Financial Education on Bank Lending and Economic Volatility in Taiwan

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ABSTRACT
Education regarding money and banking always tells us that banking is a critical point for macroeconomics. However, there is not enough evidence to further prove the relationship between banking and volatility. In our view, an integration of small and medium-sized enterprises (SMEs) with serious financing constraints, small open economy and bank-based financial system can provide the best opportunity to explore bank-volatility nexus. Fortunately, Taiwan is the most notable case to offer the key to an understanding of banking and volatility for our students of finance. There is sufficient evidence based on panel data analysis with spatial dependency to support the significance of regional bank lending (credit supply) rather than the stock market (credit demand) in explaining volatility. It is clear that the role of bank system in volatility in Taiwan deserves explicit emphasis.

Keywords: volatility, SMEs, credit view, bank lending

INTRODUCTION

The financial-growth nexus stems from the traditional economic wisdom that the financial system can help to overcome market frictions and to improve the allocation and flow of capital more efficiently as a lubricant for promoting economic growth (King and Levine, 1993; Jayaratne and Strahan, 1996; Beck and Levine, 2004). However, there is no conclusive proof that bank system can significantly affect economic fluctuation or risk. To convince our students of accepting this viewpoint, we find that Taiwan itself is an excellent case to emphasize the importance of banking in economic volatility on the grounds that Taiwan is an integration of SME-based, bank-based and small open economy and these characteristics all points to critical role of banking in national development.

In particular, Taiwan's successful experience as an SME-based economy has been regarded as a unique role model for the developing world (Hu and Schive, 1998). Wu and Huang (2002) have further described these unique characteristics in several ways: (1) Taiwan's SMEs are more concentrated in the manufacturing sector, which faces more global than domestic competition; (2) Taiwan's FDI flows come primarily through SMEs, which are different from those in other countries where large multinational corporations are mainly involved, and (3)

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Contribution of this paper to the literature

- Facing a variety of arguments for economic volatility, searching a sound and reasonable model is indispensable to teaching and learning the role of bank lending in economic volatility and this paper integrates all possibilities to evaluate the effects of bank lending on local economic volatilities.
- This paper shows all theories and channels to let students better understand the relationship among volatility, economic factors and bank lending. At the same time, Taiwan is a notable example to all of my students.
- We teach our students to survey articles, to read textbooks, to set up a model, to calculate volatility, to collect different types of data, and to apply panel data methodology. Finally, we can determine the sources of economic volatility; at the same time, propose some policy implications.

Taiwan's SMEs have the greatest impact on employment and job opportunities.[1] These findings all point out that the development of SMEs is the most important reason behind Taiwan's economic miracle.[2] However, it is generally believed that SMEs have two distinctive characteristics: a lack of access to capital markets and opaque information as a result of local banks being the single most important source of external credit for small firms (Meyer, 1998). The role of banks is to facilitate information exchange between lenders and borrowers (Fishman, 2009). In other words, the financial and operating conditions of SMEs suffer from finance gaps (Avery et al., 1998; Berger and Udell, 1998) and the relationship between SME financing and banks is therefore noteworthy (Grunert and Norden, 2012; Berger and Udell, 2006).

Financial system in Taiwan, which is dominated by government-controlled banks, leads to banks function as central institutions not only for allocating capital but also for managing development policies (Zhang, 2009). In fact, Taiwan is still a notable of bank-based system with more than 50% of the amount of corporate financing capital from banking industry now. For the above reasons, the influence of the banking lending is much more conspicuous in Taiwan than in other nations. In addition, Taiwan is a small open economy with a high ratio of economic output from exports and hence the advance in international competitiveness comes from the infusion of massive public resources in some specific regions and industry segments, namely, a "growth pole" strategy, which may result in serious regional divergence. This policy makes it more vulnerable to economic risks (Chiang, 2009).

Finally, while most studies in the past have focused their attention on volatility at the macroeconomic level, we choose to analyze panel data for 23 regions over the 1998-2008 period to identify the critical factors which influence regional volatility. More specifically, monetary policy transmission causes a complicated interworking between monetary-policy tools and credit view. Thus, another contribution of this paper is to disentangle pure credit view from these possible correlations in order to delicately evaluate the effects of real credit view and monetary policy, respectively on local volatility. The empirical result that regional bank lending channel significantly affects regional volatility is fully consistent with our expectations.

The remainder of the paper is organized as follows. Section 2 reviews past studies on the bank lending and all other possible sources of volatility. Section 3 discusses the model and describes the data. Section 4 outlines the econometric method and discusses the empirical findings. Finally, Section 5 provides the conclusions and policy implications.

