

Earnings Management Motivation and Cost Stickiness—Research Based on Private Equity Placement

Yihuan Li

Accounting Department, Management School, Jinan University, Guangzhou, China
Email: liyh_jnu@163.com

How to cite this paper: Li, Y.H. (2018) Earnings Management Motivation and Cost Stickiness—Research Based on Private Equity Placement. *American Journal of Industrial and Business Management*, 8, 597-606.

<https://doi.org/10.4236/ajibm.2018.83039>

Received: February 26, 2018

Accepted: March 18, 2018

Published: March 21, 2018

Copyright © 2018 by author and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Cost Stickiness means that costs increase more rapidly with an activity increase than they decrease with an activity decrease. This paper focuses on Chinese A-shares listed companies, which implement private equity placement from 2007 to 2016, to study the impact of earnings management motivation of private equity placement on listed companies' cost stickiness. The results show that the listed companies implementing private equity placement have positive motivation of earnings management, and will cut more costs when the operating income declines, thus weakening their cost stickiness. Further tests find that this weakened effect is more obvious in the state-owned enterprises, and less obvious in the enterprises audited by the big-four.

Keywords

Private Equity Placement, Earnings Management Motivation, Cost Stickiness, State-Owned Enterprises, Big Four International Audit Firms

1. Introduction

Cost management is an important theme of business management. Theoretically, costs change symmetrically and proportionally with changes in activity levels, but later scholars questioned it. ABJ (2003) [1] found that when operating income rose by 1%, the sales and management expenses of the American public companies (SG & A) increased by 0.55%. When operating income decreased by 1%, SG & A decreased by only 0.35%. That is to say, the cost increase caused by the increase of operating income was greater than the cost reduction caused by the decrease of operating income. ABJ called this phenomenon "cost stickiness". The study of cost stickiness helps to reveal the "black box" of cost management

in enterprises, so it becomes a rising concern.

Enterprise cost management is closely related to managers. If managers have earnings management motivation, the cost adjustment will not be in line with the optimal resource allocation of enterprises, resulting in cost stickiness. China's listed companies generally have earnings management motivation in the process of offering shares and other financing [2] [3] [4]. Since China Securities Regulatory Commission issued "Administrative Measures for Securities Issuance of Listed Companies" in May 2006, allowing listed companies to refinance by private equity placement, the number of private equity placements and the scale of fund-raising have been rising. According to Wind statistics, the number of private equity placements has increased from 53 in 2006 to 797 in 2016, accounting for 69.55% of the number of equity financing. The fund-raising scale of private equity placements has increased from 94.120 billion in 2006 to 1.809241 trillion in 2016, accounting for 80.66% of the total equity financing. The trillion-level raised amount indicates that private equity placement has become the most important equity financing way for enterprises currently, and investment project for institutional investors to participate actively. It is worth noticing and exploring. This paper discusses how the earnings management motivation affects the cost stickiness based on the private equity placement scenario. On the one hand, it expands the drivers of cost stickiness, explains how the earnings management motivation of private equity placement affects the enterprise cost management behavior. On the other hand, it reveals the formation mechanism of earnings, helping investors make more reasonable valuation or pricing in the purchase of private equity placement, enhancing the efficiency of capital markets.

The contribution of this paper included two aspects. Firstly, although some foreign scholars such as Weiss, Jiang Wei studied the impact of earnings management motivation on cost stickiness, they both choose avoiding losses and meet or exceed the analysis expectation as earnings management motivation. No scholar studies cost stickiness from the perspective of earnings management motivation of equity financing. Currently private equity placement has become an important equity refinancing method in China's listed companies. This paper exploring how earnings management motivation affects the cost stickiness based on the private equity placement scenario, complements the research in this field.

Secondly, the scholars exploring the agency motivation of cost stickiness mainly focused on the internal corporate governance, such as the size of the board of directors, the separation of two posts, the proportion of independent directors. Less scholars research from the perspective of external governance or combine external governance with cost stickiness earnings management drivers. This paper conducts an empirical test through the government supervision and the auditing quality group, further expanding the research to external governance.

