLR	1.000	.686	.711
	LIPI	123.6153	16.650	88.34	156.24		LIPI		1.000	.859
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000
CH	LCRD	232.8666	99.590	83.31	421.36		LLR	1.000	.554	.715
	LIPI	115.1482	12.693	83.95	147.31		LIPI		1.000	.702
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000
MC	LCRD	208.9306	81.604	87.8	380.41		LLR	1.000	.716	.526
	LIPI	133.6957	19.847	74.37	174.83		LIPI		1.000	.608
	LLR	143.229	28.045	94.75	189.65		LCRD			1.000

Mining and Quarrying (MQ), Food and Beverage (FB), Textile and Clothing (TC), Wood and Furniture (WF), Paper (PP), Chemistry (CH), Machinery (MC), the industrial production index of sub-sectors (LIPI), the total commercial bank loans (LCRD), interest rates (LLR)

Table 3: Estimated ARDL models and Bound F-test.

Sectors	Model	F-Stat.	ECM(-1)	Critical Value %1	Critical Value %5
MQ	(1, 1, 0)	18.719	-0.858	I (0) = 4.13	I (0) = 3.1
			[0.000]	I (1) = 5	I (1) = 3.87
FB	(1, 4, 2)	34.107	-1.189	I (0) = 4.13	I (0) = 3.1
			[0.000]	I (1) = 5	I (1) = 3.87
TC	(2, 0, 1)	6.764	-0.788	I (0) = 4.13	I (0) = 3.1
			[0.000]	I (1) = 5	I (1) = 3.87
WF	(5, 0, 7)	6.236	-0.913	I (0) = 4.13	I (0) = 3.1
			[0.000]	I (1) = 5	I (1) = 3.87
PP	(2, 2, 2)	9.406	-0.872	I (0) = 4.13	I (0) = 3.1
			[0.000]	I (1) = 5	I (1) = 3.87
CH	(2, 0, 0)	7.505	-0.815	I (0) = 4.13	I (0) = 3.1
			[0.000]	I (1) = 5	I (1) = 3.87
MC	(2, 0, 0)	5.649	-0.321	I (0) = 4.13	I (0) = 3.1
			[-0.815]	I (1) = 5	I (1) = 3.87

Critical values are obtained from (Pesaran et al., 2001). Numbers in brackets are p-values.

MQ, FB, TC, WF, PP and CH. Consequently, the null hypothesis is rejected thus it is concluded that long-run relationship exists among variables.

To understand the short-term adjustment process, it's needed to look at the sign and the magnitude of the coefficient of the error correction term (ECT). If the value of this coefficient is between 0 and –1, the correction to the model in the period is a fraction of the error in period t–1. If the value is between –1 and –2, then the ECT will produce damped oscillations in this model about its equilibrium path (Alam and Quazi, 2003). The study's short run adjustment period according to the error correction term that is negative and statistically significant. The negative value shows that there exists an adjustment speed from short-run disequilibrium towards the long-run equilibrium. In this study, ECM term coefficients are negative for all sub-sectors.

The long run coefficients of variables are displayed in Table 4. It observed at first glance that coefficient of bank credit is positively significant for all sub-sectors except MQ. The results suggest that an increase in bank credit leads to raise industrial production index in FB, TC, WF, PP, CH and MC. On the other hand, the lending rate is positively correlated with industrial production index in only MQ and WF. It means that, bank credit is more effective than lending rate on industrial production index of sub-sector.

In the long run, relationship was observed between the bank credits and the industrial production index in FB, TC, WF, PP, CH and MC sub-sectors. However, in the short run there is no significant relationship was observed in such sectors. The lending rate is positively correlated with industrial production index in only MQ and WF sub-sectors in the long-run. Despite, in the short-run, only FB sub-sector's industrial production index negatively correlated with interest rates. The fact that none of the sectors affected in the short- and long-term parameters with each other, indicates that each sector has its own structural characteristics.

In the long run, the absence of a relationship between bank lending rates and industrial production in most sub-sectors may be associated with the structural characteristics of the sector. The capital structure of the manufacturing industry sector firms is managed by more fixed assets. This may be the reason of failure to find a meaningful long-term relationship with credit interest rates. Moreover, long term interest rates of credits always higher than short term interest rates. Highness of long-run interest rates may be one of the reasons why the relationship is positive in two sub-sectors and not in others.

