# The Product Category Effects on Capital Structure: Evidence from the SMEs of British Manufacturing Industry

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**Abstract**

This paper investigates into the determinants of capital structure for the small and medium sized enterprises (SMEs) in British manufacturing industry and the effects of product category on the determinants of capital structure. 220 SMEs from British manufacturing industry are selected for testing the six hypothesized relationships regarding the determinants of capital structure. Results suggest that profitability, tangibility and size are positively and growth is negatively related to the debt/equity ratio, and age is in inconsistent relationship with the debt/equity ratio of British manufacturing SMEs. Product category does exert effects through the determinants of capital structure and profitability is the most important determinant through which product category imposing effects on capital structure. The interactive effects of the determinants of capital structure are also the important discovery of this paper.

**Keywords:** Capital structure, Product category effects, Interactive effects, SMEs

## Introduction

There has been an ever-increasing recognition that the small and medium enterprises (SMEs) are gaining a more and more important status in the national economy of UK. Many statistics also stressed the importance of SMEs in terms of their contribution to GDP, employment, and their economy prospect. On another side, the impression of people towards British manufacturing industry is quite the opposite and the manufacturing industry has been considered as being in recession for long. However, according to the 1995 Department of Trade and Industry statistics, manufacturing industry still account for 11.6% of the total size of British industry. Moreover, Finbarr Livesey (2004) pointed out that the future of British manufacturing industry will no longer depend on low-waged job and cost deduction but on knowledge-intense and high-waged jobs, and innovative and scientific production. However, the transformation of British manufacturing industry into to a more innovative and knowledge-intensive industry entails the financial support much more than ever, if considering most knowledge-intensive business are also capital-intensive. Therefore, the study into the capital structure of British manufacturing industry is of utmost importance to the newly transformed role of British manufacturing industry.

The issue regarding the determinants of capital structure has attracted a lot of attentions (Michael G. F. and Wesley H. J. 1979; G. Hall et al. 2000; F. Voulgaris et al 2002; Tran, D.K,N and Neelakantan, R 2006). Relevant researches initially looked into large quoted companies (Titman and Wessels 1988; Bennet and Donnelly 1993) due to the more readily available data for large quoted companies. Along with the increasing availability of data, the research on the determinants of capital structure began to include SMEs in recent years (Hall, Hutchinson and Michaelas 2004) and some of them are even industry-specific (G. Hall et al. 2000; F. Voulgaris et al 2002) and firm-specific (Wald, J. K. 1999). However, never a research before devoted to the capital structure of British manufacturing SMEs. Moreover, the product category effects on capital structure are also seldom studied even in the researches about manufacturing industry whose product-related operation is of essential importance. As mentioned in the last paragraph, the transformation of British manufacturing industry into a more knowledge-intensive and capital-based industry will increase the financing volume and financing complexity of firms inside manufacturing industry. Given the importance and the research gaps stated, this research will investigate into the determinants of capital structure for British manufacturing SMEs and the likely product category effects on capital structure.

This research will try to give answers to questions like what are the determinants of capital structure, how they influence capital structure, what are the likely sources of effects from product categories on capital structure and what the manufacturing industrial effects on the capital structure of SMEs are. Data of this research is based on the database named ‘Fame’ which includes the accounting and background descriptive information of up to

440,000 public and private British and Irish companies. Analyses of this paper will be through the cross-sectional comparison of the descriptive mean, correlation coefficient and regression coefficient of the determinants of capital structure and the ratio of capital structure. The content of this paper includes six sections: the next section will present the past researches relevant to the determinants of capital structure and will give the hypotheses regarding the relationship of determinants with capital structure. Afterwards, the Methodology and Measurement section will detail the methods for data collection, variable setting, and data analyses. In the following section, results will be presented and will be analyzed as suggested in the last section. Finally, conclusions and recommendations towards future research will be given in the last two sections.

## Literature Review

### I. Capital structure theories

Capital structure refers to *the relative amount of debt and equity adopted to finance a company* (Tran, D.K,N and Neelakantan, R 2006, p.193). Since Modigliani and Miller (1958) proposed their idea that the choice of capital structure is irrelevant to the value of companies and company should not concern too much about capital structure, the issue of capital structure becomes fiercely controversial in the academic filed thereafter. The major arguments come from three respects: the first cohort of academicians, represented by Modigliani and Miller (1963) and Miller et al (1977), suggests that capital structure can alter company value in the corporation-taxation world, and companies can maximize its value through taking the advantage of "interest tax shield", debt is supposed to be a preferable financing source for less taxation is laid on debt. However, Jensen and Meckling (1976) argued that debt can not be indefinitely used as the source of financing, there is a trade-off between bankruptcy cost, financial distress, and tax shield advantage.

The second source of views proposed initially by Majluf and Mayers (1984) and Myers (1984), they think the issue of equity would convey negative information to outside investors in the information-asymmetrical world, thus companies normally prefer financing internally to financing externally. If external financing is compulsory, the safest securities will be chosen to issue prior to more risky securities (Pecking Order Theory, Myer 1984). The final group of scholar proposed to decide capital structure of companies from the perspectives of agency cost which derives from the conflicts between shareholder, bondholder and manager (Jensen and Meckling, 1976). Jensen's (1986) free cash flow theory suggested the solution to manager's conflict with shareholder in terms of 'overinvestment' and 'inefficiency spending' is moderate volume of debt, because management will be at less liberty to invest and spend overly if with the burden of debt. The conflict between shareholder and bondholder is related to the problem of 'overinvestment' and 'underinvestment', firms are supposed to consider using more debt when overinvestment happens and more equity when underinvestment occurs (Myers, 1977).

