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# Does Debt Financing Affect the Sustainability of Transparent Accounting Information?

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**Abstract:** With the classification of debt financing into private debt (borrowing) and public debt (bond), this study aims to figure out the relationship between corporate debt financing and transparent accounting information sustainability. Debt financing of a firm was measured as a ratio of private debt to sum of private and public debt while sustainability of transparent accounting information was measured as a matching level. The sample is selected from corporations listed on the stock market in the Republic of Korea, except for the financial industry, from 2011 to 2018. As a result, the ratio of private debt of a firm was found to have a negative relationship with the matching level. It indicates that the ratio of high-private debt of a firm reduces the matching level. These results were found to be consistent even using various methodologies (e.g., Prais–Winsten, and Newey–West). This study confirmed the negative sustainability of transparent accounting information when the ratio of borrowings in corporate financing is high. Our implications that different financing methods can have different effects on the sustainability of corporate transparent accounting information.

**Keywords:** corporate debt financing; matching level; sustainability of transparent accounting information

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**Citation:** Jung, H.-U.; Mun, T.-H.; Roh, T. Does Debt Financing Affect the Sustainability of Transparent Accounting Information? *Sustainability* **2021**, *13*, 4052. https://doi.org/10.3390/su13074052

Academic Editor: Marc Lim

Received: 13 March 2021
Accepted: 2 April 2021
Published: 6 April 2021

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## 1. Introduction

Firms with a high proportion of private debt have low incentives to improve the reliability of their accounting information, while firms with a high proportion of public debt are reported to have high incentives to improve the quality of their accounting information. Firms with a high proportion of private debt are most likely to make transactions with specific banks, and since these banks have long-term relationships with these firms, it has been confirmed that access to internal corporate information is easy [1–3]. Banks, which are private debt creditors, have easy access to corporate monitoring as well as access to private information [4–6]. As a result, Chun, et al. [7] found that the higher the private debt ratio, the lower the benefit of accounting information reliability and an increase in the manager's opportunistic earnings management. In addition, Bharath, Sunder, and Sunder [4] confirm that the incentive to choose private debt is high when the quality of earnings is low.

Meanwhile, the number of creditors for companies with a high proportion of public debt is composed of an unspecified majority [4–6,8]. This means that creditors related to public debt may have a higher level of information asymmetry than private debt creditors. Therefore, Bharath, Sunder, and Sunder [4] and Chun, Kwon, and Kim [7] explain that companies with a higher share of public debt than private debt have higher incentives to improve the reliability of accounting information for funding.

Unlike the cash basis, the accrual basis has a reverse effect. If management incorrectly applies the matching level for the current period, then the effect could be reversed in the future [9–11]. The reverse effect can increase the volatility of net income. In this case, the predicted value of net income decreases. As a result, an incorrect matching level can act as an incentive to lower the predicted value of net income [3,11].

Earnings with a high predicted value can be measured in a transparent accounting information system [5]. In this case, the matching level is considered to be a measure of the sustainability of a transparent accounting information system.

Dichev and Tang [11] and Paek [3] explain that when the matching level increases, the noise included in accounting earnings decreases. The reduction of noise included in earnings leads to the sustainability of transparent accounting information. In this case, a high matching level can be linked to the sustainability of transparent accounting information. In this regard, this study analyzed how different debt characteristics affect the sustainability of transparent accounting information. This study hypothesized and empirically analyzed that the ratio of private to total borrowings would reduce transparent accounting information sustainability.

As a result of the analysis, the high proportion of private debt is found to have had a negative relationship with the matching level. This means that a high ratio of private debt reduces the sustainability of transparent accounting information. It also suggests that a high ratio of public debt could be an incentive to increase the sustainability of transparent accounting information.

Section 2 of this study presents a review of previous studies and research hypotheses. Section 3 describes the research model, the measurement of variables, and a selection of samples, and Sections 4 and 5 present the results of the empirical analysis and research.

## 2. Review of Previous Studies and Hypotheses

### *2.1. Prior Research Related to Debt Financing*

On the contrary, public debt is financed through public offerings. Therefore, the creditors of public debt consist of an unspecified majority [8,12]. Public debt creditors composed of an unspecified majority have a limited influence on a company and may have limitations in accessing the company's internal information [4]. Chun, Kwon, and Kim [7] explain that public debt creditors are more difficult to monitor for opportunistic behavior than private debt creditors.