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[1] SMEs, which are defined as enterprises with less than 200 employees, account for nearly 70% of total employment in Taiwan (MOEA, 2008).
[2] Abe and Kawakami (1997) and Kato and Wan (2001) both compared Korea (conglomerate business groups) with Taiwan (SMEs).

REVIEW OF LITERATURE

Banking Credit, Monetary Policy, and Economic Growth

One of the new growth theories suggests that financial deepening can promote economic growth (Bencivenga et al., 1991; Levine et al., 2000).[3] The bank lending of the "credit view" emphasizes that financial intermediation, such as banks possesses specialized techniques and information advantage to allow them to evaluate borrowers, especially bank-dependent borrowers and thus their credit performance affects real economic activity (Blinder and Stiglitz, 1983; Fama, 1985; Bernanke and Blinder, 1988). Wu (1999) and Ramirez (2004) proved that the influence of monetary policy using credit view on a small open economy will be apparently straightened up. This view regarding bank lending is referred to as "narrow" credit view. On the other hand, Onliner and Rudebusch (1996), Bernanke et al. (1996) and Bernanke and Kuttner (2005) argued that the increases in asset markets, such as stock market can spur credit demand from firms and households and then leads to higher investment and aggregate output. To distinguish from narrow credit view, this contention regarding asset markets is referred to as the "broad" credit channel. It is interesting to note that narrow credit channel from bank lending focuses on credit supply, while broad credit channel mainly from stock prices stresses on credit demand from firms and households.

More specifically, in accordance with credit market imperfection and localized information, there is good evidence provided by Bernanke and Lown (1991) to show that the growth rate of bank loans is positively correlated with changes in state employment. Samolyk (1994) provided the credit view from the regional perspective to stress the role of local banks in funding information-less borrowers, particularly small local firms that do not have direct access to the capital market. Carlstrom and Samolyk (1995) also proved that asymmetric information exists due to the localized advantages of local banks. Similar studies tended to discuss the direct relationship between local bank lending and regional economic performance (Jeong et al. 2006; Elyasiani et al., 2007). In fact, many studies suggested that regional analysis is possessed of several advantages over cross-country analysis. Institutional, cultural and other qualitative variables can, for example, be controlled, and local information regarding local borrowers is more available to local banks (Carbó et al., 2007; Fernández de Guevara and Maudos, 2009).

Economic Volatility and Other Factors

There has been renewed interest in identifying which variables can account for this reduction in overall economic volatility. First, Stock and Watson (2002) found that an effective monetary policy can significantly account for the reduction in volatility and Clarida *et al.* (2000) also agreed that a comprehensive monetary policy, such as an interest rate policy, can help reduce economic volatility. In fact, money aggregates have recently been ignored in the implementation of monetary policy, while the target interest rate has become more and more popular because it is relatively definitive; at the same time, it can avoid a tragedy of inflation (Romer, 2000; Ireland, 2004). However, Poilly (2010) argued that money aggregates and the interest rate as the two tools of monetary policy should be evaluated and determined simultaneously. In addition, FDI, international trade and the oil price should be critical for economic volatility. de Mello (1999) and Lensink and Morrissey (2006), for example, have both suggested that the volatility of FDI inflows reflects the stability (or volatility) of the host country. Moreover, some studies have asserted that employment volatility can be regarded as labor market flexibility (Roders and Nataraj, 1999). Finally, oil price shocks can affect the economy (Hamilton, 1983; Ahmed et al., 2004) and Hooker (1996) further suggested that oil-price volatility is a better index for understanding its impact on economic volatility.

As far as regional volatility is concerned, Conroy (1974) first applied portfolio theory to investigate the relationship between industrial diversification and local economic volatility. The volatility-growth relationship (Malizia and Ke, 1993; Trendle, 2006) found that industrial diversification at the state or metropolitan level can reduce regional volatility. In addition, Baldwin and Brown (2004) proposed two different relationships between

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[3] Although it is believed that financial development and economic growth are positively related, the causality between financial development and economic growth has been the subject of controversy (Ang and McKibbin, 2007; Bangake and Eggoh, 2011).