The above propositions on capital structure were exposed to plenty of debates after their coming out. First of all, Modigliani and Miller's proposition (1958) is based on the assumption of perfect financial market and it cannot hold up if include in some intervening factors like income taxes (Modigliani and Miller 1965). However, the benefits of tax shield can be offset by the personal tax paid by individual investor, and debt thus cannot add value to corporation (Miller 1977). Nevertheless, Graham (2000) pointed out that the marginal gain of tax shield would outweigh the marginal loss sprung from personal taxation and debt is still a preferable financing source. In spite of that, Wald (1999) found contradictory evidence in his research about the capital structure of companies from five different countries and he discovered companies are also concerned with financial distress brought up by debt. Many companies control their debt ratios so as to reduce financial distress and companies do need to trade off between financial distress and the benefits of tax shield (Jensen and Meckling 1976). Moreover, French and Fama (1998) argued that no evidence can back up the fact that debt can create extra value for company, which further discredited the tendency to the use of debt.

On the contrast, Myers' Pecking Order theory (1984) is more convincing and received several confirms from other studies (Asquith and Mullins 1986; Dierkens 1991). However, Dybvig and Zender (1991) criticized that the predictions of Pecking Order theory can be explained by other rationales and Pecking Order is not the only explanation. Also, Stewart (2001) pointed out that the Pecking Order doesn't indicate what the incentive for manager to preferably raise internal fund is. Although there are some opponent voices, Pecking Order theory is regarded as the right reflection to the real world. In particular, as small and medium enterprises (SMEs) are restricted on their access to external funding and the higher information-asymmetrical problem is normally related to less transparent SMEs, Pecking Order Theory can be more readily applied to SMEs (Holmes and Kent 1991).

The effects of agency cost on capital structure also developed much further in recent years. Shleifer and Vishny (1989) proposed the idea that management might develop capital structure that controllable by them so as to gain

more power over investors. The free cash flow theory (Jensen 1986) is further proved by Ofek (1993) that debt-financing would be beneficial to manager's handling crisis, reducing management splurge, and filing for bankruptcy. Additionally, leverage buyout is another agency cost issue affecting capital structure, which has been dynamically discussed in the academic world (Kaplan, S. N. 1989; Asquith and Wizman 1990). In general, previous researches basically pointed out the possible determinants of capital structure and now it's widely recognized that capital structure is jointly determined by tax shield advantage, financial stress, information asymmetry, agency cost, debt capacity and specific financing need.

## II. Industry difference and difference inside industry

In spite of the determinants sorted out previously, those determinants are not considered applicable across different industries. Jordan et al (1998) suggested that the industry which a company belonging to might play an intervening role in deciding capital structure. The way in which industry affect the capital structure of companies is considered to be through the debt ratio reflecting on industry average. 'Industry average' is viewed as the target by companies when they build up their capital structure (Gordon 1964; Lev 1969). This argument is agreed by Ang (1991) who think the adoption of 'industry average' for financing standard is particularly essential for SMEs. SMEs normally lack relevant financial knowledge and managerial skills for effective financing, benchmarking industry average is taken as a safe and efficient way of deciding capital structure. Moreover, empirical data from Van der Wijst, N. and Thurik, R., (1993) evidenced that industry within which firms operates tend to have similar debt ratio. Furthermore, G. Hall et al (2000) conducted a research over 3500 SMEs in the UK and found that industrial effects do exist. Therefore, different industry will have different tendency of choosing capital structure and the capital structure of companies inside an industry tend to be similar with each other.

The industrial effect on capital structure is questioned by some studies. Myer (1984) implied the debt ratio of a company is determined by the external fund need of the company and it is pointless for company to try to match industry average. Balakrishnan and Fox(1993) also debated that firm's specific needs is more important than to benchmark industry average. Therefore, the desirability to match industry average seems not an incentive for companies to align their capital structure with industry average. However, the quantitative research data mentioned before showed clear difference between industry and similarity in side industry. There must be other industrial factors affected the capital structure of companies. Gupta (1969) indicated that there is a correlation between tangibility and debt ratio, tangibility is the industrial factor influencing capital structure due to different asset requirement from different industry. This argument is supported by the 'Golden Rule' (Van der Wijst and Thurik 1993) that firms normally try to match their financing to the duration of their fixed assets. The logic here is that 'industry' itself is not a factor exerting impact on the choice of debt or equity, but the fixed asset used as the collateral for outside loans is the influencing factor. Moreover, as different industry entails different kind of fixed assets in terms of size, amount and value, the collateral used in different industry as the collateral for loan vary between each other. Fixed asset is the medium through which industry imposes effect on the capital structure of firms.

The positive relationship between tangibility and debt ratio has been observed by many scholars: Titman and Wessels (1998) confirmed that firms with lots of tangible assets would normally have high liquidity. Firms can use their fixed assets as the collateral for the exchange of debt and financers will thus undertake much less risk when firms have to be liquidated. Storey (1994) also agreed this point and stated that firms with tangible assets are more likely to access banking or other outside financing sources, tangibility is positively related to the debt ratio of firms. The reason for the higher accessibility of companies with more tangible assets to banking is that tangible asset is also considered as the effective proof of eliminating information asymmetry and adverse selection which are two damaging problems affecting adversely on obtaining financing from banking. However, the positive correlation between tangibility and debt ratio is still rarely tested for the manufacturing SMEs of UK and the extent to what the two variables correlated with each other in the UK is also another important issue that needs to be clarified. Therefore, this correlation is hypothesized here for testing:

**Hypothesis 1: debt/equity ratio is positively related to the tangibility of British SMEs**

## III. Firm-specific financing

The determinants of capital structure are not only confined to be at industry level, firm-specific characteristics will also impose some effects on financing structure.