2. Theoretical Analysis and Research Hypotheses

Earnings Management Motivation and Cost Stickiness

Because of the one-year lock-up period, when external investors such as insti-

tutions evaluate whether to participate in a purchase of private placement, for high-quality investment projects or assets, they not only consider the relevant projects, future performance of the company brought by the assets and changes in stock prices, but also consider the fundamentals of the company's financial position and other risks, in order to control the lock-up may bring the loss. The good performance of the company can convey to the outside world an image with investment value and growth potential, thus attracting external investors to subscribe (Zheng Qi, 2009 [5]). In the meantime, under the background of relatively concentrated equity and imperfect system in our country, private placement is closely related to the interests of major shareholders. The higher issue price of the private placement, the more capital raised by the listed company, the higher net assets per share thickened, and the greater wealth appreciation effect obtained by major shareholders in the private equity placement (Zhang Weidong, 2012 [6], Li Zengfu *et al.*, 2012 [7]). The company's good performance delivers to market that project finance is a good news, thus raising the issue reserve price, raising the subscription price estimated by investors based on the company's performance, and raising the issue price. Therefore, the implementation of private equity placement of listed companies motivated earnings management to improve the company's performance. Although institutional investors have professional competence, on the one hand, private equity placement companies do not disclose much information, compared with public equity financing. Institutional investors need to spend more information collection costs to understand the company, industry, financing projects and other aspects, so they will not put all effort into identifying the earnings management; on the other hand, earnings management is that internal management use accounting or real transactions to adjust the financial reports. It is difficult for institutional investors to accurately identify the earnings management of listed companies even if they spend more information collection costs. Management can show good performance by reducing costs when the revenue rises and falls, but it is more likely to have a loss due to the decline of operating revenue, which has a double negative impact on the company. Therefore, when revenue declines, management have more pressure and motivation to cut costs. Due to the adjustment costs, if managers expect the decline in operating income to be temporary, managers are not willing to cut idle costs, leading to cost stickiness. However, when listed companies prepare to implement private equity placement, companies need good performance to attract subscriptions and raise the issue price. Managers will deliberately reduce costs when operating income declines. They may reduce actual costs such as advertising expenses and general management fees resources [8] [9]. They may also reduce the book cost by reversing the provision for bad debts and the provision for decline in inventory (Jiang Wei, 2015 [10]), so as to increase the costs decline degree when revenue decline and then weaken the company's cost stickiness.

H1: The earnings management motivation of private equity placement may weaken the cost stickiness of listed companies.

Earnings management motivation, external governance and cost stick-

iness

The same as initial public offerings adopts approval system, the implementation of private equity placement needs to be approved by the issuance examination committee and the China Securities Regulatory Commission. The strict supervision of the government departments has a certain restraining effect on the earnings management in the private equity placement. Research shows that political connection can reduce government regulation's constraint of earnings management (Liu Yongze *et al.*, 2013 [11]). For instance, enterprises with political connections are more likely to get bank loans (Yu Minggui *et al.*, 2008 [12]), have higher pass rates of private equity placement approval (Yang *et al.*, 2016 [13]) and are less likely to be subject to administrative sanctions (Maria, 2014 [14]). State-owned enterprises are dominant in our market economy and have natural close relationship with government. This strong political connection makes them subject to less supervision and restriction in private equity placement, due to more earnings management. When operating income declines, the company cut more costs. That is to say, compared with non-state-owned enterprises, the costs drop more with the decline in operating income. As a result, the cost stickiness weakened more.

H2: Compared with non-state-owned enterprises, the weakening effect of private equity placement on state-owned enterprises' cost-stickiness is greater.

High quality audit plays an effective external governance role in restraining earnings management, by identifying financial statement errors and rejecting problematic financial reports (Becker *et al.*, 1998 [15], Cai *et al.*, 2014 [16]), or issuing non-standard audit opinion so that management face pressure of being warned and replaced by the board of directors (Jiang Rong, 2007 [17]). The research shows that compared with the non-big-four, the big-four have higher audit quality because of higher ability and independence [18] [19] [20] [21]. Therefore, the big-four auditors can restrain the management opportunism. When the listed companies implement private equity placement, it is hard for the management to cut too much cost when operating income declines, thus restraining the reduction of cost stickiness.

H3: Compared with non-big-four auditing firms, the weakening effect of private equity placement on big-four auditing firms' cost-stickiness is smaller.

