Journal of Business, Economics and Finance
Year: 2015 Volume: 4 Issue: 4

REVISITING THE INTERACTIONS BETWEEN THE BALANCE SHEET ACCOUNTS OF US TELECOMMUNICATIONS and TRANSPORTATION SECTORS: EMPIRICAL EVIDENCE FROM PANEL-VAR MODELS

DOI: 10.17261/Pressacademia.2015414541

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Keywords

balance sheet accounts, firm-based empirical evidence, telecommunications sector, transportation sector, panel vector autoregression model

JEL Classification

M21, D21, D22, C50

ABSTRACT

In the wake of the financial liberalization phenomena, the activities of firms can generate signals for financial and macroeconomic situation and the relationship between financial and macroeconomic variables can be captured by firm-based empirical evidence. In this respect, we employ Panel Vector Autoregression (PVAR) modeling to analyze the interactions between the balance sheets accounts of firms in US telecommunications and transportation sectors. Our results expose that investments, gross fixed capital formation and output in US telecommunications and transportation sectors can be highly dependent on the level of money capital and thus it is important for the firms in these sectors to maximize their output under the financing constraint. It is also revealed that increases in total assets and property may lead to a rise in economic value added, the profitability of a firm which in turn lowers the current liabilities. According to our estimations, we suggest that an optimal empirical framework should be derived to capture the microeconomic origins of macroeconomic developments in terms of effects of total productivity shocks in US telecommunications and transportation sectors.

1. INTRODUCTION

Since Schumpeter (1934), Hicks (1969), McKinnon (1973) and Shaw (1973) asserted that the industrial revolution was due to the expansion of financial systems allowing the applications of new technologies; it is widely recognized by the policy-makers that building and maintaining a well-functioning financial system have a crucial role on economic and financial stability. Within this context, there is substantial empirical evidence supporting the view that financial sector development has positive impact on real economic activity in the long-run such as (Demirguc-Kunt and Levine 1996; Singh 1997; Levine and Zervos 1998; Vuyyuri 2005; Adjasi and Biekpe 2006). On the contrary, Robinson (1952), Kuznets (1955) and Friedman and Schwartz (1963), stated that there existed causality from economic growth to financial development. More precisely, economic development

determines demands for financial agreements, and financial system aims to respond to these demands (Zhang, 2000). However, the importance of financial system for economic activity cannot be underestimated when the prevalent economic and financial liberalization process over the last two decades are considered.

Due to the rapid development and integration of financial markets, determination of the effects of financial variables on macroeconomic performance by quantitative and econometric techniques is of great interest (Bhargava 2014; Pradhan et. al. 2014; Kwon and Shin 1999; Kuosmanen et al. 2015; Fricke and Menkhoff 2015; Maio and Philip 2015). Along with other econometric techniques, researchers give growing interest in panel-type econometric models to expose the dynamics of financial and macroeconomic variables and thus to analyze the future macroeconomic activities of these countries (Pradhan et al. 2015; Hernandez Tinoco and Wilson 2013; Martinsen et al. 2014; Brauning and Koopman 2012). On the other hand, it can be put forward that macroeconomic dynamics can be captured by considering the firm-specific and other financial variables in the prevalent economic, financial integration and development process (Alifiah 2014; Bhattacharjee and Han 2014; Memon et al. 2015; Kero 2013; Poghosyan 2013; Claessens et al. 2014). In terms of the level of the financial markets, USA is an important case which has developed money and capital markets. Accordingly, it can be asserted that interactions between stock market indices not only reflect the relationship between the sectors of the economy but also their consequences on economic performance in the USA. In this respect, NASDAQ Telecommunications Index and Transportation Index are two of the most developing sector indices in the last decade due to globalization and increasing accessibility to the technology. Additionally, Telecommunications and Transportation sectors are important cases to be analyzed since it is recognized that they are both essential in terms of maintaining the well functioning of the market economy and promote the volume of domestic and foreign trade.

In the USA, the level of economic interactions among telecommunications and transportation sectors is also high like other developed economies; thence the main aim of this research is to analyze the interactions between the balance sheets accounts of the firms in these sectors. Since the stocks in NASDAQ Telecommunications and Transportation Indices are major examples also reflecting the industrial activity, our study indirectly attempts to expose the relationship between industrial companies and analyze the dynamics of industrial activity. Within telecommunications and transportation sectors; we use the data of the first 10 firms with the highest assets, whereupon we investigate the financial and economic consequences in a plausible econometric methodology. In this study, we use Panel Vector Autoregression (PVAR) modeling since balance sheets accounts of firms in telecommunications and transportation sectors can be treated as simultaneous, that is, one or more of the explanatory variables can be jointly determined with the dependent variable. The main hypothesis of this research is to test whether balance sheets accounts of firms in telecommunications and transportation sectors have significant effects on each other. The major theoretical contribution of our study to the existing literature is that we assert the dynamics of different balance sheets accounts on the basis of both macroeconomic and managerial perspectives in with PVAR models.

Within this framework, the paper also contributes to the existing literature by making future suggestions for the researchers and policy-makers.

The rest of the paper is organized as follows. Section 2 reviews the previous literature analyzing the dynamics of financial variables. In Section 3, the empirical data and methodology is presented. Section 4 shows the unit root properties of the data, and evaluates the performance of indices. The empirical results and findings of the paper are discussed briefly in Section 5. Finally, Section 6 concludes and discusses some implications for further researches.