### Profitability

As mentioned previously, Myers' Pecking Order Theory (1984) predicted that companies have a tendency to

finance internally rather than to finance externally due to higher external financing cost. Firms which are very profitable usually have more retained earning for internal financing and would thus be less willing to secure capital outside company. Nevertheless, the prediction from Modigliani and Miller's tax model (1963) is quite the opposite. If there is tax imposed on retained earnings, the more profitable the firms are, the more likely for them to seek financing through debt so as to take advantage of the tax shield on debt. Moreover, a firm with high profitability will convey positive information to outside investors who will then be less hesitant to lend money or invest money into that firm.

While both debt and equity are easily accessible, firms tend to use debt at the first opportunity due to the fact that a high profitable firm is normally under less intervention from outside debt holder but more intervention from equity holders and the reason is that banking and bond holders only have claims on their principals and they would not under the risk of default if the company they lend money to is still very profitable (Vernimmen, P, et al. 2005). In this case, profitable companies with debt still have discretion over its investment. On the other side, equity holders have claims on the earnings of that company. In particular for a highly profitable company, equity holder will put pressure on management to transfer profits into dividends back to them and profitable companies will thus have less freedom over their investment. As a result, a more profitable company will have a preference to debt financing.

However, empirical evidences go along with the Pecking Order Theory and demonstrated that the relationship between profitability and leverage ratio is negative (Chittenden et al 1996; Michaelas et al 1999). Moreover, Tran D.K.N and Neelakantan R (2006) claimed that the managers of SMEs often have the ownership of their companies and are unwilling to let go of their handle on companies. Outside financer will intervene with the owners of SMEs if they choose to finance externally. Therefore, SMEs will be more likely to choose financing inside company so as to keep their own discretion. Therefore, hypothesis is made here in the favor of the negative relationship between leverage and profitability.

**Hypothesis 2: debt/equity ratio is negatively related to the profitability of British SMEs**.

**Firm Size**

The size of companies is another feature that raises influence on capital structure and many studies has devoted into this area. The transaction cost of financing externally is a problem related to firm size and an invert relationship has been found between them (Titman and Wessels 1988; Wald 1999). Large companies normally can benefit from a larger economics of scale which will lower down the cost of securing loans. On the contrast, smaller companies will suffer from higher transaction cost which will refrain themselves from financing outside companies. Moreover, some public financing in the UK require a minimum financing sum to access, which again prevent some small firms from obtaining money outside. Additionally, debt financer is concerned most with the default risk of company. Larger firms usually have well diversified business layout and much more stable earnings than small firms, which will result in much lower probability of defaulting and higher chance of securing debt (Marsh 1982).

Although many studies revealed the positive relationship between firm size and debt ratio, G. Hall et al (2000) argued that previous studies overlooked the differentiation between long-term debt and short-term debt, which might hide the different relation of the two sorts of debt with firm size. To be specific, small firms might well give up long-term debt which is associated with higher fixed transaction cost and apply the alternative of short-term debt, the relationship between short-term debt and firm size is not necessarily positive. However, Doanh and Pentley (1999) pointed out that small firms are still at disadvantage if considering their information asymmetrical problem due to less transparent accounting statement is normally required to be publicly released. The information asymmetry will hinder small firms to access external financing and a positive relationship between firm size and leverage will come into being. In general, the reasons favoring positive relationship outweigh the reasons supportive of negative relationship, hypothesis thus made here in the favor of positive relationship.

**Hypothesis 3: debt/equity ratio is positively related to the firm size of British SMEs.**

**Growth**

Prior studies are quite controversial on this point. Information asymmetry (Myer and Majluf 1984) is considered as the cause of positive relationship between leverage and growth, because high growth rate will tell outside financer that the borrower is now in a growing market and is less likely to go bankruptcy. G. Hall et al (2000, p 300) also raised the point that "*growth is likely to put a strain on retained earnings and push the firm to borrow and thus be positively related to leverage*". On another side, Myer (1977) refuted that borrowing for a company

with high growth prospect will lead to wealth-transfer from equity investor to debt financer, and companies with growth opportunities will try to avoid the profit generated from its high growth prospect to be taken away by loan providers through restraining on using debt. Additionally, as SMEs normally survive in highly segmented market where growth opportunities are restricted, the restricted growth will not result in a high demand for internal earnings and there will be less need for borrowing as a consequence. Furthuermore, as mentioned before, SMEs' managers are also the owners of companies, who would not be willing to lose their control as the exchange of loan from outside financers. Also, small private company owners are usually reluctant to take the risk of borrowing from banking for the default risk is only undertaken by the owners of small businesses rather than shared by multiple investors in large company.

In spite of the voices against borrowing for SMEs with growth prospect and the suspects against the existence of high growth prospect for SMEs, Michaelas et al. (1999) still considered a positive relationship between debt/equity ratio and growth as possible, because short-term debt can smooth over the tension between debt investor and equity investor, and debt investor will not intervene with the use of money for growth by equity holder for their money will come back in a much shorter term. Moreover, firms with high growth rate normally don't have enough money to fund their growth by themselves and will seek funding from outside sources (G. Cassar and S. Holmes 2003). Debt, as a cheaper financing source, will be preferably considered as the source of financing due the tax advantage and less asymmetry information. Therefore, hypothesis is set up here for the testing about the positive relationship between growth and leverage.

**Hypothesis 4: debt/equity ratio is positively related to growth prospect of British SMEs.**

**Age**

The impact from a company's age on capital structure could be discussed from multiple perspectives: the tax model (Modigliani and Miller 1963) predicted that a firm will try to increase the debt proportion of capital structure so as to take advantage of taxation shield. Therefore, the accumulated efforts of financing through debt will increase along with age and age is thus positively related to leverage. Oppositely, a negative relationship between debt and age can be deducted from Myers' Pecking Order Theory (1984). As firms tend to choose internal financing on the first opportunity, aged firms should have more capital reserves and are less likely to use money outside companies but to finance through their internal funds first. However, Jensen's (1986) free cash flow theory pointed out the likely agency cost problem with aged companies if they refused to using debt. If aged firms have more capital reserves and more internal capital available, managers will use the surplus capital for personal pursuit at the expense of investor's interest. More debt for aged firms would be helpful on stimulating more effective management performance.