3. Method

Sample Selection

A-share listed companies in Shanghai and Shenzhen Stock Exchanges from 2007 to 2016 was selected as sample. Financial data was taken from CSMAR and private equity placement data was taken from Wind. Referring to the data processing methods of ABJ, Jiang Wei and other scholars, we excluded the financial industry and ST companies, excluding the negative assets-liability ratio

observation, excluding the negative operating income and SG&A or two years of missing observations, excluding SG&A greater than operating income observations. Excluding the private equity placement confused with other equity refinancing. According to the size of companies, industry and year, we select the listed companies without refinancing during the study period as a control sample. For each directional issuance sample and their control samples, the financial data was consolidated and extended to the study period. After the merger, the continuous variables were winsor by 0.5%.

Model Specification and Variable Definitions

For the study of earnings management motivation and cost stickiness, we construct the following model to test hypothesis 1 according to the research methods of ABJ and other scholars:

$$\begin{aligned} \ln SG \& A = \beta_0 + \beta_1 \ln Rev + \beta_2 DEC * \ln Rev + \beta_3 PEP * DEC * \ln Rev + \beta_4 PEP \\ & + \beta_5 SuccDecre * DEC * \ln Rev + \beta_6 GdpGrowth * DEC * \ln Rev \\ & + \beta_7 EI * DEC * \ln Rev + \beta_8 AI * DEC * \ln Rev + \beta_9 i.Industry + \beta_{10} i.Year \end{aligned}$$

Explained variables are cost changes ($\ln SG \& A$), explanatory variables are revenue changes ($\ln Rev$), and private equity placement (PEP). We refer to the previous research to introduce the control variables. If β_3 is significant, the hypothesis 1 is supported.

For the study of earnings Management motivation, external governance and cost stickiness, on the basis of the above model, we test hypotheses 2 and 3 by group, taking entrepreneurial property right (SOE) and big-four (Big4) as the group variables. The definition of research variables is shown in **Table 1**. If β_3 is significant in state-owned group but non-significant in non-state-owned group, the hypothesis 2 is supported. If β_3 is significant in non-big-four group but non-significant in big-four group, the hypothesis 3 is supported.

4. Results

Descriptive Results

Table 2 shows the descriptive statistics of the regression variables. As can be

Table 1. Variable definitions.

| Variable | Definitions |
|---------------|--|
| $\ln SG \& A$ | $\log(SG \& A_{it}/SG \& A_{it-1})$, $SG \& A_{it}$ are sales and management expenses |
| $\ln Rev$ | $\log(Rev_{it}/Rev_{it-1})$, Rev_{it} are operating income |
| DEC | Equal to 1 when sales in year t are smaller than sales in year $t - 1$, and 0 otherwise |
| PEP | Equals 1 if implement private equity placement in year t or year $t + 1$, and 0 otherwise |
| SOE | Equals 1 if owned by the state, and 0 otherwise |
| Big4 | Equals 1 if audited by the big-four, and 0 otherwise |
| SuccDecre | Equals 1 if sales have decreased in two consecutive years, and 0 otherwise |
| GdpGrowth | Growth in GDP in year t |
| EI | the ratio of total number of employees over sales(million) |
| AI | the ratio of total assets over sales |

Table 2. Sample descriptive statistics.

| Variable | Mean | Std | Min | Median | Max |
|-----------|-------|--------|--------|--------|-------|
| lnSG & A | 0.152 | 0.276 | -0.809 | 0.127 | 1.685 |
| lnRev | 0.140 | 0.356 | -0.969 | 0.113 | 2.273 |
| DEC | 0.278 | 0.448 | 0 | 0 | 1 |
| PEP | 0.190 | 0.392 | 0 | 0 | 1 |
| SuccDecre | 0.102 | 0.303 | 0 | 0 | 1 |
| GdpGrowth | 0.121 | 0.0511 | 0.0700 | 0.102 | 0.231 |
| EI | 1.647 | 1.422 | 0.0368 | 1.286 | 9.005 |
| AI | 2.461 | 2.232 | 0.320 | 1.834 | 17.49 |

seen from **Table 2**, lnSG&A has a mean of 0.152 and a median of 0.127. lnRev has a mean of 0.14, a median of 0.113. Observations of DEC = 1 account for 27.8%. In recent years, there have been more and more companies funding through private equity placement. 19% observations have implemented private equity placement this year or next year. In addition, 10.2% observations' operating income decreased in two consecutive years. EI has a mean of 1.647, a median of 1.286 while AI has a mean of 2.46, a median of 1.834. All variables are in the normal range.