Chun, Kwon, and Kim [7] explain that creditors of public debt use information brokers such as corporate bond credit rating to resolve this information risk and information asymmetry. Na and Kim [13] analyzed the relationship between earnings' quality (the informativeness of earnings) and the credit rating of corporate bonds. As a result of empirical analysis, the quality of earnings is found to have had a positive relationship with the credit rating of corporate bonds. This can be interpreted as an essential consideration for the quality of earnings in calculating the credit rating of corporate bonds by credit rating.

Given that public debt creditors use information brokers to mitigate the information risk of investment firms, public debt creditors consider the accounting information a vital criterion. In addition, this suggests that the demand for transparency of accounting information may be higher in companies with a high public debt ratio than in companies with a high private debt ratio. Bharath, Sunder, and Sunder [4] empirically analyzed how the quality of earnings information affects borrowers' debt choices. As a result of empirical analysis, companies with a low quality of earnings information are found to prefer private debt to public debt. Therefore, Bharath, Sunder, and Sunder [4] interpreted that the quality of earnings information had different effects on the firm's debt contract design.

In short, according to the prior studies above, the lower the quality of earnings, the higher the incentive to choose private debt over public debt. In addition, private debt is shown to have a positive relationship with earnings management [7]. This indicates that there may be a relationship between matching and debt financing. Moreover, this suggests that the sustainability of transparent accounting information may differ depending on debt financing.

### *2.2. Research Related to Matching and Establishment of Hypotheses*

Matching is one of the major principles of accrual accounting, and it increases the timeliness and persistence of accounting profits by recognizing related expenses during the period in which revenue is generated [7,9,14]. In this respect, Dechow [10] explains

that net income measured by accrual-basis has a better information effect than net income measured by cash-basis. This suggests that high matching plays an important role in sustaining the information effect of accounting information.

Although matching is an important issue in accounting, research has not been actively conducted due to a problem related to measuring the matching level. However, Dichev and Tang [11] present a model related to the matching level measurement, and studies related to the matching level are actively being conducted. Dichev and Tang [11] found that the poor matching level included noise in net income. Therefore, Paek [3] explains that a poor matching level leads to low quality of earnings. Based on the logic that a low matching level lowers the quality of earnings, Lee and Jung [8] and Jung and Moon [6] approved that a poor matching level decreases the future earnings response coefficient (FERC) and increases the trading volume.

Existing studies that affect matching present a variety of variables. Specifically, Dichev and Tang [11], Paek [3], and Kim [14] suggest unavoidable business factors, losses, managerial discretion, inadequate accounting rules, and earnings management as factors that lower the matching level. However, few studies have analyzed the effect of debt financing on matching. Previous studies related to debt financing have shown that companies with a higher quality of earnings prefer financing using public debt over private debt [4]. Therefore, companies that issue public debt are shown to have lower earnings management than those that issue private debt [5].

On the other hand, Dichev and Tang [11] and Paek [3] suggest that high matching levels reduce the noise included in net income, resulting in a higher quality of earnings. Transparent accounting information can be measured with a high quality of earnings, and the high quality of earnings is the result of a high matching level. Credit rating consider the quality of earnings to calculate the credit rating of a company [15]. This indicates that companies with a high public debt ratio may have a high interest in transparent accounting information sustainability. However, companies with a high ratio of private debt may have a low interest in transparent accounting information sustainability. Companies with a high private debt ratio are expected to have a negative relationship with matching if the demand for transparent accounting information sustainability is low. Based on these expectations, the following hypothesis is established.

**Hypothesis:** *The ratio of private debt will have a negative relation with the matching level.*

## 3. Research Methodology

### *3.1. Research Model*

This study measured the sustainability of transparent accounting information as shown in Equation (1). Equation (1) is the model of Dichev and Tang [11]. The $EXP_t$ regression coefficient in Equation (1) indicates the appropriateness of matching. In other words, if the $EXP_t$ regression coefficient is large, it can be interpreted that the matching level is excellent.

$$REV_t = \beta_0 + \beta_1 EXP_{t-1} + \beta_2 EXP_t + \beta_3 EXP_{t+1} + \varepsilon, \quad (1)$$