Another concern about age is asymmetry information (Myer 1977). An aged company will have more track records in history and will undergo less information-asymmetrical problems, thus the more transparent information available from aged company will facilitate its financing outside company. As a result, debt will precede equity as the source of outside financing, leverage will be positively related to debt. However, this research will not go along with either side, because a firm, especially for SMEs, will not infinitely increase its debt without considering the consequence of financial distress and bankruptcy cost (Brounen et al 2004). On another side, when the profits or equity of a company accumulates to a specific extent, company will try to adjust its capital structure so as to maintain its debt ratio through securing more debt or it need to raise debt again for further expansion. Additionally, a new start business is usually not big enough to go public equity market and will have to borrow from banking or other debt holders to finance its growth at preliminary stage of its life span. Therefore, firms' debt/equity ratios are supposed to increase initially for start-up and then decrease under the pressure of financial distress, and again turn up to raise debt for further expansion.

**Hypothesis 5: debt/equity ratio is in *N*-shaped relationship with the age of British SMEs.**

Finally, as previously discussed, capital structure vary across different industry due to different fixed assets required by different industry, which has been in particular confirmed by G. Hall et al (2000) about the existence of that relationship in the UK. However, the product manufactured by a company can also be considered as a factor of influencing capital structure. The product-dominated capital structure was rarely studied academically before while it's an indispensable factor in deciding financing structure and this paper will pay extra attention to this respect. Another reason for that is manufacturing SMEs normally do not have large portion of expenses on advertising, logistics, customer service and other functional areas which are normally seen in big companies. As a result, expenses on product manufactured will play a dominant role in deciding financial structure and there are a lot of fixed assets of manufacturing industry associated with the product manufactured. Moreover, product is the main outcome of manufacturing industries, which again stressed the importance of product-related financing.

Therefore, in spite of the above hypothesized relationships, those relationships would still vary across different product categories.

**Hypothesis 6: the quality of previously hypothesized relationships will vary across different product categories.**

**Methodology and measurement**

**I. Variable selection**

**Dependent variable**

This research focuses on the testing towards the five relationships stated before. The testing includes five explanatory variables which are tangibility, profitability, firm size, growth prospect and age, and one dependent variable which is debt/equity ratio. The only dependent variable is also named in the accounting world as **gearing** (Atrill, P & McLaney, E 2006) which it's the ratio used to ascertain a company's burden of debt and to measure how much the profit of a company would be driven out before paying to shareholders. Gearing is applied here as the measure to the capital structure of British manufacturing SMEs. This application is quite opposed to the previous studies on capital structure which normally chosen debt ratio (total debt/total asset) as the measure on capital structure (F. Voulgaris et al 2002; G. Cassar and S. Holmes 2003; Tran D.K.N and Neelankantan. R 2006). The reason for the not using of gearing for previous researches is that SMEs usually don't have too much volume of listed equities outstanding and many sampling SMEs are not publicly listed, which will distort the reflection of gearing on capital structure. However, as this study consider SMEs normally operate on a large amount of self-financed businesses, shares from the owners of SMEs can still account for a sizable proportion of capital structure. Therefore, the applying of gearing can be justified in this case.

The second concern to the use of measure on capital structure is about the choice of using market value or book value. G. Cassar and S. Holmes (2003) pointed out that the shortcoming of using book value is the excluding of the testing towards the relationship between profitability and market value of equity, which will undermine the likely positive correlation between them. However, the market value is very difficult to capture due to its high variability and more importantly, SMEs won't benefit from that kind of variability. Moreover, G. Cassar and S. Holmes (2003 p132.) themselves also admitted that "*the equity of SMEs is very illiquid due to information asymmetries and agency considerations, and SMEs do not have a dynamic equity market*". Therefore, the book value of gearing will be used here as the basis for further discussion.

**Explanatory variables**

As mentioned previously, tangibility, profitability, firm size, growth prospect and age are the five independent variables studied in this research. The natures of the five independent variables are listed below:

**1> Profitability = Profit before Taxation / Annual Turnover**

**2> Growth Prospect = Percentage Change of Turnover**

**3> Tangibility = Total Fixed Asset / Total Asset**

**4> Size = Total Number of Employees**

**5> Age = 2005 minus the Year of Incorporation**

The measure of profitability is the quotient between profit and turnover and this measure has been justified by some studies before (Timan and Wessels 1988; G. Hall et al 2000). Profitability is also considered as an effective ratio of measuring the competence of making profit for a company (Atrill, P & McLaney, E 2006). Moreover, profitability, as a ratio, excludes the varying size effect of companies on the reflection to the competence of making profit, especially considering some firms might well make more profits simply based on their larger size. Therefore, the choice of profitability can be well justified. However, this research would only collect the data of profitability in the year 2006 due to the mathematical intricacy deriving from securing the average mean of profitability over several years. This conduct might well lead to some distortion to the real profitability of companies for some companies may have made abnormal profit in 2006. Certainly, a larger sampling size would offset this distortion to some extent.

Growth was measured differently in prior studies, G. Cassa and S. Holmes (2003) used percentage change in turnover while Tran D.K.N and Neelankantan. R (2006) used the percentage change in total asset as the measure of growth. F. Voulgaris et al (2002) even chosen the combined mean of both so as to avoid the likely bias results from either way of measuring. In this research, as the asset has been set aside as another independent variable to be related to capital structure, the use of percentage change in total asset to represent growth would duplicate the

testing to the correlation between assets and capital structure. Moreover, SMEs normally borrow outside if they cannot use their own earnings to finance growth, turnover is a figure related more with earnings or profits than asset. For that reason, percentage change in turnover is adopted here for measuring growth. Similarly, distorting effect might come up due to only the growth rate from the year 2005 to 2006 is applied.