Table 1. The channels of monetary transmission

Monetary policy	Mediator	Real variables	Demand or supply side	Channels
interest rate	real term	investment	aggregate demand	interest rate
money aggregate	bank lending	investment	credit supply	narrow credit
interest rate money aggregate	stock prices	investment	credit demand	broad credit 1 (firms)
interest rate money aggregate	stock prices	consumption	credit demand	broad credit 2 (households)

Note: While the interest rate channel is based on money view, the other remaining channels can be classified as the narrow and broad credit views

exports and regional volatility: exports reduce volatility due to geographic diversification of international markets, whereas exports may promote regional specialization and thereby increase risk and volatility. Besides, Clark and Summer (1981) and Rios-Rull (1996) found that the young experience much more employment volatility than prime-aged individuals. Jaimovich and Siu (2009) also pointed out, the baby boom can account for the moderation of volatility in the U.S. In addition, Carlino and DeFina (1998, 1999) found little evidence in the credit channel effect of monetary policy transmission. Finally, Bhattacharya (2003) highlighted the significantly positive role of the oil price shocks in employment fluctuations in energy-rich states.

It is clear that past studies on the sources of volatility have lacked a linkage with the credit view, especially in relation to local bank lending. Furthermore, Taiwan combining SME-led economy, a pole policy with a bank-based system offers a key understanding of the bank-volatility nexus. The purpose of this paper is to explore the magnitude of regional volatility in Taiwan to be reflected in the status of the banking.

METHODOLOGY AND DATA

Monetary Policy Transmission Mechanism

As long as monetary policy transmission mechanism is very complicated, past studies mostly applied vector autoregression (VAR) or structural VAR models to pursue the possible effects of monetary policy on macroeconomics. We summarize them following by Mishkin (2007) as shown in **Table 1**.[4]

First, traditional economic theory emphasizes that monetary policy from money view and interest rate channel is to reduce interest rate to stimulate economic growth. Secondly, the credit view can be further classified into two categories: narrow credit view and broad credit view. The former indicates that bank lending as credit supply is critical to surviving SMEs and economic development. The latter suggests that an active monetary policy can become an impetus of a bullish stock market and then the increases in stock prices can improve net worth in firms and households and so leads to higher credit demand.

Economic Model

First, due to the limited availability of regional data and highlighting the importance of SMEs, regional output is replaced by regional employment. In order to account for the link between regional employment volatility (Vol_emp) and two kinds of factors, namely, national factors (NF) and regional factors (RF), this study proposes the following model in (1):

$$Vol\_emp_{it} = f(RF_{it}, NF_t) \tag{1}$$

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[4] In fact, even Mishkin (2007) mentioned that, for other types of balance sheet channels such as cash flow and unanticipated price level channels, these two effects are ultimately reflected in stock prices. In addition, other asset price channels such as Tobin's q theory and wealth effects also correspond to stock prices. Therefore, quoting "stock prices" in support of the broad credit channels should be appropriate for our analytical simplicity.

$$RF_{it} = RF(Vol\_lending_{it}, DIV_{it}, POPR_{it}, DEP_{it}) \tag{2}$$

$$NF_t = NF(Vol\_rr, Vol\_M, Vol\_stock, \exp ortg, Vol\_FDI, Vol\_Oil) \tag{3}$$

The subscript represents region i at time t. It is important to note that many variables are transformed into volatility measures so as to explain employment volatility more directly, except for local demographics or explicit arguments to announce the relationship between some factor and volatility. Compared with Owyang et al. (2008) and Carlino et al. (2011), this study considers regional and national factors in (2) and (3) to explain sources of regional volatility with the role of credit views.

We first want to discuss about monetary policy, credit views and economic volatility. Traditionally speaking, the interest-rate volatility (Vol_r) can affect macroeconomic performance through the interest rate channel. Another monetary tool, money-aggregates volatility with Vol_M, can investigate the degree of its effect on economic stability. In addition, monetary policy through affecting the desire for bank lending (narrow credit) and stock-market performance (broad credit) can also affect real economic activity. Two volatilities, namely, $Vol\_lending_{it}$ and Vol_stock_t, show the effects of the two kinds of pure credit views on economic volatility. The former denotes the degree of volatility in local bank lending itself to quote the regional credit view that greater volatility in local bank lending makes firms' operations more difficult and the situation is further reflected in increased employment volatility. The latter from stock-market performance itself which affects aggregate lending activity, regardless of whether from firms or households, should be positively related to real economic fluctuations.