Results of Hypothesis Tests

Earnings management motivation and cost stickiness

Table 3 shows the hypothesis 1 test results. The estimated values of β_1 and β_2 are 0.5 and -0.186 respectively in column (1) of **Table 3**, both significant at 1% level, indicating that the cost stickiness of listed companies exists in China. When operating income rises 1%, the cost increases by 0.5%; when operating income decreases by 1%, the cost decreases by 0.314%. The estimated value of β_3 in column (2) is 0.119 and is significant at 1% level, indicating that compared to the control sample, private equity placement companies will cut more costs when operating income decline, resulting in weakening cost stickiness, thus supporting Hypothesis 1.

Earnings Management Motivation, External Governance and Cost Stickiness

Table 4 shows the test results for Hypothesis 2 and Hypothesis 3. Column (1) and column (2) of **Table 4** show the group test results of state-owned and non-state-owned listed enterprises. It can see that the estimated values of β_3 are 0.253 and 0.03 respectively. The former is significant at the level of 1% and the latter is not significant, supporting the hypothesis 3, which shows that compared with non-state-owned enterprises, state-owned enterprises have strong political connections and are subject to fewer earnings management constraints in the approval of private equity placement, thus increasing the decline of cost when operating income declines and weakening the cost stickiness.

Columns (3) and (4) of **Table 4** show the group test results of the big-four au-

dit firms and the non-big-four audit firms. The coefficient of $PEP*DEC*lnRev$ is not significant in the big-four, while the coefficient of $PEP*DEC*lnRev$ is 0.112 and is significantly positive at the level of 1% in the non-big-four, supporting the hypothesis 4, which indicates that when listed companies implement private equity placement, the big-four auditors play a positive role for restraining earnings management, thereby inhibiting the weakening of cost stickiness.

Robustness Test

The listed companies in our country separately disclosed the management expenses and sales expenses. Chen Lei *et al.* (2012) [22] showed that compared with the sales expenses, the management expenses are more sticky. In this paper, we use the change of management expenses as the dependent variable to test the hypothesis and the test results have good stability. In order to avoid ignoring the enterprises heterogeneity, the individual effects and time effects in the panel data, we also use the fixed effect model and the random effect model to test the

Table 3. Hypothesis 1 test results.

| Variable | (1) | (2) |
|-------------------------|-----------------------|-----------------------|
| Constant | 0.0723*** (30.67) | -0.0533*** (-3.64) |
| lnRev | 0.500*** (80.09) | 0.500*** (79.32) |
| DEC * lnRev | -0.186*** (-11.56) | -0.248*** (-6.12) |
| PEP * DEC * lnRev | | 0.119*** (2.99) |
| PEP | | 0.0409*** (8.35) |
| SuccDecre * DEC * lnRev | | 0.161*** (6.54) |
| GdpGrowth * DEC * lnRev | | 0.790*** (3.02) |
| EI * DEC * lnRev | | -0.00895 (-1.56) |
| AI * DEC * lnRev | | -0.0201*** (-7.20) |
| Industry | control | control |
| Year | control | control |
| F value | 4221.59 | 277.55 |
| Adjusted R ² | 35.04% | 37.54% |
| Number of Observations | 15,648 | 15,648 |

*, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 4. Hypothesis 2 and 3 test results.