Size is another variable that remain controversial. Some articles before (G. Cassar and S. Holmes 2003) prefer to use total asset for the measure of size. The number of employees is also applied by some researchers (Heshmati 2001; Tran D.K.N and Neelankantan. R 2006). This study applies the total number of employees as the measurement. The reason for that is because the *European Commission* defined SMEs from the perspective of number of employees (*SME definition,* European Commission, 2005), number of employees will thus be viewed as a proper measure regarding the size of a company. Additionally, using total asset would again duplicate the testing of tangibility effect on capital structure, which has been discussed in the last paragraph. Finally, when a firm adjust its operating size, it normally go first to increase or deduct employee and sell or buy asset afterwards due to the more variable cost is related to employment and more fixed cost is related to asset. Therefore, the number of employees will be a measurement more sensitive to firm size.

Total fixed asset to total asset is a proper measurement here for tangibility and Reid and Jacobsen (1988) also found the preference of outside financers to use fixed asset as the collateral for loans. Some other researches (Chittenden, Hall, and Hutchinson 1996; Huang and Song 2001) also used the fixed asset to total asset ratio as the measurement of tangibility. However, a high fixed asset to total asset ratio does not mean a company has more fixed asset as collaterals for loans, but just mean fixed asset accounts for a high proportion of the total asset of the company. Banks would not use a ratio as the collateral for loans but the absolute volume of tangible asset as the guarantee against default risk. Nevertheless, as the tangibility will be used here to be tested in relationship with gearing which is a ratio rather than an absolute number of total debts. Therefore, as a corresponding application, the ratio of total fixed asset to total asset will be applied here for measuring tangibility. Finally, age is measured by G. Hall et al (2000) *as 1995 less the year of incorporation,* this study will imitate this way of measurement to present age as the difference after 2005 minus the year of incorporation. The larger the difference of the measurement the older the company is.

## II. Sampling procedure

Samples of this study are selected from the database named FAME which is accessible from the database list of Durham University library webpage. The FAME database contains the company reports, detailed annual accounts, financial ratios and some descriptive information of 3.4 million companies from UK and Ireland, which guaranteed the complete access to information that necessary. One hundred Small and Medium Enterprises (SMEs) is selected from the database and SMEs is defined as the companies with employees less than 250 in this research. However, this definition is not definitive due to the all kinds of basements for the definition of SMEs in the previous studies, like employeement (G. Hall et al. 2000), annual turnover (Tran D.K.N and Neelankantan. R 2006), and other firm-specific characteristic measures. The reason for the choice of the companies with fewer than 250 as defined SMEs is partially because the EU commission referred the SMEs as firms with staff less than 250 and turnover lower than or equal to 50 million Euros (*SME definition* 2005). The reminder of the reasons backing up the choice is that the definition will facilitate obtaining of the data required.

For the sake of better representing the situation of the British manufacturing SMEs, sampling will be stratified in proportion to the manufactured product categories constituting manufacturing industry of UK in reality. The stratification will be based on the data from the Office for National Statistics (ONS 2006) which is the governmental agency for collecting and analyzing Britain's socio-economic statistics and demographic statistics. The statistic information about the number of companies with employees less than 250 in each product category manufactured within manufacturing industry was published in 2006 under the document named *UK Business: Activity, Size and Location – 2006* by ONS (see Appendix I ). Therefore, the proportional data of each product category can be sorted out and the relevant compiled table is presented in the page next. The 100 sampled SMEs will be selected in proportion to the percentage of each product category presented in the above pie chart, which will be a way of better reflection to reality.

Beside the 100 stratified SMEs, another ten SMEs from each product category was randomly selected in an attempt to investigate into the capital structure situation specific to the SMEs in each product category, which will be totally a further 120 samples. The reason for this additional 120 samples is because some of the product category, like iron and steel, only occupy a small proportion of the total manufacturing industry and its allocated sampled number under the stratified sampling would be too few to reveal the capital structure situation in that product category. Therefore, an equally random sampling with 10 SMEs of each product category is selected for

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the analysis of the capital structure variety between product categories. Moreover, the equally random sampling is also a way that provides control on the product category effect on capital structure and offers further insight and verification to situation of the capital structure reflected from the stratified sampling.

Finally, as an attempt to exclude some intervening factors, some of the British SMEs are not involved into sampling. The first are the companies which belonging to a large parent company and their capital structure can no longer viewed as the result from a SME but a large enterprise. Another group of SMEs excluded is the inactive firms and firms nearly go into bankruptcy. The reason for that is because those two kinds of SMEs might produce some outlier data because inactive firms normally don't have

too many staff on record and the nearly bankrupted firms usually are indebted to outside financers to the extent of being unpayable. The excluding of the two kinds of SMEs will avoid some extreme figures which might well distort the testing of the above relationships.

## III. Analysis method

The study will apply the methodology named cross-sectional analysis which is also the most commonly used methodology by researchers who have studied into the determinants of capital structure before (Michaela et al. 1999; G. Hall et al. 2000; G. Cassar and S. Holes 2003). The cross-sectional analysis will be conducted through the comparison of the descriptive means, correlation coefficients and regression coefficient from both stratified and equally random sampling so as to assess the effects of independent variables on capital structure both with and without product category effects. The analysis process includes four stages: the first is to compare the descriptive means of both independent and dependent means from both sorts of samplings so as to ascertain the likely mediums (independent variables) influencing capital structure in manufacturing industry; the second step will be the comparison for the descriptive means of independent and dependent variables from each product category, weights will be put on the impact of determinants of capital structure explicit at product level; the following step is to analyze and compare the correlation and regression coefficients between independent variables and dependent variable from both sorts of sampling and to decide the hypothesized relationships are true or false. Techniques of Pearson correlation and leaner regression with gearing as the dependent variable are used to test the relationships hypothesized; the final stage is study the relationship between gearing and age through the scatter diagram presenting the distribution of the gearing of sampled companies with different age and the Hypothesis 5 will be tested in this final stage.