For reasons already stated, regional volatility in (1) may come from regional factors (RF) in (2) and national factors (NF) in (3) followed by Carlino et al. (2013). The former includes local bank lending, industrial diversification, and the demographic distribution (age population and the dependency ratio), while the latter refers to monetary policy (the interest rate and money aggregates), exports, FDI inflows and the oil price. As a beginning, we provide three indices to control the status of regional economics and it is unnecessary for these variables to be transformed into volatility measures since the industrial structure and demographics are used to control regional economy. DIV_{it} is the index of industrial diversity at the regional level and it is expected that a higher degree of industrial diversity calculated by the Herfindahl index, can reduce employment volatility, according to portfolio theory. A higher (lower) DIV implies advanced industrial specialization (diversity) in a given region, and so it should reflect a positive relationship between DIV and volatility. $POPR_{it}$ and DEP_{it} represent percentages of the young in population and the dependency ratio, respectively. A higher $POPR_{it}$, the ratio of the young in the population leads to greater volatility while a higher DEP_{it} pushes workers to remain in their jobs in order to maintain their family's living standards, thus leading to lower employment volatility.

It follows from what has been said that the employment volatility model with the expected impacts of different explanatory variables can be summarized as follows:

$$Vol\_emp_{it} = \underset{(+)}{f(Vol\_lending_{it}}, \underset{(+)}{DIV_{it}}, \underset{(+)}{POPR_{it}}, \underset{(-)}{DEP_{it}}, \underset{(+)}{Vol\_rr_t}, \underset{(+)}{Vol\_M_t}, \underset{(+)}{Vol\_stock_t}, \underset{(+)}{\exp ortg_t}, \underset{(+)}{Vol\_FDI_t}, \underset{(+)}{Vol\_Oil_t)} \tag{4}$$

Measuring Volatility

Defining and estimating the volatility is a critical step and this study follows Morgan *et al.* (2004):

$$g_{it} = c_i + c_t + v_{it} \tag{5}$$

$$g_t = c_t + v_t \tag{6}$$

Where g_{it} and g_t stand for growth rate of a specific variable in region i at time t and its national growth rate at time t, respectively. Thus, c_i and c_t are represented by regional and time fixed effects, respectively. From (5) and (6), we can run regional or national growth of this variable against one or two fixed effects to obtain regional or national residuals as regional or national volatility.
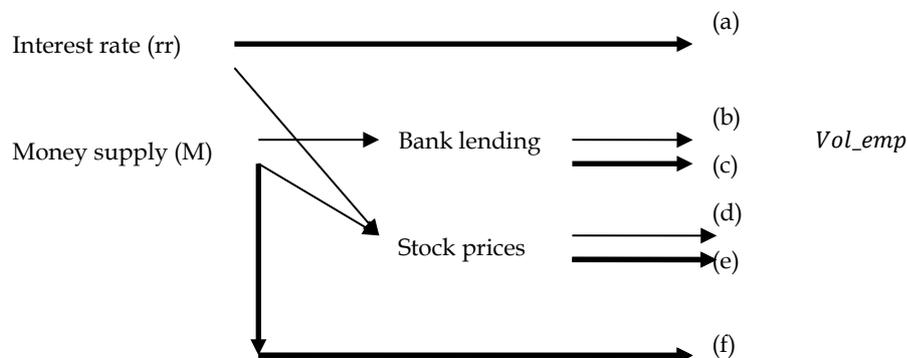
Note: bold and thin lines represent direct and indirect effects on employment volatility, respectively.
Figure 1. Route map of monetary policy transmissions

On the grounds that monetary policy can affect real economic volatility through different credit channels, how to distinguish monetary policy from different credit views becomes a difficult but essential question. Illustration from **Figure 1** may be informative. First, flows a and d show direct and indirect effects of interest rate channel. Similarly, flows b and d represent two kinds of indirect effects from money supply and flow f indicates direct effects of money supply on employment volatility. What is more, flow c is the impact of bank lending itself on employment volatility, while flow e points to its own effect of stock price. If we can compute their own effects from bank lending (credit supply) and stock price (credit demand), we can obtain the full impacts of monetary policy from interest rate and money supply no matter from direct or indirect effects.

To reach this goal, in the first step, by regressing stock-price growth (SG) on time fixed effects, interest-rate growth (r_g) and money-aggregate growth (M_g) as (7), we can obtain the stock-price-specific volatility, which is the deviation from average national growth (c_t) plus two tools of monetary policy, namely, the average growth rates of both the interest rate and money aggregates. In other words, we utilize the regression process to remove the direct effect of monetary policy on stock market and the residual is the volatility of the stock price itself (Vol_stock). Analogously, we can run a regression of bank-lending growth (BLG) against two fixed effects at regions and time (c_i and c_t) associating with money supply growth in (8) to obtain the residuals as the volatility of region-specific bank lending.

$$SG_t = c_t + \alpha_1 r\_g_t + \alpha_2 M\_g_t + \varepsilon_t \tag{7}$$

$$BLG_{it} = c_t + c_i + \beta_1 M\_g_t + \mu_{it} \tag{8}$$

Since Vol_stock_t and $Vol\_lending_{it}$ are two residuals, which are statistically independent of volatilities from interest rate and money supply, four individual effects on employment volatility can be estimated by a regression model in (4).