2. LITERATURE REVIEW

The dynamics financial variables can be determined and thus the possible interactions between financial and macroeconomic variables can be interpreted also with firm-based empirical evidence. The first contribution in this context can be recognized by Bagchi et al. (2002) who divided into groups according to their dividend payout ratios. They employed a panel data analysis and used a simultaneous equations model with the data of 600 Indian firms from 1991-92 to 1997-98. Moreover, a high dividend payout ratio indicated a low cost of information faced by the firm and vice versa. Although early works in developed countries showed that high-cost group faced with financial constraints and severity of constraint decreased with decreasing cost of information, Bagchi et al. (2002) suggested that medium dividend payout ratios were constrained in the loans market. Apart from the probability of firms determining the investments which in turn influence macroeconomic aggregates, other economic fundamentals and financial factors should be examined. Within this context, Das (2008) used VAR methodology with dynamic panel approach and formulated econometric model included investment, marginal profit, cash flow and balance sheet variables of Indian firms. Focusing on the dynamic adjustments of variables due to the shocks and impulse responses, Das (2008) revealed that the effect of marginal productivity of capital shock on investment was slightly larger for smaller firms, while the impact of cash flow was more for larger firms than for the smaller firms. In addition, Das (2008) found that cash flow had role to play as a fundamental variable in the sense it contained information about future values of the fundamental variables. Expectations related to cash-flows were incorporated into empirical analysis by Vuolteenaho (2002) who used VAR modelling to decompose an individual firm's stock return into changes in cash-flow expectations and changes in discount rates by providing data from NYSE, AMEX, and Nasdaq stocks. Vuolteenaho (2002) found that firm-level stock returns were mainly driven by cash-flow expectations (cash-flow news) rather than changes in discount rates (expected-return news). Furthermore, Vuolteenaho (2002) exposed that the variance of cash-flow news was more than twice that of expected-return news. Using panel techniques, Memon et al. (2015) underlined the role of firm-specific variables, macroeconomic factors, and firms' heterogeneity in determining the debt levels of non-financial listed firms of Pakistan. Their results showed that profitability, tangibility, and size of the firm affect debt level significantly across different proxies and different estimation techniques. Moreover, Memon et al. (2015) also revealed that the interest rate and inflation are significant determinants of debt in fixed effect estimation. The impact of firm-specific and macroeconomic factors on financial stress is another feature gaining

ground on empirical approaches in that extent. Hernandez Tinoco and Wilson (2013) developed a risk model for listed companies that predict financial distress and bankruptcy using a sample of 23,218 company-year observations of listed companies. Their results indicated the utility of combining accounting, market and macro-economic data in financial distress prediction models for listed companies. In a similar effort, Bhattacharjee and Han (2014) implemented an economic model of financial distress using their own firm-level measure of distress for Chinese listed companies and they found important effects of firm characteristics, macroeconomic instability and institutional factors on the hazard rate of financial distress. Most recently, Alifiah (2014) intended to analyze the financial distress in trading and services sector in Malaysia using financial distress companies as the dependent variable and macroeconomic variables and financial ratios as the independent variables. According to Alifiah (2014) debt ratio, total assets turnover ratio, working capital ratio, net income to total assets ratio and base lending rate could help to predict the future financial distress.

The relationship between the financial ratios and firm value is also a critical issue to be taken into consideration. In this respect, Birgili and Düzer (2010) analyzed Istanbul Stock Exchange by using panel data analysis for 21 ratios. Results showed that 16 ratios had a significant impact on the firm value. Birgili and Düzer (2010) concluded that liquidity, debt and market ratios had a great influence on firm value while asset management ratios and some of profitability ratios did not have an impact. Yener and Karakuş (2012) also performed panel data analysis with the data Istanbul Stock Exchange and they attempted to study the relationship of leverage ratios and firm value. Yener and Karakuş (2012) found no empirical evidence for the relationship between capital structure and firm value, but also they rejected the hypothesis stating the positive relationship between leverage ratios and firm value. Similarly, Küçükkaplan (2013) analyzed the relationship between the market value and financial ratios of 111 manufacturing firms quoted in Istanbul Stock Exchange. By using panel data analysis, he found that 23% of the market value can be interpreted by firm's financial ratios and debt ratio affected the market value negatively. Findings of Küçükkaplan (2013) also showed that sectorial level analysis raised the explanatory power of the variables on the market value. Therefore, Küçükkaplan (2013) concluded that sectorial differences should be taken into account when studying about the relationship between firm market value and internal variables. In a similar effort to Küçükkaplan (2013), Apergis et al. (2012) used a detailed approach by revealing the impact of accounting information on the excess returns via cost of capital using a sample of US manufacturing firms.

Apergis et al. (2012) showed that components of accounting information had an impact on the cost of capital, which directly affected stock returns. According to their results, accounting information had an influence on firm's cost of capital and it tended to have a negative impact on the firm's excess stock returns. Rahman and Hassan (2013) enhanced the previous approaches by dealing the relationship between microeconomic, macroeconomic and financial variables. They analyzed the relationship between firm fundamentals and stock prices in an emerging Asian stock market sample by using firm-level panel data. According to Rahman and Hassan (2013), it was possible to interpret the relationship between the variations in stock returns and firm fundamentals in a simple

present value framework. Rahman and Hassan (2013) showed that firm fundamentals explained a significant part of firm-specific return variation in most of the emerging markets in Asia. Most recently, Claessens et al. (2014), constructing an enhanced investment model, predicted the interaction between financial frictions at the firm level and through the required rate of return at the macro level. Basing on some 78,000 firm–year observations from 40 countries over the period, their results revealed that with respect to cross-country differences in firm investment, frictions related to shareholder rights were more relevant than debt-related frictions.