## Result and analysis

### I. Descriptive data

The data from table II (see next page) shows the information about the descriptive mean of each independent and dependent variables and the purpose of the table is to discover the likely sources of different manufactured product effects on the capital structure of manufacturing SMEs. Through the comparison between the stratified samples and the equally random samples, similarities are found in terms of 'tangibility' 'size' and 'age' from the both sorts of samples, but evident differences between their growth, profitability, and gearing (if comparing their arithmetic mean, median, and standard deviation). As the equally random sampling secured equal amount of samples from each product category, the effects of product category on capital structure will be controlled. On another side, the stratified sampling data regarding each explanatory variable and dependent variable will be colored by the effects of product category for the proportion of samples in each product category contained in the stratified sampling varies significantly between each other. Therefore, if the dependent variable (gearing) were affected by the independent variables (growth, profitability, tangibility, size, age), the likely sources of impact from different manufactured product on capital structure would be through growth, and profitability. The reason for this conclusion is that the mean and the standard deviation of tangibility and age from stratified sampling and equally random sampling are quite similar, which means tangibility, size and age from the sampling with product effect control and the sampling without product effect control are the close to each other. However, the mean and standard deviation of growth, profitability and gearing from both samplings are evidently different with each other, which indicate that the growth, profitability, and gearing of SMEs are obviously changeable across different product manufacturers. Therefore, product category is likely to exert effects on capital structure through growth and profitability. However, there is still difference between two samplings in terms of their tangibility, size and age, so tangibility size and age are also the factors related to the product effect on capital structure, but are factors which are not as much influenced by product category as growth and profitability.

Beside the fact about the product category effect on capital structure, some extra information can also be revealed from table II. The arithmetic mean of gearing from stratified sampling data and equally random sampling data shows a high dependence of the manufacturing SMEs on debt and both gearing ratios are above 45%. However,

the discrepancy between the two sorts of sampling data about gearing is still obvious (around 20%), which implies that there are some product manufacturers rely on debt much more heavily than other kinds of product manufacturers. Therefore, the financing structure variety is not only confined to industry level and company level as previously studied(Gordon 1964; Lev 1969; Balakrishnan and Fox 1993), but also exists at product level. Additionally, data from both tables also show great difference between their growth ratios. The growth ratios from both sorts of sampling are 49.68% and 29.79 %, which indicates almost up to 20% difference. As previously mentioned, one of the sample tables above is product-effect controlled while another is not. Therefore, the marked difference between the controlled and uncontrolled sampling means that some of products market are highly prospect on growth but some of the manufacturing product markets are restricted for further growth. The product-related growth can be a dominated factor in deciding capital structure.

**Table III**

The table III (see next page) displays the arithmetic mean of each independent and dependent variable for each product category. First of all, the output of this table. Generally confirmed the information revealed from table II about the mean variety for each dependent variable. Gearing, profitability and growth varies drastically across different product category while size and age are much less variable with their maximum mean just twofold bigger than minimum mean. Tangibility is morderate variable comparing with the variations of other dependent variables. To be specific, Wood, Paper & Board, Iron & Steel, and Textiles & Clothing product industries are highly leveraged product categories. If comparing those product categories with those with high profitability, coincidences could be discovered to some extent. The most profitable product categories are Textiles & Clothing, Wood, Iron & Steel, and Bricks, Pottery & Glass. Apart from Bricks, Pottery & Glass, which are also the most leveraged product categories. Usually, the affluent cash flow of firms with high profitability will make the firm stand away from bankruptcy, which will also decrease the default risk from the perspective of banking and other debt financers. The low default risk of profitable firms will enable they borrow more.

Where growth is concerned, the fastest growing product categories are Food & Drink and Automotive, Aerospace, Rail & Ship. However, their growing dynamics seemed do not pose great appeal to banking and other debt financers, and their leverages are not at the top range throughout all the product categories. This phenomenon is contradictory to the hypothesis 4 that growth is positively related to gearing. Moreover, observation on Table III also discovered that the product categories with low profitability and high growth rate (Food & Drink, Chemicals & Pharmaceuticals, and Plastic & Rubber) normally have lower gearing ratios. The reason for that can also be interpreted as the numerous investment opportunities result from high growth rate cannot be financed by their low profits or by the hardly secured debt in those low profitability product categories, but have to be financed through equity and thus the low gearing ratios for those product categories. However, there is an exception. Although the Automotive, Aerospace, Rail & Ship is the product category with low profitability and high growth rate, this product category still have a gearing ratio up to 54.87%. The reason for this exception is because a portion of the Automotive, Aerospace, Rail & Ship business is nationally owned and government is a good warrantor against default risk. Therefore, the Automotive, Aerospace, Rail & Ship is exceptionally geared comparing with other product categories with low profitability and high growth rate. On the other side, if profitability is high and growth rate is high, company will have two choices: the first is to use profit to finance growth and growth will thus be negatively related to gearing; the second choice is to use its profitability to secure debt and growth would thus be positively related to gearing. In the final analysis, the decision to choose the first or the second depends on whether company has profitability high enough to finance growth or not. In the Table III, some product categories adopted the first choice, like Bricks, Pottery & Glass. More product categories went for the second choice, like Textiles & Clothing, Wood, and Paper & Board. Myers and Majluf's Pecking Order theory (1984) failed here to accurately predict the behavior of the product manufacturers who chosen the second choice, because they didn't use internal finance ahead of using debt.