$\beta_0$ constant term
REV total revenue (=(sales + non-operating revenue)/average total assets))
EXP total expense (=(cost of goods sold + selling and administrative expenses + non-operating expenses)/average total assets))
$\varepsilon$ residual term

In this study, an empirical analysis model is set up by extending the Equation (1). Specifically, this study attempts to verify the hypothesis of this study by setting the following Equation (2).

$$\begin{aligned} REV_t = {} & \beta_0 + \beta_1 EXP_{t-1} + \beta_2 EXP_t + \beta_3 EXP_{t+1} + \beta_4 LR_t + \beta_5 EXP_{t-1} \times LR_t + \\ & \beta_6 EXP_t \times LR_t + \beta_7 EXP_{t+1} \times LR_t + \beta_8 YD + \beta_9 IND + \varepsilon \end{aligned} \quad (2)$$

LR private debt ratio (private debt/(private debt+public debt)), private debt means borrowing and public debt means corporate bond.
YD year dummy.
IND industry dummy. For other variables, see Equation (1).

In Equation (2) above, the relationship between debt financing and the matching level can be measured by $\beta_2 + \beta_6 \times$ EXP. In order to present a result consistent with the hypothesis, $\beta_2$ must be presented with a positively significant sign, and $\beta_6$ must be presented with a significantly negative. If $\beta_2$ and $\beta_6$ present significant positive and negative signs, respectively, it can be interpreted that companies with a high proportion of private debt lower the matching level.

In addition, it can be interpreted that companies with a high proportion of private debt have low incentives for the sustainability of transparent accounting information. Conversely, companies with a high proportion of public debt can be interpreted as having high incentives for transparent accounting information sustainability.

### *3.2. Sample Selection*

In this study, based on the following conditions, the sample is selected from corporations listed on the stock market in Korea, except for the financial industry, from 2011 to 2018.

(1) A company that can continuously measure financial data, stock price data, and accounting firms from 2002 to 2019 in the KIS-Value database of NICE.
(2) Modify opinion and Impairment of Capital are excluded.

The final samples satisfying the above conditions (1) and (2) are 3344 (company-year). When the sample companies are divided by industry, the number of manufacturing industries is 2395 (company-year). In addition, the wholesale and retail businesses are 271 (company-year), and the construction industry is 173 (company-year).

## 4. Empirical Analysis

### *4.1. Descriptive Statistics and Correlation Analysis*

Table 1 presents descriptive statistics for the variables included in Equation (2). First, the mean (median) of REV is 0.9889 (0.8975), and the standard deviation is 0.5293. The average (median) of $EXP_{t-1}$ is 0.9872 (0.8828), and the average (median) of $EXP_t$ is 0.9660 (0.8699). The average (median) of $EXP_{t+1}$ is 0.9467 (0.8603). The average of the EXP variables in this study seems to be somewhat higher compared to the median. The mean (median) of LR is 0.8629 (1.0000), and the standard deviation is 0.2666. The sample companies show a high ratio of borrowings when raising funds.

**Table 1.** Descriptive statistics.

| Variables | Mean | Stdev | Min | 25% | Median | 75% | Max |
|---|---|---|---|---|---|---|---|
| REV | 0.9889 | 0.5293 | 0.0082 | 0.6546 | 0.8975 | 1.2081 | 5.0935 |
| $EXP_{t-1}$ | 0.9872 | 0.5373 | 0.0046 | 0.6502 | 0.8828 | 1.1947 | 6.2847 |
| $EXP_t$ | 0.9660 | 0.5156 | 0.0046 | 0.6396 | 0.8699 | 1.1764 | 5.0625 |
| $EXP_{t+1}$ | 0.9467 | 0.5028 | 0.0046 | 0.6268 | 0.8603 | 1.1633 | 4.3964 |
| LR | 0.8629 | 0.2666 | 0.0000 | 0.8830 | 1.0000 | 1.0000 | 1.0000 |

Notes: REV = total revenue ((sales + non-operating revenue)/average total assets), EXP = total expense ((cost of goods sold + selling and administrative expenses + non-operating expenses)/average total assets), LR = private debt ratio (private debt/(private debt + public debt)).