On the other hand, it is recognized by policy-makers and researchers that microeconomic decisions can generate signals for the analysis of macroeconomic trends and thus the activities of firms. In a sense, Pradhan et al. (2015) examined the linkages between economic growth, oil prices, depth in the stock market and other macroeconomic variables for the G-20 countries. The results revealed that in the long run, real economic growth responded to any deviation in the different measures of stock market depth, oil prices, and the other macroeconomic variables. Despite the mixed short-run causality evidence, Pradhan et al. (2015) emphasized that real economic growth responded to various measures of stock market depth, allowing for real oil price movements and changes in macroeconomic variables. Within Dynamic Stochastic General Equilibrium (DSGE) model framework, Meh and Moran (2010) assumed that the capital position of banks had influence on their ability to attract loanable funds and therefore affected the business cycle and firms' activities through a bank capital channel of transmission. In line with their assumptions, Meh and Moran (2010) concluded that the bank capital channel triggered and propagated the effects of technology shocks on output, investment and inflation. Similarly, Christensen et al. (2011) analyzed the role of countercyclical bank balance sheet regulation for the stabilization of financial and economic cycles by constructing a DSGE model. Christensen et al. (2011) implied that countercyclical bank leverage regulation could have stabilizing impacts on thus firm values when shocks in financial system were an important source of real business cycles. Christensen et al. (2011) also exposed that the appropriate contribution of countercyclical capital requirements to stabilization in the activities of firms depended on the size of the externality and impacts of total factor productivity shocks and on the conduct of the monetary authority. Most recently, Sandri and Valencia (2013) developed a DSGE with financial frictions on both financial intermediaries and goods-producing firms. Sandri and Valencia (2013) found that welfare gains of financial intermediates from their recapitalization were larger when recapitalization funds are raised from the household rather than the real sector. Sandri and Valencia (2013) also exposed that welfare gains were similar to the elimination typical business cycle fluctuations. Furthermore, Sekkel (2015) exposed the balance sheets of leveraged financial institutions had out-of-sample predictive power for future economic activity, while financial variables had very little predictive power during periods of economic expansion, with predictability arose mainly during the financial crisis period. Moreover, Davis (2014) expanded the approach in international basis by showing empirically that debt market integration has a positive effect on co-movement, implying that balance sheet effects are the main conduit for international transmission through integrated debt markets. His paper is of crucial importance with respect to firm-based data and international macroeconomics.

3. DATA AND METHODOLOGY

3.1. Empirical Model

Vector autoregression (VAR)-type models are based on simultaneous equation models and they can be used to identify the transmission mechanism of financial and macroeconomic variables to economic activity empirically. In this study, we employ Panel-VAR modeling with the data for the period from 2000 to 2013, to show the interactions between; cash ($cash_t$), common equity ($cequ_t$), current liabilities ($clia_t$), number of employee ($nemp_t$), property (pro_t), total assets ($asset_t$) due to availability of data. In this respect, we estimate 6 Panel-VAR models to show the model parameters and test whether the coefficients of the models are in line with the theoretical assumptions and expectations. All the series are derived using the statistical database of Thomson Reuters Datastream and EViews 8.0 is used to conduct the empirical exercise.

3.2. Econometric Estimation

The point of departure of panel data analysis depends on the linear panel data regression model expressed as below;

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad (1)$$

where the dependent and independent variables of the model are represented by Y_{it} and X_{it}, respectively. Y_{it} and X_{it} are both with i and t subscripts, referring to $i = 1, 2, ..., N$ sections and $t = 1, 2, ..., T$ time periods. The coefficients of the model (α and β) specified in (1) are without subscripts since they will be the same for all unit and samples. Finally, ε_{it} refers to the error term of the panel data model in (1). Assuming that there are no differences among the data matrices of the cross-sectional dimension N, the model (1) can be estimated by pooled OLS method with a common constant for all cross-sections (Asteriou and Hall, 2007). The error term of panel data model in (1) is critical since it determines whether the panel data model can be estimated with fixed effects or random effects. In a fixed effects model, it is assumed that the error term varies non-stochastically over i and t. On the other hand, the error term is assumed to be varying stochastically in random effects model. Therefore, types of models as in (1) can be estimated using a pool object.

$$Y_{it} = \alpha + X_{it}^{'}\beta_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (2)$$

where Y_{it} is the dependent variable, X_{it} is a vector of k regressors, and ε_{it} are the error terms for cross-sectional units, $t = 1, 2, ..., T$. In model (2); the constant term is denoted by α, while the cross-section or period specific effects (random or fixed) are represented by δ_i and γ_t. Within this framework, we can place restrictions on β coefficients [common (across cross-section and periods), cross-section specific and period specific regressor parameters] to identify the panel data model (E-Views 7 User's Guide 1,

2010). For instance, M cross-sectional equations each with T observations stacked on top of one another can be expressed as below.

$$Y_{it} = \alpha I_T + X_{it}^{'}\beta_{it} + \delta_i I_T + I_T \gamma_t + \varepsilon_t \quad (3)$$

In model (3), I_T is the $T-$element identity matrix and the vector $\gamma^{'} = (\gamma_1, \gamma_2, ..., y_T)$ includes all the period effects (E-Views 7 User's Guide 1, 2010). Similarly, we can specify as a set of T period specific equations, each with M observations stacked on top of one another as in (4);

$$Y_{it} = \alpha I_T + X_t^{'}\beta_{it} + I_M \delta_i + \gamma_t I_M + \varepsilon_t \text{ for } i = 1, 2, ..., M \quad (4)$$

In model (4), I_M refer to the $M-$element identity matrix and all of the cross-section effects $\delta^{'} = (\delta_1, \delta_2, ..., \delta_T)$ are included in the vector δ.