Data Description

Regional differences occur due to the pole policy that Taiwan's public investment and industrial base are highly concentrated in the Northern region. In this environment, it is necessary that the development of region-specific labor markets on an individual regional basis. In general, the counties or cities having geographic contiguity and sharing similarities in resources are aggregated into four regions: the Northern region (the cities of Taipei, Keelung, and Hsinchu and the counties of Taipei, Taoyuan, Hsinchu, and Illan), the Central region (Taichung city and the counties of Miaoli, Taichung, Changhua, Nantou, and Yunlin), the Southern region (the cities of Kaohsiung, Tainan, and Chiayi and the counties of Chiayi, Tainan, Kaohsiung, Pingtung, and Penghu), and the Eastern region (the counties of Hualien and Taitung), as shown in **Figure 2**.

Figure 2. Map of Taiwan's counties and cities
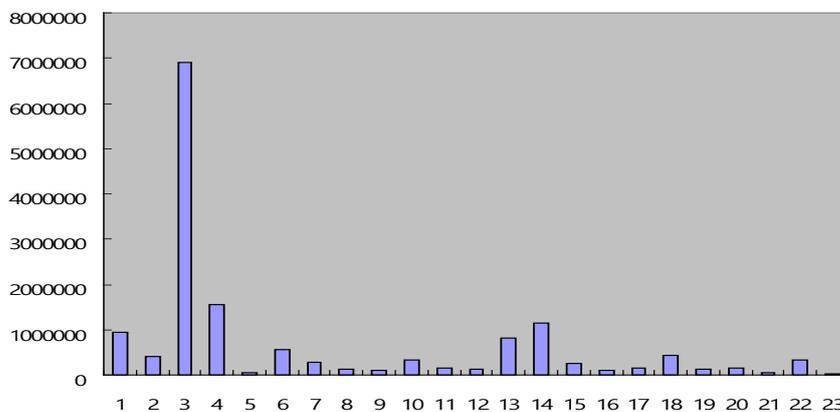
Unit: millions (NT)

Figure 3. The distribution of regional bank loans

Figure 3 depicts by the distribution of average amounts of regional bank lending in 23 regions during 1998-2008. It is clear that bank lending is excessively unevenly concentrated in Taipei city and other metropolitan areas. This pattern preliminarily proves the validity of the regional credit view from bank lending.

The descriptive statistics for related variables from various sources of data are summarized in **Table 2**. As far as monetary policy is concerned, the interest rate is the interbank loan rate in real terms to show that the interest rate channel of monetary policy and money aggregates is represented by broad money, M2. The sample period is restricted by the fact that the statistics for local banking are available only since 1997. Moreover, the industrial

Table 2. Descriptive statistics and data sources for the 1997-2008 period

Variable	Mean	Max	Min	Data sources
Vol_emp_{it}	3.61	15.07	0.01	*Manpower Survey*
$Vol\_lending_{it}$	3.62	15.74	0.04	*County Financial Statistics*
DIV_{it}	9.93	20.52	6.09	*Manpower Survey*
$POPR_{it}$	24.21	27.41	19.74	*Statistical Yearbook of Interior*
DEP_{it}	42.59	50.50	31.90	*Urban and Regional Development*
Vol_rr_t	6.62	18.73	0.35	*Statistical Abstract of National Income*
Vol_M_t	1.22	2.68	0.004	*Statistical Abstract of National Income*
Vol_stock_t	22.02	43.59	2.93	*Statistical Abstract of National Income*
$Exportg_t$	8.01	18.64	-10.04	*Statistical Abstract of National Income*
Vol_FDI_t	49.87	198.48	6.39	*Handy Guide for Foreigners*
Vol_Oil_t	21.78	53.46	2.22	*Handy Guide for Energy Statistics*