Table 2 is the result of correlation analysis. First, it is shown that REV has a significant positive correlation with all of the EXP variables ($EXP_{t-1}$, $EXP_t$, and $EXP_{t+1}$). In particular, REV has the highest correlation coefficient with $EXP_t$ among all cost variables. This means that the current revenue has the highest correlation with the current expense. LR appears to have a significant positive correlation with REV. In addition, LR appears to have a

significant positive correlation with all EXP variables. This correlation analysis result is a result of not taking into account the direction, but it suggests that companies with high revenue and expense may have a high proportion of private debt.

**Table 2.** Correlation Coefficient.

| Variables | REV | $EXP_{t-1}$ | $EXP_t$ | $EXP_{t+1}$ |
|---|---|---|---|---|
| $EXP_{t-1}$ | 0.9403 *** | | | |
| $EXP_t$ | 0.9855 *** | 0.9450 *** | | |
| $EXP_{t+1}$ | 0.9374 *** | 0.8916 *** | 0.9483 *** | |
| LR | 0.0616 *** | 0.0643 *** | 0.0735 *** | 0.0751 *** |

Notes: (1) REV = total revenue ((sales + non-operating revenue)/average total assets), EXP = total expense ((cost of goods sold + selling and administrative expenses + non-operating expenses)/average total assets), LR = private debt ratio (private debt/(private debt+public debt)), (2) *** denotes the significant level at 0.01, 0.05, and 0.10, respectively.

### *4.2. Results*

Table 3 is the result of analyzing the hypothesis of this study. Model 1 in Table 3 is the result of re-validating the model of Dichev and Tang [11] for Korean companies, and Model 2 does not include year dummy (YD) and industry dummy (IND) in Equation (2). Model 3 results from analyzing the hypothesis by including YD and IND in Equation (2).

**Table 3.** Hypothesis test results.

| Variables | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Inter. | 0.0069 | 2.08 ** | 0.0545 | 5.11 *** | 0.0756 | 6.54 *** |
| $EXP_{t-1}$ | 0.0840 | 9.64 *** | 0.0394 | 1.07 | 0.0354 | 0.97 |
| $EXP_t$ | 0.8983 | 69.41 *** | 1.0340 | 18.80 *** | 1.0333 | 19.03 *** |
| $EXP_{t+1}$ | 0.0332 | 3.46 *** | −0.0938 | −2.27 ** | −0.0907 | −2.22 ** |
| $LR_t$ | | | −0.0557 | −4.73 *** | −0.0703 | −5.76 *** |
| $LR_t \times EXP_{t-1}$ | | | 0.0491 | 1.23 | 0.0534 | 1.35 |
| $LR_t \times EXP_t$ | | | −0.1487 | −2.51 ** | −0.1465 | −2.51 ** |
| $LR_t \times EXP_{t+1}$ | | | 0.1411 | 3.18 *** | 0.1387 | 3.17 *** |
| YD | Not-included | | Not-included | | Included | |
| IND | Not-included | | Not-included | | Included | |
| F-value | 38,863.78 *** | | 16,801.82 *** | | 4679.16*** | |
| Adj.$R^2$ | 0.9721 | | 0.9724 | | 0.9733 | |

Notes: (1) REV = total revenue ((sales + non-operating revenue)/average total assets), EXP = total expense ((cost of goods sold + selling and administrative expenses + non-operating expenses)/average total assets), LR = private debt ratio (private debt/(private debt+public debt)), YD = year dummy, IND = industry dummy, (2) ***, **, and * denote the significant level at 0.01, 0.05, and 0.10, respectively.

First, all EXP variables ($EXP_{t-1}$, $EXP_t$, and $EXP_{t+1}$) regression coefficients suggest a significant positive sign in Model 1 of Table 3. Paek [16] explains that $\beta_2$ should be "1" when a complete matching level is achieved. However, $\beta_2$ in Model 1 is 0.8983, so it is confirmed that the sample companies are not fully matched.

In the case of Models 2 and 3 in Table 3, $\beta_2$ presents a significant positive sign. Moreover, $\beta_6$ suggests a significant negative sign. This is a result consistent with the hypothesis, so it can be interpreted that companies with a large proportion of private debt have a low matching level. This study analyzed whether the sum of $\beta_2$ and $\beta_6$ is different from zero through the F-test. In the case of Model 2, the F-value was 3926.89, and in the case of Model 3, the F-value was 4006.82. According to these results, it can be interpreted that the sum of $\beta_2$ and $\beta_6$ in Models 2 and 3 differs from zero.