On the other hand, PVARs have the same structure as VAR models, in the sense that all variables are assumed to be endogenous and interdependent, but a cross-sectional dimension is incorporated into the representation (Canova and Ciccarelli, 2013). PVAR models specified in (5) can be estimated jointly with the fixed effects or, alternatively, independently of the fixed effects after some transformation with (OLS).

$$Y_{it} = Y_{i,t-1}A_1 + Y_{i,t-2}A_2 + Y_{i,t-p+1}A_{p-1} + Y_{i,t-p}A_p + X_{i,t}B + u_{i,t} + e_{i,t} \quad (5)$$

where Y_{it} is a $(1\times k)$ vector of dependent variables and $X_{i,t}$ is a $(1\times l)$ vector of exogenous covariates. Dependent variable-specific fixed-effects and idiosyncratic errors of the model (5) are denoted by $(1\times k)$ vectors $u_{i,t}$ and $e_{i,t}$, respectively. Finally, the $(k\times k)$ matrices $A_1, A_2, ..., A_{p-1}, A_p$ and the $(l\times k)$ matrix B are parameters of model (5) to be estimated (Abrigo and Love, 2015). Accordingly, lags of all endogenous variables of all units enter the model for cross-section i, $u_{i,t}$ are generally correlated across i and the intercept, the slope and the variance of the shocks $u_{1,i,t}$ may be cross-section specific (Canova and Ciccarelli, 2013).

4. RESULTS

4.1. Empirical Data

For the specification of appropriate type of the panel data model, alternative panel unit root tests with different theoretical assumptions are to be implemented. Assuming that the persistence parameters are common across cross-sections, the panel unit root tests of Levin, Lin and Chu (LLC), Breitung and Hadri are applied. On the other hand, persistence parameters vary across cross-sections in the panel unit root tests of Im, Pesaran and Shin (IPS), Fisher-ADF and Fisher-PP. In Table 1 below, we summarize the results of Levin, Lin

and Chu, Im, Pesaran and Shin, Fisher-ADF and Fisher-PP applied to the variables included in our empirical exercise.

Table 1: Panel Unit Root Test Results

	Levin, Lin and Chu		**Im, Pesaran and Shin**		**Fisher-ADF**		**Fisher-PP**	
	Statistic	***Prob.***	***Statistic***	***Prob.***	***Statistic***	***Prob.***	***Statistic***	***Prob.***
$cash_t$	-0.52	0.29	0.55	0.70	45.93	0.23	44.44	0.29
$\Delta cash_t$	-12.28	0.00	-10.74	0.00	172.31	0.00	245.76	0.00
$cequ_t$	-1.24	0.10	0.68	0.75	39.27	0.41	53.94	0.04
$\Delta cequ_t$	-8.67	0.00	-6.85	0.00	121.99	0.00	144.31	0.00
$clia_t$	0.55	0.71	3.70	0.99	20.17	0.99	33.40	0.76
$\Delta clia_t$	-11.61	0.00	-9.08	0.00	161.63	0.00	226.80	0.00
$nemp_t$	0.38	0.64	2.76	0.99	25.73	0.96	21.27	0.99
$\Delta nemp_t$	-7.07	0.00	-4.85	0.00	90.19	0.00	83.19	0.00
pro_t	-0.08	0.46	3.86	0.99	43.69	0.31	28.82	0.90
Δpro_t	-8.18	0.00	-6.01	0.00	107.88	0.00	115.96	0.00
$asset_t$	0.14	0.55	3.90	1	25.82	0.95	15.69	0.99
$\Delta asset_t$	-7.09	0.00	-5.54	0.00	99.77	0.00	117.60	0.00

Source: Authors' calculations

According to Table 1, the Levin, Lin and Chu, Im, Pesaran and Shin, Fisher-ADF and Fisher-PP tests reveal that all the variables are non-stationary in levels and stationary in first-differences. In this case, the possibility of panel cointegration relationships among the variables can be explored. We applied Engle-Granger based Pedroni and Kao tests as in Table 2.

Table 2: Panel Cointegration Tests' Results

Series: $cash_t$, $cequ_t$, $clia_t$, $nemp_t$, pro_t, $asset_t$

No. of Included Lags (Levels):1 (Automatic lag length selection based on Schwarz Information Criterion (SIC) with a max lag of 1)
Included observations: 280
Cross-sections included: 20
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend

Pedroni Test: Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	***Prob.***	***Weighted Statistic***	***Prob.***
Panel v-Statistic	-2.87	0.99	-2.55	0.99
Panel rho-Statistic	2.61	0.99	3.81	0.99
Panel PP-Statistic	-5.93	0.00	-4.28	0.00
Panel ADF-Statistic	-0.02	0.49	-1.78	0.03
Pedroni Test: Alternative hypothesis: common AR coefs. (between-dimension)				
	Statistic	***Prob.***		
Group rho-Statistic	5.32	1.00		
Group PP-Statistic	-7.95	0.00		
Group ADF-Statistic	-0.13	0.44		
Kao Residual Cointegration Test				
	t-Statistic	**Prob**		
ADF	0.32	0.37		

Source: Authors' calculations

According to Table 2, majority p-values of the Pedroni and Kao tests indicate that no cointegration relationship among the variables in our empirical exercise exists. Thus, we employ PVAR modeling instead of panel cointegration models. However, the variables included in PVAR model are in differences since panel unit root tests reflect that all variables we consider are stationary in first-differences.

4.2 The Case for NASDAQ Telecommunications, Transportation Index and Relevant Data

Technology-based NASDAQ stock exchange is the second largest stock exchange according to market capitalization in the U.S. and world, behind the NYSE. It began trading at 1971 as the world's first electronic stock market. Today, market-cap weighted NASDAQ includes more than 5000 stocks. NASDAQ has many indices, such as well-known NASDAQ-100 Index and NASDAQ Composite Index. There are also some sector indices: Bank, biotechnology, computer, financial-100, industrial, insurance, other finance, telecommunications and transportation (Kann, 2002).

NASDAQ Telecommunications Index and Transportation Index are the sub-indexes of NASDAQ Composite Index. NASDAQ Transportation Index consist of 52 securities, which work in the areas of delivery services, marine transportation, railroads, transportation services, trucking and airlines. The market-cap weighted Transportation Index was designed to measure the performance of transportation securities in NASDAQ. Index was developed in February 1971 with base point of 100. NASDAQ Telecommunication Index includes 115 stocks, providers of fixed-line and mobile telephone services, makers and distributors of high-technology communication products. Name of the NASDAQ Utility Index was changed to NASDAQ Telecommunications Index on November 1, 1993.