The short run parameters in Table 4 indicate that bank credit and lending rate are related to industrial production index. According to findings, industrial production index is negatively affected by bank credit only on MQ and lagged values of bank credit on FB sub-sectors. In other sub-sectors, no significant relationship was observed between the bank credits and the industrial production index. On the other hand, industrial production index is significantly affected in a negative way by bank credit lending rates only in FB sub-sector. In addition, industrial production is significantly affected positively by lagged value of

Table 4: The results of long and short run

The results of long and short run							
LIPI	MQ Coefficient	FB Coefficient	TC Coefficient	WF Coefficient	PP Coefficient	CH Coefficient	MC Coefficient
Panel A. Long Run Estimates							
Cons.	3.967*	*3.641	4.117*	4.379*	2.768*	3.806*	4.189*
LCRD	0.102	*0.18	0.063*	0.24*	0.427*	0.165*	0.219*
LLR	0.041*	0.03	0.042	0.189**	-0.024	0.0106	-0.086
Panel B. Short Run Estimates							
LIPI (-1)	-	-	*-0.313	-0.286	*-0.348	**-0.234	*-0.478
LIPI (-2)	-	-	-	0.181	-	-	-
LIPI (-3)	-	-	-	0.423**	-	-	-
LIPI (-4)	-	-	-	0.250**	-	-	-
LCRD	***-0.25	-0.106	0.052	0.125	0.027	0.13	-0.021
LCRD (-1)	-	*-0.392	-	-	0.21	-	-
LCRD (-2)	-	-0.198	-	-	-	-	-
LCRD (-3)	-	*-0.455	-	-	-	-	-
LLR	-0.032	**-0.154	-0.131	-0.107	-0.089	0.007	-0.117
LLR (-1)	-	*-0.213	-	0.154	-0.123	-	-
LLR (-2)	-	-	-	0.355**	-	-	-
LLR (-3)	-	-	-	0.124	-	-	-
LLR (-4)	-	-	-	0.016	-	-	-
LLR (-5)	-	-	-	0.084	-	-	-
LLR (-6)	-	-	-	0.392*	-	-	-
Panel C. Diagnostic Statistics							
Serial	1.078 [0.39]	1.013 [0.447]	0.996 [0.46]	0.684 [0.759]	0.754 [0.693]	0.407 [0.956]	0.349 [0.976]
Arch	0.462 [0.929]	0.324 [0.982]	0.343 [0.977]	0.627 [0.81]	1.322 [0.227]	0.42 [0.95]	0.28 [0.99]
Ramsey	0.196 [0.658]	1.698 [0.196]	0.90 [0.345]	0.088 [0.766]	0.125 [0.724]	1.764 [0.187]	1.634 [0.204]
CUSUM	Stabil	Stabil	Stabil	Stabil	Stabil	Stabil	Stabil
CUSUMQ	Stabil	Stabil	Stabil	Stabil	Stabil	Stabil	Stabil

*, ** and *** indicate statistical significance at 10, 5 and 1% level respectively. Diagnostic tests results based on F-statistic, numbers in brackets are p-values.

bank credit lending rates in WF sub-sector. Although some of the test values are not significant, their negative signs give us a clue. Additionally, any significant relation between the lending rates and the industrial production index of other sub-sectors could not be found.

The absence of a relationship between bank lending rates and industrial production could be because of various reasons. In some emerging economies, although interest rates are favourable, there are a number of other factors limiting the credit supply of enterprises, especially through banks. These include many factors such as the high level of collateral and insurance costs, the legal structure of enterprises, the

age of the enterprises, the attitude of the banks, and the excess of formalities of providing credit. (Arıcay and Kok, 2009) According to the findings of Bhaird and Lucey (2006), long-term borrowing has a negative relationship with the enterprise age. This result indicates that the funds formed in the enterprise over time reduce the borrowing necessity. In addition, the study conducted by the Government of Scotland (2008) examined the difficulties faced by businesses in accessing bank financing. The results of the study found that almost half of the firms seeking bank loans were close to using alternative financing (grants, soft loans and equity financing). The consultancy problem and high accounting costs experienced in applying to

banks were among the main complaints of the firms. It has been determined that the lack of collateral and/or the lack of trading record has prevented the bank from receiving loans. The study determined that the firms affected by these reasons accounted for about one third of the non-creditors.

The current value of the industrial production index is not related to the sub-sectors growth. The one-period lagged value of the industrial production index is adversely affected by the growth of the PP, TC, CH and MC sub-sectors. When the causes of this finding are investigated, it is thought that delay may be a loss of time. Considering the return on investment period, it will take time for goods and services to emerge. The current volume of goods and services can only be explained by past financial resources used in production. Same situation occurs on one-period lagged value of lending rates. It is negatively related to PP sub-sector growth while current value is not.

Checking stability properties of parameters is also a very important issue. This study used CUSUM and CUSUMQ tests for examining the stability properties. The CUSUM test is based on cumulative error terms associated with the observation set and is drawn between two critical points showing 5 percent significance. In the tests, it was observed that the CUSUM and CUSUMQ test statistics remained within critical limits at 5% significance level. So, the null hypothesis is accepted and the model is stable. This means that the estimated parameters were stable during the period of examination.