Table 3 presents the results that companies with a high proportion of private debt (borrowing) in the financing may have a low matching level. This suggests that the high ratio of private debt has a negative relationship with transparent accounting information sustainability.

At the same time, Table 3 presents the results that the matching level may be high for companies with a high proportion of public debt (corporate bonds) when raising funds.

This can be interpreted as the higher the public debt ratio, the greater the sustainability of transparent accounting information. Therefore, Table 3 suggests that the characteristics of debt affect the sustainability of management.

### *4.3. Robustness Test*

In this study, based on the methodology of Dichev and Tang [11], Equation (2) is established and an empirical test is performed. However, Equation (2) may cause the problem of autocorrelation [10]. However, Table 3 is the result of an empirical test with ordinary least squares (OLS). If there is autocorrelation, it is not from the OLS estimator Best Linear Unbiased Estimators (BLUE). Most of the standard deviations of the OLS estimators are underestimated, so the estimates have higher statistical significance than the actual ones. For this reason, this study examined the Durbin–Watson d-statistic.

When the value of the d-statistic approaches zero, it indicates that the residuals have a positive correlation. However, when the value of the d-statistic is close to four, it indicates that the residuals have a negative correlation. In this study, the d-statistic is found to be 0.9308.

Methods such as Prais–Winsten and Newey–West are suggested for solving autocorrelation. Panel A of Table 4 below is the result of testing Equation (2) with Prais–Winsten (AR(1)), and Panel B is the result of testing with Newey–West. Table 3 is the result of analyzing the hypothesis of this study. Model 1 in Table 3 is the result of re-validating the model of Dichev and Tang [11] for Korean companies, and Model 2 does not include year dummy (YD) and industry dummy (IND) in Equation (2). It is the result without the hypothesis. Model 3 is the result of analyzing the hypothesis by including YD and IND in Equation (2). Model 1 of Panel A and Panel B in Table 4 is the result of testing without including YD and IND in Equation (2), and Model 1 of Panel A and Panel B in Table 4 is the result of testing by including YD and IND.

**Table 4.** Additional test results 1: Test results that solved the autocorrelation problem.

| **Variables [Prais–Winsten Test]** | **Model 1** | | **Model 2** | |
|---|---|---|---|---|
| | **Coeff.** | **t-stat.** | **Coeff.** | **t-stat.** |
| Inter. | 0.0652 | 4.30 *** | 0.0843 | 5.30 *** |
| $EXP_{t-1}$ | 0.0335 | 1.05 | 0.0346 | 1.08 |
| $EXP^{t}$ | 0.9731 | 23.35 *** | 0.9780 | 23.42 *** |
| $EXP_{t+1}$ | −0.0258 | −0.70 | −0.0334 | −0.91 |
| $LR_t$ | −0.0721 | −4.34 *** | −0.0827 | −4.89 *** |
| $LR_t \times EXP_{t-1}$ | 0.0560 | 1.62 | 0.0558 | 1.62 |
| $LR_t \times EXP_t$ | −0.0915 | −2.03 ** | −0.0966 | −2.14 ** |
| $LR_t \times EXP_{t+1}$ | 0.0792 | 2.00 ** | 0.0875 | 2.22 ** |
| YD | Not-included | | Included | |
| IND | Not-included | | Included | |
| F-value | 9063.67 *** | | 2532.32 *** | |
| Adj.$R^2$ | 0.9499 | | 0.9517 | |
| **Variables [Newey–West Test]** | **Model 3** | | **Model 4** | |
| | **Coeff.** | **t-stat.** | **Coeff.** | **t-stat.** |
| Inter. | 0.0545 | 6.22 *** | 0.0756 | 7.01 *** |
| $EXP_{t-1}$ | 0.0394 | 0.70 | 0.0354 | 0.63 |
| $EXP^{t}$ | 1.0340 | 15.42 *** | 1.0333 | 15.75 *** |
| $EXP_{t+1}$ | −0.0938 | −2.30 ** | −0.0907 | −2.32 ** |
| $LR_t$ | −0.0557 | −5.28 *** | −0.0703 | −5.80 *** |
| $LR_t \times EXP_{t-1}$ | 0.0491 | 0.71 | 0.0534 | 0.78 |
| $LR_t \times EXP_t$ | −0.1487 | −1.68 * | −0.1465 | −1.70 * |
| $LR_t \times EXP_{t+1}$ | 0.1411 | 2.56 ** | 0.1387 | 2.61 *** |
| YD | Not-included | | Included | |
| IND | Not-included | | Included | |
| F-value | 15,761.74 *** | | 4905.74 *** | |