4.3 Empirical Results and Discussion

As for the empirical exercise, we use the balance sheet items of firms in Telecommunications and Transportation sectors quoted in NASDAQ. By estimating six PVAR models, we analyze the interrelations among cash, common equity, current liabilities, number of employees, property and total assets in terms of the lagged values of coefficients. More precisely, we integrate the effects of firms' liquidity, activity, debt, profitability and market performance into PVAR framework with the selection and usage of these variables. In order to specify the appropriate estimation method of our PVAR models, we employed Hausmann Test. Accordingly; two of the six PVAR models are estimated with fixed effects, while four PVAR models are estimated with random effects. On the other hand, optimal lag lengths of the all models are imposed by the Akaike Information Criterion (AIC) and SIC as 3. In a sense, possible effects of these balance sheet items on macroeconomic variables are also considered with PVAR(3) models.

Table 3: Estimation results of PVAR model using $\Delta cash_t$ as dependent variable

Dependent Variable: $\Delta cash_t$
Method: Panel Least Squares
Sample (adjusted): 2004 2013
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
R-squared: 0.694904
Adjusted R-squared: 0.625222

Variables	Coefficient	Std.Error	t -Statistic	Prob.
c	8.84E+08	1.37E+08	6.433534	0.0000
$\Delta cash_{t-1}$	-0.503362	0.078436	-6.417490	0.0000
$\Delta cequ_{t-1}$	0.036699	0.106685	0.343994	0.7313
$\Delta clia_{t-1}$	-0.373933	0.117124	-3.192629	0.0017
$\Delta nemp_{t-1}$	-9986.956	17530.12	-0.569703	0.5697
Δpro_{t-1}	-0.198105	0.059342	-3.338355	0.0010
$\Delta asset_{t-1}$	0.125216	0.025177	4.973511	0.0000
$\Delta cash_{t-2}$	-0.136330	0.093358	-1.460294	0.1461
$\Delta cequ_{t-2}$	-0.151340	0.129392	-1.169625	0.2439
$\Delta clia_{t-2}$	-0.725605	0.117059	-6.198637	0.0000
$\Delta nemp_{t-2}$	33277.08	16173.20	2.057544	0.0412
Δpro_{t-2}	-0.169393	0.111271	-1.522349	0.1299
$\Delta asset_{t-2}$	0.101556	0.040579	2.502684	0.0133
$\Delta cash_{t-3}$	0.258968	0.070966	3.649191	0.0004
$\Delta cequ_{t-3}$	-0.202777	0.101492	-1.997964	0.0474
$\Delta clia_{t-3}$	-0.240103	0.122211	-1.964661	0.0512
$\Delta nemp_{t-3}$	27196.50	15554.98	1.748411	0.0823
Δpro_{t-3}	0.170112	0.122868	1.384514	0.1681
$\Delta asset_{t-3}$	-0.058463	0.048856	-1.196638	0.2332

Source: Authors' calculations

According to Table 3, our PVAR model specification including cash as dependent variable indicates that cash maybe under the influence of its own lags. More precisely, cash

account does not have a deterministic way of impact on itself in future periods. We can assert that changes in the cash account of firms quoted in NASDAQ do not induce future change in cash. In this respect, other financial variables that may influence cash accounts should be taken into consideration seriously. Particularly, changes in cash capital reflect the activity of firms and thus may indirectly affect their cash position since they provide labor and physical capital and make R&D. Unlike our theoretical assumptions, our panel estimations show that the change in common equity does not have a significant impact on the change in cash account. We can interpret this finding as a possible use of common equity in fixed asset investments or long-term borrowing. The coefficients of current liabilities can be accepted as statistically significant at 10% confidence level, exposing that change in raising leverage has a direct effect in the change of cash account due to the future interest expenses. The signs of the coefficients of property and total assets for the lags 1 to 3 indicate that there is no significant impact on cash for the firms quoted in NASDAQ. Cash is found as unrelated to the other asset accounts, namely total assets and property, and asset accounts do not alternate to each other. This phenomenon expose that the change in cash maybe influenced by liability accounts. Our panel estimations reflect that, despite it is theoretically assumed that increases in labor affect cash position of firms negatively due to increased wage expenditures, the majority of the coefficients of employee variable is positive meaning a rising productivity level. The coefficient of employee is in line with Harrod neutral production function approach, more precisely technological progress can be accepted as labor–augmenting.

Table 4: Estimation results of PVAR model using $\Delta clia_t$ as dependent variable

Dependent Variable: $\Delta clia_t$
Method: Panel Least Squares
Sample (adjusted): 2004 2013
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
R-squared: 0.726805
Adjusted R-squared: 0.664409

Variables	Coefficient	Std.Error	t -Statistic	Prob.
$\Delta cequ_{t-1}$	0.121101	0.075478	1.604449	0.1106
$\Delta cash_{t-1}$	0.295724	0.055492	5.329092	0.0000
$\Delta clia_{t-1}$	-0.207341	0.082864	-2.502203	0.0133
$\Delta nemp_{t-1}$	10675.87	12402.33	0.860795	0.3906
Δpro_{t-1}	-0.202255	0.041984	-4.817452	0.0000
$\Delta asset_{t-1}$	-0.070274	0.017812	-3.945269	0.0001
c	2.88E+08	97261467	2.957033	0.0036
$\Delta cequ_{t-2}$	0.102880	0.091543	1.123836	0.2627
$\Delta cash_{t-2}$	0.179073	0.066049	2.711204	0.0074
$\Delta clia_{t-2}$	-0.089585	0.082818	-1.081717	0.2810
$\Delta nemp_{t-2}$	-9992.622	11442.33	-0.873303	0.3838
Δpro_{t-2}	0.304766	0.078723	3.871378	0.0002
$\Delta asset_{t-2}$	-0.222200	0.028709	-7.739740	0.0000
$\Delta cequ_{t-3}$	-0.011372	0.071804	-0.158371	0.8744
$\Delta cash_{t-3}$	0.138225	0.050207	2.753073	0.0066
$\Delta clia_{t-3}$	0.225615	0.086463	2.609391	0.0099
$\Delta nemp_{t-3}$	7023.227	11004.95	0.638188	0.5243
Δpro_{t-3}	0.217761	0.086927	2.505087	0.0132
$\Delta asset_{t-3}$	-0.089783	0.034565	-2.597536	0.0103