Diagnostic tests results are shown in Table 4. The result of Breusch-Godfrey LM test rejects serial correlation for the equations. ARCH test results support that residuals are homoscedastic for all sub-sectors. Finally, Ramsey-Reset test results confirm the correct functional form.

While positive correlation was observed between bank credits and industrial production index in some of the studies (Kelly and Everett, 2004; Tawose, 2012; Manova, 2013; Toby and Peterside, 2014; Buono and Formai, 2014; Ebi and Emmanuel, 2014; Nnamocha and Eke, 2015; Sogules and Nkoro, 2016; John and Therhemba, 2016; Dörr et al., 2017; Ume et al., 2017; Vovchak, 2017; Ramcharran, 2017; Dimelis et al., 2017) negative correlation was observed in others (Larrain, 2006; Ma and Jalil, 2008; Izhar and Tariq, 2009; Toby and Peterside, 2014; Chisasa, 2014). In this research we have reached to a conclusion which supports both findings. There was a positive relationship between bank loans and industrial production index in the WF sub-sector, while a negative relationship was found in the MQ and FB sub-sectors. The situation is changing for the lending rate and the industrial production index. For the FB, TC, WF and MC sub-sectors, a negative relationship between interest rates and GDP variables for (Ma and Jalil, 2008; Ebi and Emmanuel, 2014; Nnamocha and Eke, 2015; John and Therhemba, 2016; Ume et al., 2017) were also identified. The study could not confirm the positive relationship between interest rates and growth variables. But for CH sub-sector, having a positive sign countable through studies are only Ma and Jalil (2008) and Tawose (2012).

After the ARDL test, Toda-Yomomato (TY) test was performed. TY technique is performed through two steps; First, the maximum lag length (k) determined by using either the Schwarz Information Criteria (SIC) and the maximum order of integration (d). Secondly, causality through the Wald test is determined. The modified Wald (MWALD) test is adopted in this technique in order to restrain the parameters of the VAR model along with the asymptotic chi-square distribution.

According to the TY test results Table 5), in all the sectors except Machinery (MC), there is a degree of significance towards the industrial production index from bank credits. In addition to the results, in all other sectors except MC and CH sectors, causality relation was observed at different rates from credit

Table 5: Toda-Yomamato Causality Results

Sectors	LCRD » LIPI		LLR » LIPI	
	Wald Stat	Asym P-Value	Wald Stat	Asym P-Value
MQ	31.239***	0.002	39.75***	0
FB	20.987*	0.051	25.655***	0.007
TC	59.206***	0	36.627***	0
WF	80.204***	0	23.683**	0.022
PP	46.607***	0	19.433*	0.079
CH	25.273**	0.014	15.47	0.162
MC	9.278	0.596	0.009	0.925

*, ** and *** indicate statistical significance at 10, 5 and 1% level respectively. Max lag length criteria are taken 12.

interest rates to industrial production index. There are also some studies in the literature in which the causality relation from bank credits to industrial production index is partially or completely observed (Toby and Peterside, 2014; Chisasa, 2014; Rahman et al., 2015; Stolbov, 2017; Qamruzzaman and Jianguo, 2017) However, there are also studies in which the causality relationship from bank loans to industrial production index cannot be found (Dal Colle, 2011; Marques et al., 2013; Tripathi and Kumar, 2015; Adeola and Ikpesu, 2016).

The casual relationship between the industrial production index and the bank credit volume and credit interest rates give clues that production is financed by bank loans. If this relationship is positive, the low credit interest rates will increase the use of credits and the increase in the banks' lending volume will increase the production. The process will be reversed if the relationship is negative.

Evidence of supply leading hypothesis has been found whereby financial sector is leading and causing economic growth. There was positive relationship between loans to the private sector and industrial production index growth, in the case of Turkey. It reveals that it was the financial system which would create various types of economic growth to which the sectoral and sub-sectoral would respond.

As to continue on macro base findings; an important idea states that interest rate is positively correlated with savings under financially repressing economies especially in developing countries. In these economies the higher interest rates encourage savings and decrease consumption which is called substitution effect. Consequently, higher interest rates increase income for those people with high levels of savings, which is called income effect (Ma and Jalil, 2008). While this study's short-run findings support substitution effect in one sector significantly, it does not support substitution and income effects in certain sub-sectors. According to findings, on MQ and FB sub-sectors' bank credits have negative effect on growth which means substation effect is not an issue. On the meantime, on WF sub-sector's bank credits have positive effect on growth which means substation effect could occur. On the other hand, FB, TC, WF and MC sub-sectors' interest rates have negative effect on growth which does not support income effect.