Notes: (1) REV = total revenue ((sales + non-operating revenue)/average total assets), EXP = total expense ((cost of goods sold + selling and administrative expenses + non-operating expenses)/average total assets), LR = private debt ratio (private debt/(private debt+public debt)), YD = year dummy, IND = industry dummy, (2) ***, **, and * denote the significant level at 0.01, 0.05, and 0.10, respectively.

As a result of the test, it is found that $\beta_6$ has a negative sign in all models of Panel A and Panel B in Table 4. This is consistent with Table 3, indicating that the proportion of private debt has a negative relationship with the matching level. A low matching level increases (decreases) volatility (predict value) of earnings and consequently lowers the transparency of accounting information. Hence a high proportion of private debt indicates that it is acting as a negative factor for transparent accounting information sustainability. However, a high proportion of public debt indicates that it is acting as a positive factor for transparent accounting information sustainability.

Dichev and Tang [11] explain that $\beta_2$ in Equation (1) is a matching level. In this study, an additional test is performed by measuring $\beta_2$ of Equation (1) as a proxy of the matching level.

The $\beta_2$ of individual companies presented in Equation (1) is measured based on the methodology of [17]. Francis, LaFond, Olsson and Schipper [17] explain that rolling ten year windows data is required to measure a firm-specific approach. In the sample company, the mean (median) of $\beta_2$ in Equation (1) is 0.9840 (1.0110), and the standard deviation is 0.2702.

The dependent variable (MAT_DT) in Equation (3) is $\beta_2$ in Equation (1). In order to present results consistent with Tables 3 and 4, the regression coefficient of LB should present a significant negative sign. The controlling variables are debt ratio (LEV), firm size (SIZE), accounting firm (BIG), earnings smoothing (SMO), and standard deviation of stock returns (VOL).

LEV is included in the model to control the impact of financial risk on matching. LEV is expected to give a negative value. SIZE is included in the model to control the size of the company. SIZE is expected to present a positive value.

BIG is included in the model to control the effect of audit quality on matching. BIG is expected to give a positive value. SMO is included in the model to control the effect of the quality of earnings on matching. VOL is included in the model to control the influence of the information environment on matching. SMO and VOL are expected to present positive and negative values, respectively. For other variables, see Equations (1) and (2).

$$MAT_DT_t = \beta_0 + \beta_1 LR_t + \beta_2 LEV_t + \beta_3 SIZE_t + \beta_4 BIG_t + \beta_5 SMO_{t-1} + \beta_6 VOL_{t-1} + \beta_7 YD + \beta_8 IND + \varepsilon \quad (3)$$

MAT_DT additional matching level1($\beta_2$ given in Equation (1))
LEV debt ratio (=total liabilities/total assets)
SIZE size (= *ln* (total assets))
BIG accounting firm (= 1 if BIG accounting firm, 0 otherwise)
SMO earnings smoothing (=standard deviation of net income for 5 years/standard deviation of cash flow from operating activities for 5 years $\times$ $(-1)$)
VOL standard deviation of stock returns (=standard deviation of annual stock returns). For other variables, see Equation (1).

Table 5 is the result of testing Equation (3). The regression coefficient of $\beta_1$ presents a significant negative value. This is consistent with the results of Tables 3 and 4, indicating that the high proportion of private debt is related to poor matching. Taking the above results together, it can be considered that different debt financing systematically affects the sustainability of transparent accounting information.

**Table 5.** Results of the Solved Autocorrelation Problem

| Variables | Coeff. | t-stat. |
|---|---|---|
| Inter. | 1.5010 | 12.69 *** |
| LR | −0.0507 | −2.40 ** |
| LEV | −0.0697 | −3.16 *** |
| SIZE | −0.0057 | −1.50 |
| BIG | −0.0014 | −0.13 |
| SMO | 0.0126 | 5.95 *** |
| $VOL_t$ | −0.4659 | −2.88 *** |
| YD | Included | |
| IND | Included | |
| F-value | 7.73 *** | |
| Adj.$R^2$ | 0.0519 | |

Notes: (1) MAT_DT = $\beta_2$ given in Equation (1), LEV = debt ratio (total liabilities/total assets), SIZE = (*ln* (total assets)), BIG = accounting firm (1 if BIG accounting firm, 0 otherwise), SMO = earnings smoothing (standard deviation of net income for 5 years/standard deviation of cash flow from operating activities for 5 years × (−1)), VOL = standard deviation of stock returns (standard deviation of annual stock returns), YD = year dummy, IND = industry dummy, (2) *** and ** denote the significant level at 0.01 and 0.05, respectively.