Source: Authors' calculations

According to Table 4, it can be asserted that the change in past values of current liabilities do not have a significant impact direction on itself despite past values of liabilities may induce variations on the current values of liabilities. More precisely, the change in the liability account arises from firms' other accounts. In our PVAR model all the coefficients of cash account from lag 1 to 3 are statistically significant and in line with the theoretical assumptions. In corporate finance, the debt management suggests that the cash account needs to be kept positive in order to meet firms' short-term obligations. Therefore, a positive change in cash account results in a positive change in current liabilities account which is also reflected in our findings. Liabilities are related to the activities of firms (investment, inventory management, sales etc.) rather than its common equity. The level of common equity is not a precise and a deterministic factor of leverage in the future. Our findings reveal that the change in total assets has a negative effect on the change in current liabilities. We can interpret this empirical evidence with the help of an increase in total factor productivity and thus in firms' economic value added which in turn has a direct impact on profitability and therefore on retained earnings resulting in a decrease in current liabilities. In this respect, we suggest the transmission mechanism of total factor productivity shock on firm performance with DSGE framework. However, the coefficients of property account do not support the interpretations based on the coefficients of total assets. Specifically, the change in property has a positive impact on the change in current liabilities suggesting that the fixed asset investments are financed by debt borrowing. Furthermore, property account is not a current account and thus does not have a total factor productivity generating effect both in the short- and medium-term. On the other hand, the change in productivity level of employees does not have an impact on the change in current liabilities since we found insignificant coefficients.

Table 5: Estimation results of PVAR model using $\Delta cequ_t$ as dependent variable

Dependent Variable: $\Delta cequ_t$
Method: Panel EGLS (Cross-section random effects)
Sample (adjusted): 2004 2013
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
Swamy and Arora estimator of component variances
R-squared: 0.591741
Adjusted R-squared: 0.551141

Variables	Coefficient	Std.Error	t -Statistic	Prob.
$\Delta cash_{t-1}$	-0.012609	0.040627	-0.310349	0.7567
$\Delta clia_{t-1}$	-0.033511	0.079818	-0.419845	0.6751
$\Delta nemp_{t-1}$	-7487.392	12240.17	-0.611707	0.5415
Δpro_{t-1}	-0.111217	0.039955	-2.783537	0.0059
$\Delta asset_{t-1}$	0.021180	0.015919	1.330492	0.1850
$\Delta cequ_{t-1}$	0.704064	0.075428	9.334275	0.0000
c	17011606	68323881	0.248985	0.8037
$\Delta cash_{t-2}$	0.046641	0.043791	1.065095	0.2883
$\Delta clia_{t-2}$	-0.392065	0.082421	-4.756882	0.0000
$\Delta nemp_{t-2}$	72940.06	10850.23	6.722445	0.0000
Δpro_{t-2}	0.358788	0.071436	5.022495	0.0000
$\Delta asset_{t-2}$	-0.072306	0.023140	-3.124747	0.0021
$\Delta cequ_{t-2}$	-0.553471	0.089635	-6.174735	0.0000
$\Delta cash_{t-3}$	0.071936	0.041217	1.745312	0.0826
$\Delta clia_{t-3}$	-0.254089	0.079447	-3.198240	0.0016
$\Delta nemp_{t-3}$	-32467.78	10472.03	-3.100428	0.0022
Δpro_{t-3}	0.044473	0.071541	0.621648	0.5350
$\Delta asset_{t-3}$	0.014553	0.028309	0.514075	0.6078
$\Delta cequ_{t-3}$	-0.186369	0.069286	-2.689859	0.0078

Source: Authors' calculations

According to Table 5, the coefficients of the change in common equity are statistically significant and indicate that increases in common equity lead to the decrease of common equity in future periods and thus increase the need of capital. Moreover, this implication is in line with the coefficient of common equity in the PVAR model specification using cash as dependent variable (Table 3). Additionally, it can be suggested that firms in these sectors frequently uses its capital in its operations. Our findings have mixed results in terms of coefficients, implying that property account does not have an impact on common equity. This implication is also verified by the coefficients of property account in Table 4 where the dependent variable is current liabilities. More precisely, increases in property are financed by current liabilities in future periods since property is a long-term investment. On the other hand, changes in total assets do not have a direct, significant effect on changes in common equity suggesting that there is a possible financing of common equity by current liabilities. In detail, a decrease in the change of current liabilities will cause an increase in the change of common equity which is also in accordance with the corporate finance theory. Similarly, the change in the cash account does not have a direct, significant effect on changes in common equity which is also consistent to that of total assets. According to the coefficients of number of employees, a mixed effect on common equity is detected. Despite labor-augmenting technological progress may increase the total profit in the long-run; increase in the number of employees does not have a significant influence on common equity. Possible increases of profitability are reflected by other balance sheet components.