6. CONCLUSIONS AND POLICY IMPLICATIONS

This paper examines the relationship between manufacturing industry sub-sector growth and financial sectors' bank credits of Turkey, an advanced emerging market of the world, over the period between 2010 and 2017. The data has been analyzed by using Auto Regressive Distributed Lag (ARDL) model and Toda Yomamato Causality test to capture the nature of relationship between seven manufacturing industry sub-sectors including Mining and Quarrying (MQ), Food and Beverage (FB), Textile and Clothing (TC), Wood and Furniture (WF), Paper (PP), Chemistry (CH), and Machinery (MC) in Turkey context.

In this study, industrial production index (LIPI) was used instead of the GDP data of the manufacturing industry sub-sectors. It clearly brought a contribution to literature as a dependent variable. Independent variables of research are total commercial bank loans (LCRD) opened by the banking sector to the manufacturing industry sub-sectors, and interest rates (LLR) applied by commercial banks to commercial credits.

It would not be appropriate to compare the findings of this study with the findings of other previous studies. Because this study was carried out on the basis of manufacturing industry sub-sectors and industrial production index which is used as an indicator of economic development and sector GDP. The use of industrial production index of sub-sectors could not be found in other studies. In this respect, this research is unique and different from other studies and it is a contribution to the literature.

Findings of this study support that bank credits are more effective than loan rates on industrial production index of sub-sectors in the long-run. Moreover, an increase in bank credit leads to the rise of industrial production index. On the long-run parameters, bank credit is positively correlated with industrial production index except for Mining and Quarrying sub-sectors. In addition, on short-run findings, industrial production index is negatively affected by bank credit only on Mining and Quarrying and lagged values of bank credit on Foods and Beverages sub-sector. According to the Toda Yomamato causality test results, in all the sub-sectors except Machinery, there are different degrees of causalities in the level of significance from bank loans to industrial production index. On the other hand, in all sub-sectors except Machinery and Chemical sub-sectors, causality relation was observed at different grades from loan interest rates to industrial production index.

One of the macro-based results of this study is finding evidence of supply leading hypothesis whereby financial sector is leading and causing economic growth. Another result of this study supports substitution effect in one sector while it does not support substitution and income effects in certain sectors.

Following implications can be deduced from the study:

1. The causality between the industrial production index and the bank credit volume and credit interest rates emphasizes the significant linkage of production with bank lending. This connection indicates that production can be increased by improving credit conditions.

2. Results reveal that industrial sub-sector managers should be very careful about their financing decisions in Turkey. Any consequences of adequate resources, sub-sector firms with higher outstanding total debt and higher capital intensity may more adversely affected. Hence, credit supply shocks could significantly affect the firms' investment decisions and productivity. (Dörr et al., 2017) External financing is another option that managers could follow in case of high rates and shortage of loans in Turkey.

3. Another implication could be about banking practices. The fact that existence of causal relationship towards growth from loans, especially the situation that comes up after the Asian financial crisis which can be summarized as credit rationing, does not exist in Turkey.

4. Macro-based implications; firstly, performing policies and future institutional reforms in Turkey must enable more efficient allocation of resources. Accordingly, it is suitable for the Turkish government to design policies that will encourage banks to create an enabling environment to distribute credits by making more funds available for the manufacturing industrial sub-sector as so this will increase the level of industrial output in the country and contribute to increased economic growth.

5. Having found banks as actual financier of manufacturing industrial sub-sectors, there is a need to promote the banking sector in Turkey. Appropriate policies should be implemented by the Central Bank of the Republic of Turkey and other monetary authorities alike and should be pursued by the strengthening of the banking sector.

6. Recommendation could be given to Turkish government and Central Bank authorities on determination of interest rates. Policies that lower interest rates (cost of capital) should be pursued by governmental agencies.

7. Future researches should focus on other sub-sectors of the economy. Another point that should not be forgotten is that the findings of this study may be unique. It should be emphasized that the sub-sector findings cannot be generalized, that each sector should be evaluated within its own dynamics, and that the relationship between bank loans and industrial production index growth may only belong to that sub-sector.

8. It is important to stress that the findings of this study may be specific to Turkish manufacturing industry sub-sectors. Results cannot be generalized across countries. More detailed analysis is required to explain the uncovered country-level causal patterns.

9. It may also be possible to test for causality in a time-series framework using alternative econometric techniques.

Endnote: _____

[1] The credit channel operates through two mechanisms: the balance sheet and the bank credit channel (Bernanke and Gertler, 1995; Kashyap and Stein, 2000).

[2] The monetary policy implemented by the monetary authorities is called monetary transmission mechanisms in the process of influencing the real economy. Monetary transmission mechanisms are grouped under five headings: interest rate channel, exchange rate channel, asset prices channel, expectations channel and credit channel (Mishkin, 1995; 1996; and 2001).

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