Tangibility has been considered as an important variable of determining leverage due to high tangibility results in high liquidation value. Information from Table III suggests that Food & Drink product manufacturers are with the highest tangibility and Iron & Steel product manufacturers are showing the lowest tangibility. However, the Food & Drink product category is not highly leveraged as predicted while Iron & Steel product category is unexpectedly highly leveraged. Although evidence is not sufficient to conclude that leverage is negatively related to tangibility, but conclusion can still be made that tangibility is not as much important on deciding capital structure as expected. However, one important feature noticeable is that nearly all the product categories, except for Iron & Steel and Electronics & Instrumentation are with tangibility above 30% and also the gearing ratio of almost all product categories, except Chemicals & Pharmaceuticals and Unclassified product categories, are above 30%. This observed feature implies the existence of a basic relationship between leverage and tangibility.

To be specific, the reason for outside financers to ask for a certain amount of tangible assets is that the tangible asset can be used for liquidation when companies go bankruptcy and thus reduce the default risk associated with bankrupted companies. However, tangible assets are of no use to debt financers if company who borrowed is well alive and is still with potential to pay back the borrowed money. If transforming this logic into figures presented in the table III, the average above 30% tangible asset is a basic guarantee for companies to borrow outside and also a hedge, as the last resort, against default risk. The more valued point by debt financers is whether the company has stable cash flow in the future to pay back, because no debt financers wish their payback to be in the form of liquidation. Therefore, profitability is a more important factor for accessing borrowing, but tangibility is still needed as a basic guarantee and collateral for loans outside company. This point is essential for the understanding of the degree to which each independent variable can influence capital structure and is also the discovery exclusive for this study.

Size and age are two variables take on less variation across different product categories. Particularly, the size of SMEs for each product category normally falls into the range from 100 to 180 employees and there is no noticeable size difference between different product categories. Table III also failed to demonstrate any obvious correlation between the size of a particular product category and gearing. If looking back to the section of literature review regarding the effects of size on capital structure, the rationales concerning size can be generally classified as smaller transaction cost from economics of scale(Titman and Wessels 1988; Wald 1999), information asymmetry from smaller sized firms (Doanh and Pentley 1999), and less default risk from bigger and diversified firms (Marsh 1982). However, those rationales cannot be evidenced by the data of Table III, because the size of SMEs does not present distinct variation across product categories. Because of the limited size variation, the difference of economics of scales, diversification, and information asymmetry for each product category manufacturers can not be identified. As a result, the effects of size on capital structure are not observable from Table III. However, the later Bivariate and Multivariate data will include a much wider size range and the effects of size will be observable. Similarly, the effects of age are also hardly captured from Table III. The reason is because firms have different financing needs at different stage of development, a lineal relationship study between age and leverage will mask the changeability of the effects of age on capital structure. More proper technique to study the effects of age will be presented in the following paragraphs.

**II. Bivariate data:**

**Table IV**

Pearson' r is used to test the correlation between each independent and dependent variable, and the tested output is presented in Table IV (see next page). Table IV displays the tested results both for the stratified sampling and the equally random sampling. For the stratified sampling, significant correlation has been found between size and age (significant at 0.01 level). The reason for this correlation is understandable that aged firms normally has bigger accumulated scale of operation and also need more employments. While for the equally random sampling, significant correlation has been discovered between age and profitability (significant at 0.05 level). The correlation can be explained as the more aged firms have more experience of doing business in a specific market section and would be more able to control cost, make profit, and operate business. Moreover, a more aged firm normally has progressed into a more mature stage of growth comparing with new start-ups and would thus have a more stable cash flow while less aged firms who at initial stage of growth are normally incurring cost of product-launch and expansion. Additionally, in the manufacturing industry, to be proficient in production process, supply chain management and other best practices are essential for cost efficiency. As a result, the more experienced firms will be at advantage in how to achieve best operations through a longer time of continual improvement and are more efficient at improving cost efficiency. One point noticeable is that the correlation between age, size and profitability also get confirmed in both kinds of sampling tables and thus the two significant correlations are existent across product categories.

Apart from the two correlations confirmed in both sampling tables, there are many other correlations between independent and dependent variables confirmed by both stratified and equally random sampling. The first group of correlations regarding gearing confirmed by both samplings is the positive correlations between profitability, tangibility, size and gearing. The positive correlation between profitability and gearing is contradictory to Hypothesis 2 which predicts a positive relationship. The reason for this unexpected result, as explained in the discussion about Table III, is because the low default risk associated with high profitable companies will attract debt financers to lend money to them. However, as mentioned in the section of literature review, many empirical studies found negative relationships between leverage and profitability (Chittenden et al 1996; Michaelas et al 1999). Nevertheless, the common feature of their studies is to investigate companies from all industries but not to concentrate on manufacturing industry. The research by G. Hall et all (P.308, 2000) about the industry effect

on capital structure revealed that profitability is positively related to capital structure for the SMEs in manufacturing industry but the negative relationship observed in more other industries. Therefore, reason here need to be sorted out about why the positive relationship between profitability and leverage is existent in manufacturing industry.

The reason cannot be explained as before that high profitability boosted borrowing, because manufacturing as an industry are not considered as more profitable than other industries. In another word, banking would not lend money into manufacturing industry only because of its profitability. The reason lies in the demand side and it's the borrower itself in manufacturing industry decided to borrow along with the increase of profitability while firms in other industries decided not to borrow. The likely explanation is that firms of other industries used profit to finance their growth instead of using debt. The preference of using profit over debt to finance growth in other industries is because other industries, especially for service industries (G. Hall et all 2000), have much higher profitability than manufacturing industry. The high profitability of other industry will enable them to finance themselves while the comparatively lower profitable manufacturing industry, especially for SMEs, cannot use profits to sustain its further growth and have to finance through borrowing. Therefore, profitability plays two opposite roles that inside and outside manufacturing industry. Inside manufacturing industry, high profitability works as a hedge against default risk, which increased debt supply by attracting debt financers. Outside manufacturing industry, high profitability works as an incentive to finance internally, which reduced the debt demand by using the alternative of financing internally. On another side, profitability cannot be an incentive for financing internally inside manufacturing industry for profitability inside manufacturing industry is not high enough to sustain growth. Also, although profitability can be as a hedge against default risk outside manufacturing industry, but it's too high for other industries to have the need to finance externally. As a result, the two opposite relationships between leverage and profitability inside and outside manufacturing industry come into being.