The regression coefficients of LEV and VOL suggest a significant negative value. This indicates that the debt-to-equity ratio and standard deviation of stock returns are negatively related to matching. The regression coefficient of SMO was positive. This indicates that there is a positive relationship between the quality of earnings and matching.

Paek [3] uses Adj.$R^2$ measured by the OLS analysis of Equation (4) as a matching proxy. In this study, the robustness of Table 3, Table 4, and Table 5 is to be verified using matching measured by Paek [3] methodology. When matching is measured by Adj.$R^2$(MAT_P) in Equation (4), the mean (median) is 0.8494 (0.9353) and the standard deviation is 0.2052.

$$REV_t = \beta_0 + \beta_1 EXP_t + \varepsilon \quad (4)$$

$$MAT_P_t = \beta_0 + \beta_1 LR_t + \beta_2 LEV_t + \beta_3 SIZE_t + \beta_4 BIG_t + \beta_5 SMO_{t-1} + \beta_6 VOL_{t-1} + \beta_7 YD + \beta_8 IND + \varepsilon \quad (5)$$

REV total revenue (= (sales + non-operating revenue)/average total assets))
EXP total expense (= (cost of goods sold + selling and administrative expenses + non-operating expenses)/average total assets))
MAT_P additional matching level2 (Adj.$R^2$(MAT_P) in Equation (4))
LR private debt ratio (private debt/(private debt + public debt)), private debt means borrowing and public debt means corporate bond.
LEV debt ratio (=total liabilities/total assets)
SIZE size (= *ln* (total assets))
BIG accounting firm (= 1 if BIG accounting firm, 0 otherwise)
SMO earnings smoothing ((=standard deviation of net income for 5 years/standard deviation of cash flow from operating activities for 5 years × (−1))
VOL standard deviation of stock returns (= standard deviation of annual stock returns)
YD year dummy
IND industry dummy. For other variables, see Equation (1).

Equation (5) sets Adj.$R^2$(MAT_P) measured in Equation (4) as the dependent variable. The control variable in Equation (5) is based on Equation (3).

Table 6 is the result of the empirical test of Equation (5). Examining the test results, the regression coefficient of private debt ratio (LR) suggests a significant negative value. This is consistent with the results of Table 3, Table 4, and Table 5, and it is judged that the level of response to private liabilities and income costs has a negative relationship.

**Table 6.** Results Using Paek [3]'s Methodology.

| Variables | Coeff. | t-stat. |
|---|---|---|
| Inter. | 1.0066 | 11.82 *** |
| LR | −0.0276 | −1.82 * |
| LEV | −0.0373 | −2.35 *** |
| SIZE | −0.0027 | −1.00 |
| BIG | 0.0199 | 2.57 *** |
| SMO | 0.0223 | 14.26 *** |
| $VOL_t$ | −0.5234 | −4.49 *** |
| YD | Included | |
| IND | Included | |
| F-value | 15.88 *** | |
| Adj.$R^2$ | 0.1079 | |

Notes: (1) MAT_DT = $\beta_2$ given in Equation (1), LEV = debt ratio (total liabilities/total assets), SIZE = (*ln* (total assets)), BIG = accounting firm (1 if BIG accounting firm, 0 otherwise), SMO = earnings smoothing (standard deviation of net income for 5 years/standard deviation of cash flow from operating activities for 5 years × (−1), VOL = standard deviation of stock returns (standard deviation of annual stock returns), YD = year dummy, IND = industry dummy, (2) *** and * denote the significant level at 0.01 and 0.10, respectively.

The regression coefficient of LEV presents a significant negative value. This can be interpreted as the high debt ratio negatively affecting the matching. The regression coefficient of BIG appears to be a significant positive value, and if a big accounting firm performs an audit, it can be interpreted that the matching level is improved.