| Variable | (1) | (2) | (3) | (4) |
|-------------------------|-----------------------|-----------------------|---------------------|-----------------------|
| | State-owned | Non-state-owned | Big-four | Non-big-four |
| Constant | -0.0798*** (-3.84) | -0.0196 (-0.93) | 0.00835 (0.14) | -0.0554*** (-3.72) |
| lnRev | 0.514*** (51.93) | 0.483*** (58.72) | 0.607*** (22.63) | 0.496*** (76.58) |
| DEC * lnRev | -0.432*** (-7.67) | -0.0981* (-1.69) | -0.393* (-1.89) | -0.240*** (-5.78) |
| PEP * DEC * lnRev | 0.253*** (4.11) | 0.0300 (0.58) | 0.415 (1.65) | 0.112*** (2.76) |
| PEP | 0.0502*** (6.42) | 0.0317*** (5.01) | 0.0555*** (2.80) | 0.0402*** (7.96) |
| SuccDecre * DEC * lnRev | 0.0938*** (2.63) | 0.184*** (5.44) | 0.0571 (0.47) | 0.161*** (6.38) |
| GdpGrowth * DEC * lnRev | 1.421*** (3.94) | 0.367 (0.97) | -1.932 (-1.47) | 0.853*** (3.18) |
| EI * DEC * lnRev | 0.0164** (2.01) | -0.0297*** (-3.69) | 0.0648 (1.59) | -0.0102* (-1.73) |
| AI * DEC * lnRev | -0.0181*** (-4.29) | -0.0199*** (-5.27) | -0.00969 (-0.81) | -0.0202*** (-6.97) |
| Industry | control | control | control | control |
| Year | control | control | control | control |
| F value | 119.38 | 162.13 | 22.96 | 261.64 |
| Adjusted R ² | 35.89% | 38.02% | 44.97% | 37.35% |
| Number of Observations | 6979 | 8668 | 780 | 14868 |

*, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

hypothesis, which is basically consistent with the previous regression results. Due to space limitations, the test results omitted.

5. Conclusions

This paper takes Shanghai and Shenzhen A-share listed companies from 2007 to 2016 as samples, and studies the impact of earnings management motivation on the cost stickiness based on the private equity placement scenario. The results show that in order to show a good profitability, listed companies which implement private equity placement will cut more costs when revenue declines, thereby weakening its cost stickiness. Further research finds that private equity placement has a greater effect of weakening cost stickiness on the state-owned listed companies, which indicates that earnings management of the state-owned

listed companies are restrained to a lesser extent by the regulatory agencies, aggravating the weakening of cost stickiness. Private equity placement has a smaller effect of weakening cost stickiness on the big-four auditing enterprise, indicating that the big-four representing high-quality audit can effectively restrain earnings management behavior in private equity placement, inhibiting the weakening of the cost stickiness.

The theoretical significance of this paper is to enrich the research on the causes of cost stickiness, explain how the earnings management motivation based on private equity placement effects the cost management behavior, and expand the research on cost stickiness to the perspective of external governance. Earnings management motivation based on private equity placement will weaken cost stickiness, but the reduction of cost stickiness may not necessarily means the improvement of cost management efficiency. Scholars should consider the impact of earnings management motivation when studying cost stickiness. Effective external governance can restrict the earnings management, thereby inhibiting the weakening of cost stickiness. The practical significance of this paper is to uncover the “black box” of enterprise cost management and reveal the formation mechanism of earnings, which helps investors make more rationally valuation or pricing of private equity placement, improving the efficiency of capital markets.

References

- [1] Anderson, M.A., Banker, R.D. and Janakiraman, S. (2003) Are Selling, General, and Administrative Costs “Sticky”? *Journal of Accounting Research*, **41**, 47-63.
<https://doi.org/10.1111/1475-679X.00095>
- [2] Teoh, S.H., Welch, I. and Wong, T.J. (1998) Earnings Management and the Underperformance of Seasoned Equity Offerings. *Journal of Financial Economics*, **50**, 63-100. [https://doi.org/10.1016/S0304-405X\(98\)00032-4](https://doi.org/10.1016/S0304-405X(98)00032-4)
- [3] Rangan, S. (1998) Earnings Management and the Performance of Seasoned Equity Offerings. *Journal of Financial Economics*, **50**, 101-122.
[https://doi.org/10.1016/S0304-405X\(98\)00033-6](https://doi.org/10.1016/S0304-405X(98)00033-6)
- [4] Chen, X.Y., Xiao, X. and Guo, X.Y. (2000) Equity Rights and Profit Control of Listed Companies. *Economic Research*, No. 1, 30-36.
- [5] Zheng, Q. (2009) Research on the Earnings Management of Private Placement Company. *Journal of Shanghai Finance University*, No. 3, 53-58.
- [6] Zhang, W.D. (2010) Private Placement and Earnings Management—Empirical Evidence from China’s Securities Market. *Management World*, No. 1, 54-63+73.
- [7] Li, Z.F., Huang, H.L. and Lian, Y.J. (2012) Private Placement, Earnings Management and Corporate Performance Decline—Research Based on Accidental Manipulation and Real Activity Manipulation. *Journal of Applied Statistics And Management*, **5**, 941-950.
- [8] Kama, I. and Weiss, D. (2013) Do Earnings Targets and Managerial Incentives Affect Sticky Costs? *Journal of Accounting Research*, **51**, 201-224.
<https://doi.org/10.1111/j.1475-679X.2012.00471.x>
- [9] Dierynck, B., Landsman, W.R. and Renders, A. (2012) Do Managerial Incentives drive Cost Behavior? Evidence about the Role of the Zero Earnings Benchmark for Labor Cost Behavior in Belgian Private Firms. *The Accounting Review*, **87**,