Table 6: Estimation results of PVAR model using Δpro_t as dependent variable

Dependent Variable: Δpro_t
Method: Panel EGLS (Cross-section random effects)
Sample (adjusted): 2004 2013
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
Swamy and Arora estimator of component variances
R-squared: 0.613172
Adjusted R-squared: 0.574703

Variables	Coefficient	Std.Error	t -Statistic	Prob.
$\Delta cequ_{t-1}$	-0.085189	0.142425	-0.598131	0.5505
$\Delta cash_{t-1}$	0.229232	0.076714	2.988156	0.0032
$\Delta clia_{t-1}$	1.052750	0.150714	6.985069	0.0000
$\Delta nemp_{t-1}$	38419.67	23112.18	1.662312	0.0982
Δpro_{t-1}	0.148824	0.075444	1.972625	0.0501
$\Delta asset_{t-1}$	-0.125950	0.030059	-4.190115	0.0000
c	24856646	1.29E+08	0.192671	0.8474
$\Delta cequ_{t-2}$	0.015597	0.169250	0.092152	0.9267
$\Delta cash_{t-2}$	-0.599006	0.082687	-7.244268	0.0000
$\Delta clia_{t-2}$	0.040120	0.155629	0.257793	0.7969
$\Delta nemp_{t-2}$	33776.54	20487.66	1.648628	0.1010
Δpro_{t-2}	-0.464507	0.134887	-3.443661	0.0007
$\Delta asset_{t-2}$	0.091109	0.043693	2.085213	0.0385
$\Delta cequ_{t-3}$	-0.113202	0.130827	-0.865278	0.3880
$\Delta cash_{t-3}$	0.090947	0.077827	1.168590	0.2441
$\Delta clia_{t-3}$	0.458292	0.150013	3.055014	0.0026
$\Delta nemp_{t-3}$	23498.64	19773.55	1.188388	0.2362
Δpro_{t-3}	0.008796	0.135085	0.065112	0.9482
$\Delta asset_{t-3}$	-0.014300	0.053455	-0.267519	0.7894

Source: Authors' calculations

Property is a critical account in terms of showing fixed asset investments which in turn can be determinative on firms' investment capabilities. More precisely, fixed asset investments are alternate to current assets accounts such as inventory etc. Firms' investment decision into current or long-term assets may vary according to firm's financial equity structure. Table 6 indicates that the change in the property account may cause variations in the value of the fixed asset portfolio and thus properties. Similarly, increases of the past values of cash account have a mixed effect on the values of property account. The increase in the change of cash account may not have a positive effect on the change in property account as the second lag suggests. This may be caused by an alternative use of cash such as in Table 4 in terms of current liabilities. On the other hand, we found that the change in common equity does not have a significant influence on the change in properties. As we've mentioned above previously, issuing new capital stock are alternate to fixed asset investments. We can assert that firm's investment decisions are made considering this phenomenon. Additionally, the change in current liabilities has a significant positive effect on the change in fixed asset investments. This shows that the firms, using their leverage effects, invest in fixed assets by borrowing short-term debts and financing their growth. Total assets consist of accounts such as cash, current assets, inventory, property etc. The change in total assets may not have a direct impact on the change in property account as Table 6 shows. Moreover, the coefficients of the lags of cash account are in line with this finding. Additionally, changes in fixed asset investments can cause an increase in labor demand and thus employment. Labor can also trigger total factor productivity, especially in the cases when production function is labor-augmenting. According to our PVAR estimations, it is implied that increase in the number of employees does not lead to an increase in total productivity that may affect the value of fixed investments positively.

Table 7: Estimation results of PVAR model using $\Delta asset_t$ as dependent variable

Dependent Variable: $\Delta asset_t$
Method: Panel EGLS (Cross-section random effects)
Sample (adjusted): 2004 2013
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
Swamy and Arora estimator of component variances
R-squared: 0.654732
Adjusted R-squared: 0.620396

Variables	Coefficient	Std.Error	t -Statistic	Prob.
$\Delta cequ_{t-1}$	-0.387824	0.281180	-1.379271	0.1695
$\Delta cash_{t-1}$	1.664570	0.151451	10.99081	0.0000
$\Delta clia_{t-1}$	0.940827	0.297546	3.161954	0.0018
$\Delta nemp_{t-1}$	116192.4	45628.98	2.546462	0.0117
Δpro_{t-1}	-0.727849	0.148945	-4.886686	0.0000
$\Delta asset_{t-1}$	0.157417	0.059343	2.652644	0.0087
c	4.73E+08	2.55E+08	1.858765	0.0647
$\Delta cequ_{t-2}$	-0.632842	0.334141	-1.893938	0.0598
$\Delta cash_{t-2}$	-1.228264	0.163244	-7.524117	0.0000
$\Delta clia_{t-2}$	-0.346084	0.307248	-1.126399	0.2615
$\Delta nemp_{t-2}$	225009.6	40447.54	5.562998	0.0000
Δpro_{t-2}	-0.788786	0.266300	-2.962018	0.0035
$\Delta asset_{t-2}$	-0.021271	0.086261	-0.246592	0.8055
$\Delta cequ_{t-3}$	-0.061024	0.258284	-0.236268	0.8135
$\Delta cash_{t-3}$	-0.014174	0.153648	-0.092252	0.9266
$\Delta clia_{t-3}$	1.222549	0.296161	4.127982	0.0001
$\Delta nemp_{t-3}$	6666.839	39037.71	0.170779	0.8646
Δpro_{t-3}	-0.302789	0.266691	-1.135355	0.2577
$\Delta asset_{t-3}$	-0.070200	0.105532	-0.665196	0.5068

Source: Authors' calculations

The total assets account is a balance sheet account which reflects the economic and financial activities of the firm. Financial and economic activities may follow autoregressive process, more precisely economic and financial decisions made by the firms may be under the influence of their past decisions and/or their economic and financial positions. We analyzed the lagged values of total assets and found that there is no significant impact on the future value of total assets because of the coefficients. In terms of the cash account, we found that there is no significant impact direction on total assets. Variations in total assets may arise from other components of total assets. According to corporate finance theory, it's expected that a change in total assets may have a direct effect on the change in current liabilities due to the balance sheet equation. Our results suggest a positive relationship between the changes in current liabilities and the changes in total assets. On the other hand, we can infer that changes in total assets are not related to the changes in common equity according to the relevant coefficients of common equity which can be accepted as in contrast to the corporate finance theory. It is generally assumed that property, as a part of total assets, is not efficiency generating and profit maximizing when compared to the other types of investments. Our PVAR results suggest a negative relationship between the change in property and the change in total assets which is in line with this assertion. In line with the detected effects of employment on property, our coefficients indicate that labor force of firms may generate a total factor productivity increase and thus profit.