Table 3. Estimation Results

	OLS	Fixed Effects with Spatial Errors
Intercept	0.035 (0.799)	0.130 (3.083)***
$Vol\_lending_{it}$	0.032 (1.122)	0.026 (1.690)*
DIV_{it}	0.089 (1.355)	-0.035 (-0.364)
$POPR_{it}$	-0.207 (-1.240)	-0.057 (-0.474)
DEP_{it}	0.001 (1.581)	-0.002 (-2.053)**
Vol_rr_t	-0.001 (-1.640)	-0.001 (-0.430)
Vol_M_t	0.023 (0.006)	0.432 (2.133)**
Vol_stock_t	-0.007 (-0.435)	0.004 (0.700)
$Exportg_t$	-0.046 (-1.915)*	-0.042 (-4.515)***
Vol_FDI_t	0.010 (2.517)**	0.005 (2.820)***
Vol_Oil_t	0.013 (0.569)	0.065 (4.825)***
R^2	0.109	0.402
Diagnostic tests	F=2.949***	F=4.613***
	D-W=1.714	D-W=2.230
Specification tests	Test of fixed effects: F=3.183***	
	Test of local factors effects: F=2.850**	
	Test of national factors effects: F=14.470***	

Note: Numbers in parentheses are t statistics; *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively

classification has increased to 37 sectors and the index of industrial diversity in this study is more robust than the index in Chiang (2009).

ESTIMATION RESULTS

Our data is consisted of 23 regions covering for 1998-2008 period, so this is a standard panel-data format. **Table 3** shows the results of comparing the pooled OLS method with the fixed effects model adjusted for spatial dependency. It is easily found that the latter econometric model is the most efficient and robust estimation based on R^2 as well as two diagnostic tests, namely, the Wald test and the Durbin-Watson (D-W) test, which indicate that the selected variables are adequate and that no autocorrelation exists. Finally, the fixed effects test fully proves the existence of regional heterogeneity.

As far as the local factors are concerned, a joint test is conducted to check whether the effects of local factors are important. Although it is found that effects of local factors are statistically significant in explaining regional volatility, their effects are less pronounced than those of national factors. In addition, the industrial diversity index

(DIV) and the ratio of young population (POPR) both have insignificant effects on regional volatility. On the other hand, the estimated coefficient of the dependency ratio (DEP), which is statistically significant and negative, is consistent with our expectation that a higher dependency ratio forces workers to keep their jobs and, therefore, leads to lower employment volatility.

Most important of all is the finding that the coefficient of "pure" local bank lending volatility is significantly positive, and this not only fully shows that local financial conditions play a critical role in local employment fluctuations, but it also supports the regional credit view. We believe this is a reasonable outcome given that SMEs, which play a much more important role in Taiwan than in other Asian countries, rely more on the local banking system for economic stability.

To sum up, based on the significant results from the regional credit view and money aggregates, we can conclude that the authorities should once again consider the importance of money in the case of Taiwan and the credit environment is very critical to regional employment volatility. However, in this era of globalization, the Taiwan's government always focuses on the internationalization of the stock market. What seems to be lacking is a decision to accelerate and improve the function of bank lending in relation to SMEs. In particular for an SME-based economy with a bank-based financial system, the critical position of local bank lending can really affect the survival of SMEs and subsequently the magnitude of employment volatility from our study. We propose that Taiwan's authorities should change its mind from stock globalization to financial reforms. In other words, an efficient allocation of capital based on the ability of SMEs to compete through local bank lending is especially worth noting in the case of Taiwan on the grounds that SMEs absorb the majority of employment. Regional specialization for a small economy with pole policy tends to lay emphasis on the importance of regional analysis. Moreover, the issues regarding reducing the dependency ratio at the regional level and the volatilities caused by FDI inflows and the oil price are also vital for reducing employment volatility. After all, we believe that the above arguments can provide our students more sensible for the role of banking system in Taiwan.

CONCLUSION

This study identifies and estimates the differential impacts of national factors and region-specific variables on employment volatility in local counties and cities in Taiwan. We try to provide our students with a good illustration of relationship between banking and employment volatility in financial education. In the case of Taiwan that involves the integration of SMEs, export-orientation, and a bank-based characteristic of the economy, empirical results completely support our view point. We believe that this result can impress students who are learning a course of "Money and Banking" with the importance of banking industry. Finally, from the standpoint of national policy, bank lending attitude toward SMEs rather than the stock market can improve volatility through SMEs with the absorption of massive job opportunities. Thus, we strongly recommend that the authorities engage in banking-sector reform to straighten out the performance of local bank lending in relation to SMEs, namely, relationship lending (Berger and Udell, 1995; Petersen and Rajan, 1995).

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