1219-1246. <https://doi.org/10.2308/accr-50153>

- [10] Jiang, W., Hu, Y.M. and Lu, Z. (2015) Does Accrual-Based Earnings Management Affect Firm Cost Stickiness. *Nankai Business Review*, **2**, 83-91.
- [11] Liu, Y.Z., Zhang, D.L. and Tang, D.P. (2013) Market Degree, Political Linkage and Earnings Management—An Empirical Study based on Private Listed Companies in Shenzhen Small and Medium Enterprises. *Audit and Economy Research*, **28**, 49-58.
- [12] Yu, M.G. and Pan, H.B. (2008) Political Relationship System Environment and Private Enterprise Bank Loans. *Management World*, **8**, 9-21+39+187.
- [13] Yang, X., Tian, G.L., Si, Y. and Fonseka, M.M. (2016) The Nature of Ownership, Corporate Political Relations and Private Placement—Empirical Analysis Based on Chinese Listed Companies. *Nankai Business Review*, **19**, 34-141+154.
- [14] Correia, M.M. (2014) Political Connections and SEC Enforcement. *Journal of Accounting and Economics*, **57**, 241-262. <https://doi.org/10.1016/j.jacceco.2014.04.004>
- [15] Defond, B.C.M., Jiambalvo, J. and Subramanyam, K.R. (1998) The Effect of Audit Quality on Earnings Management. *Contemporary Accounting Research*, **15**, 1-24. <https://doi.org/10.1111/j.1911-3846.1998.tb00547.x>
- [16] Cai, C., Huang, Y.J., Zhao S. (2005) An Empirical Study on the Impact of Audit Quality on Earnings Management—Empirical Evidence from Shanghai Manufacturing Industry. *Auditing Research*, **2**, 3-10.
- [17] Jiang R., Liu X. and Liu B. (2007) Empirical Study on the Effectiveness of External Audit Governance in Chinese Listed Companies—Based on CEO Change Perspective. *Journal of Finance and Economics*, **11**, 92-103.
- [18] De Angelo, L.E. (1981) Auditor Size and Auditor Quality. *Journal of Accounting and Economics*, **3**, 183-199. [https://doi.org/10.1016/0165-4101\(81\)90002-1](https://doi.org/10.1016/0165-4101(81)90002-1)
- [19] Becker, C.L., Defond, M.L., Jiambalvo, J. and Subramany, K.R. (1998) The Effect of Audit Quality on Earnings Management. *Contemporary Accounting Research*, **15**, 1-24. <https://doi.org/10.1111/j.1911-3846.1998.tb00547.x>
- [20] Eshleman, J.D. and Guo, P. (2014) Do Big 4 Auditors Provide Higher Audit Quality after Controlling for the Endogenous Choice of Auditor? *Auditing: A Journal of Practice & Theory*, **33**, 197-219. <https://doi.org/10.2308/ajpt-50792>
- [21] Wang, Y.Y. and Chen, H.W. (2006) Auditing Quality and Accounting Information Transparency—Empirical Data from Chinese Listed Companies. *Accounting Research*, **4**, 9-15.
- [22] Chen, L., Song, L. and Shi, D. (2012) Is the Firm's Cost Stickiness Overestimated: An Empirical Study Based on Chinese Listed Companies. *China Accounting Review*, **3**, 4-16.