Both SMO and VOL raise significant positive and negative values. This can be interpreted as an increase in matching when an individual company's accounting environment is excellent, but if the information environment of an individual company is not excellent, matching decreases.

Taken together, the fact that private debt has a negative relationship with the matching level suggests that the high private debt ratio has a low incentive for the sustainable reporting of transparent accounting information. These results show that private debt has a negative impact effect on the sustainability of transparent accounting information.

On the contrary, corporate bonds have to finance an unspecified number of people, so the high public debt ratio suggests that there is a high incentive for sustainable reporting of transparent accounting information. Public debt acts as a positive factor in the sustainability of transparent accounting information. In other words, this suggests that different liabilities are related to the sustainability of transparent accounting information.

## 5. Discussion and Conclusions

This study analyzed the effect of debt financing on the sustainability of transparent accounting information. In this study, debt financing is measured by the proportion of private debt, and the sustainability of transparent accounting in-formation is measured by matching.

Our theoretical contribution is as follows. First, matching increases the timeliness and persistence of accounting profits by recognizing related expenses during the period in which revenue is generated. In addition, matching reduces the noise included in net income. Although matching plays an important role in measuring net income, research related to this has not been actively conducted. Investors generally perceive debt negatively. Therefore, companies with a high level of public debt are very interested in transparent accounting information sustainability. Second, companies that rely on a specific bank for financing for borrowing are more interested in their relationship with a specific bank than the transparency of accounting information. Therefore, companies with high levels of borrowing have low incentives to generate transparent accounting information. Therefore, companies with a high proportion of private debt have little interest in transparent accounting information sustainability. Third, although the effect of debt financing on accounting information may be contradictory, there have been few studies on the effect of debt financing on the sustainability of transparent accounting information.

Depending on debt financing, the incentives to manage the accounting information system are different. When financing a specific bank, these companies will be more interested in maintaining a relationship with a specific bank than incentives to continuously manage the accounting information system. In this regard, this study analyzed the relationship between debt financing and transparent accounting information sustainability.

The managerial contribution of this study is as follows. As a result of the analysis, it is found that the high proportion of private debt had a negative relationship with matching. This is found to be consistent even when measuring matching in various ways. In addition, it was found to be consistent using various methodologies (i.e., Prais–Winsten and Newey–West). Based on the analysis results, Firms with high private debt ratios have relationships with specific banks, so these firms have low incentives to continuously manage transparent accounting information. Therefore, a high private debt ratio was found to have reduced the sustainability of the production of transparent accounting information. Conversely, a high share of public debt was found to have increased the sustainability of transparent accounting information. Empirical data was provided that debt financing can affect the sustainability of the production of transparent accounting information. In addition, the results provide implications that debt financing can affect corporate accounting policies. Second, empirical data are presented that debt has an information effect. In particular, there is a contributing point in that the matching level was measured in various ways. The research results are expected to serve as the basis for active matching papers in the future.

Our limitations are as follows. Firstly, there is a limitation in the study in that only data from South Korea was accessible for the authors. This is expected to proceed as a future research project. Second, unobservable variables that affect the transparency of accounting information may exist. Throughout the reviews on related existing studies, we added variables that influence the matching as many as possible and investigated the hypothetical model with multiple analyses. Still, future studies have an opportunity to improve the model by figuring out more unobservable causalities. Third, the generalizability of our results may be limited to the countries that have a similar regulation on financing. Although some countries may impose substantial corporate private debt restrictions, some may be more demanding on public debt. It implies that the interpretation of the results of this study may be limited depending on the degree of sanctions by the state on corporate debt fiscal regulation. Future research is expected to consider to what extent the sample has similar financing regulations to Korea. If the degree of regulation is different, it would be desirable to add new variables for regulation.

**Author Contributions:** Conceptualization, H.-U.J. and T.-H.M.; methodology, H.-U.J. and T.-H.M.; formal analysis, H.-U.J. and T.-H.M.; writing—original draft preparation, H.-U.J., T.-H.M., and T.R.; writing—review and editing, T.R. All authors have read and agreed to the published version of the manuscript.

**Funding:** This work was supported by the Dong-A University Research Fund and Soonchunhyang University Research Fund.

**Informed Consent Statement:** Not appliable.

**Conflicts of Interest:** The authors declare no conflict of interest.

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