Table 8: Estimation results of PVAR model using $\Delta nemp_t$ as dependent variable

Dependent Variable: $\Delta nemp_t$
Method: Panel EGLS (Cross-section random effects)
Sample (adjusted): 2004 2013
Periods included: 10
Cross-sections included: 20
Total panel (balanced) observations: 200
Swamy and Arora estimator of component variances
R-squared: 0.615776
Adjusted R-squared: 0.577566

Variables	Coefficient	Std.Error	t -Statistic	Prob.
$\Delta cequ_{t-1}$	5.25E-06	4.25E-07	12.36862	0.0000
$\Delta cash_{t-1}$	-1.71E-07	2.29E-07	-0.748036	0.4554
$\Delta clia_{t-1}$	1.02E-06	4.49E-07	2.264985	0.0247
$\Delta nemp_{t-1}$	-0.086847	0.068912	-1.260260	0.2092
Δpro_{t-1}	-1.16E-06	2.25E-07	-5.150439	0.0000
$\Delta asset_{t-1}$	1.21E-07	8.96E-08	1.347350	0.1796
c	821.3081	384.6622	2.135141	0.0341
$\Delta cequ_{t-2}$	-3.77E-06	5.05E-07	-7.471232	0.0000
$\Delta cash_{t-2}$	6.36E-07	2.47E-07	2.579740	0.0107
$\Delta clia_{t-2}$	2.06E-07	4.64E-07	0.444876	0.6569
$\Delta nemp_{t-2}$	0.386306	0.061087	6.323907	0.0000
Δpro_{t-2}	1.03E-06	4.02E-07	2.553656	0.0115
$\Delta asset_{t-2}$	-2.00E-07	1.30E-07	-1.536468	0.1262
$\Delta cequ_{t-3}$	-1.78E-07	3.90E-07	-0.455514	0.6493
$\Delta cash_{t-3}$	1.89E-08	2.32E-07	0.081405	0.9352
$\Delta clia_{t-3}$	-5.26E-07	4.47E-07	-1.174925	0.2416
$\Delta nemp_{t-3}$	0.091351	0.058957	1.549447	0.1230
Δpro_{t-3}	2.47E-07	4.03E-07	0.613373	0.5404
$\Delta asset_{t-3}$	7.30E-08	1.59E-07	0.457756	0.6477

Source: Authors' calculations

Labor is an important factor for firms since the structure of the production function may be labor-augmenting. Thus, labor can influence the balance sheet accounts of the firms and vice versa. According to the lagged coefficients of the number of employees, we can infer that the employment policy of firms does not have a significant impact on its current policy. Hereby, it is not possible to expose the pattern of labor productivity and the effect on firms' profitability. Balance sheet accounts, which are dependent variables in our panel VAR model, shed light on firms' economic activity which in turn may be determinative on labor demand. The majority of the coefficients in Table 8 are insignificant revealing that the pattern of labor demand cannot be explained by balance sheet accounts. First and second lags of common equity and property are significant, but signs of their coefficients are in contrast to each other. Thus, it is difficult to make an accurate comment.

5 CONCLUSION

In this study, we employed VAR-type of models allowing to analyze a variable's lagged values since their coefficients are computed. In this respect, via our panel VAR estimations it was possible to detect the effects of previous years' financial statements on their current ones. Within this empirical framework, we found that the lagged values of the change in equity account have both negative and positive signs and they are all statistically significant which indicates that firms frequently use their capital in their operations. It can also be inferred that investments, gross fixed capital formation and output in these sectors can be highly dependent on the level of money capital. Indeed, it is critically important for the firms in these sectors to maximize their output under the financing constraint.

Due to the working capital management, liquidity of a firm infers the ability to make the short-term obligations with respect to firm's current assets. In our study, the change in cash account has a significant and positive effect on the current liabilities which shows that firms in these sectors are sufficient enough to make their short-term payments. Additionally, the change in total assets and property has a statistically significant and negative impact on the change in current liabilities which is in line with the debt management of a firm where an increase in total assets, creating an economic value added, raises the profitability of a firm which in turn lowers the current liabilities. In this respect, it can be asserted that it is critically important for the firms in these sectors to determine the relationship between total factor productivity, physical capital and labor. Thereby, plausible production function formulation can be obtained and possible effects of total productivity shocks in these sectors on macroeconomic aggregates can be detected within DSGE framework. Our PVAR estimations suggest that the positive change in current liabilities may reflect itself in the investment in property account. However, according to the signs of the coefficients of current liabilities showing the effects on total assets, it can be put forward that the firm cannot use the leverage effect and thus cannot trigger a financial growth by incurring liabilities. Furthermore, our results indicated that increasing the amount of current liabilities affects the equity negatively in line with the theoretical expectations. As a result, it is stressed that generating total productivity shocks, investment specific shocks and making innovation are obligatory in order to

increase the profitability of the firms and promote the sectors. In this respect, we suggest that economic policy-makers should focus on sustaining financial and economic stability. Generally, our PVAR results show mixed results between different balance sheet accounts. This pattern may arise from the uncertainty and volatility of the financial markets and economic situations which makes interrelating the accounts difficult via quantitative techniques. Thus, it can be inferred that economic fragility and financial volatility may induce a negative impact on firms. In conclusion, we suggest that decreasing the volatility in financial markets and economic fragilities will provide sustainable growth in these sectors.

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