In spite of the explanation stated for the two opposite relationships between leverage and profitability, evidence from G. Hall et all (P.305-308, 2000) still show that there are industries(construction, wholesale and retail industries) with profitability insufficient to finance growth, but still have their profitability negatively related to leverage. The explanation mentioned in the last paragraph regarding the negative relationship between leverage and profitability seems no longer true, because the insufficient profitability of those industries can not be as an incentive to finance internally. Actually, the expiation of last paragraph still holds up but is interrupted by the effect of another determinant on capital structure-**Tangibility**. As discussed in the section of Table III, tangibility is normally not the most important appeal to banking and other debt financers, because no outside financer hopes their financed companies go bankruptcy and retrieve their investment through liquidation. Profitability is the appeal to outside financers. However, debt holders still need some tangible assets as the hedge against the risk of bankruptcy when they lend money to firms with high profitability. Therefore, tangibility here is a necessary condition but not a sufficient condition. Table IV also confirmed the positive effects from tangibility on gearing but as a factor with effects secondary to profitability (coefficient regarding profitability > coefficient regarding tangibility).

If predicted by the explanation of last paragraph, the companies in the industries (construction, wholesale and retail industries) with comparatively lower profitability should have their profitability positively related leverage. However, as those industries have tangibility lower than manufacturing industry (G. Hall et all, P.305, 2000), the supply side of debt is not willing to lend money under the default risk associated with bankruptcy. As a consequence, the industries with profitability insufficient to finance growth and low tangibility will not only have insufficient profit to finance internally but also have insufficient tangibility to secure loans outside company. The more profitable SMEs inside those industries thus cannot use their low tangibility to secure loans but have to finance growth through partially their profits and partially through equity, which leads to a negative relationship between profitability and leverage in industries with the similar profitability but lower tangibility comparing with manufacturing industry. Up to this point, the roles of profitability and tangibility on deciding capital structure are explicit. Profitability works as the primary factor influencing leverage both negatively (if profitability is sufficient for internal finance or insufficient to attract loans) and positively (if profitability is insufficient for internal finance while sufficient to attract loans). Tangibility works as a secondary but necessary factor influencing leverage indirectly through the relationship between profitability and leverage and will bring on both negative relationship between profitability and leverage (if tangibility is insufficient to hedge default risk) and positive relationship between profitability and leverage (if tangibility is sufficient to hedge default risk). However, the both negative and positive relationships caused by the degree of tangibility are only true if profitability is insufficient to finance growth, but if profitability is sufficient to finance growth and companies

still want use debt to finance. Tangibility will be definitely and positively related to leverage. Therefore, the role of tangibility depends on whether profitability is sufficient for internal finance and that's why tangibility is a factor secondary to profitability.

The relationship between gearing and size is confirmed by Table IV to be positive and this result is consistent with Hypothesis 3. The reason for this result has been discussed under the section of literature review and will not be repeated here. The more controversial output from Table IV is the two opposite relationship between growth and gearing from stratified sampling and equally random sampling. In the discussion regarding Table III, growth has been analyzed to be both possibly positively related to gearing (if profitability is sufficient to attract loans) because more product category manufacturers used profit to attract debt instead of using profit to finance internally and negatively to gearing ratio (if profitability is insufficient to attract loans) because manufacturers have to finance growth through equity. Therefore, the overall picture of relationship between growth and gearing depends on whether the amount of SMEs within product categories with profitability sufficient to attract loans is more than or less than the number of SMEs with product categories with profitability insufficient to attract loans. The data from the stratified sampling shows the negative relationship between gearing and growth, which means the total amount of SMEs insufficient to attract loans account for a larger proportion of the SMEs in manufacturing industry. However, the equally random sampling shows a positive relationship between gearing and growth, which means the product categories with profitability sufficient to attract loans are more than the product categories insufficient to attract loans. All in all, the overall picture of the gearing-growth relationship depends on the amount of SMEs rather than the amount of product categories, so the growth of British manufacturing SMEs as a whole is negatively related to gearing and the Hypothesis 4 is false.

**Table V**

Previous analyses have worked out the tested result for Hypotheses 3 and 4 while left the Hypotheses 1, 2 5, and 6 suspended. From the regression analysis result of Table V (see page before), the direction of the relationships between growth, size and gearing from both stratified sampling and equally random sampling regression tests are the same as appeared in the correlation analyses tables (Table IV), which further confirmed the prior discussion regarding their relationships are correct. The coefficients of growth and size from both kinds of sampling table also suggest the idea that growth is a factor over size on deciding the capital structure of the British manufacturing SMEs. However, as previously discussed, growth plays different role on affecting the capital structure of different product category of manufacturing industry and thus the opposite directions of relationships displayed from the stratified sampling table(with product category effect) and the equally random sampling table(without product category effect). Admittedly, the coefficients of both growth and size with gearing appeared not so significant, so the fact that growth is a more important deciding factor on leverage than size can not be certain, but the direction of the relationships can be confirmed, if considering their regression coefficients and the correlation coefficients displayed before.

In the both regression tables above, profitability and tangibility are contributive positively to gearing and this result is consistent with the result of the Pearson's correlation presented before. Therefore, the relationship of profitability and tangibility with gearing for manufacturing SMEs are thus positive without doubt. As discussed before, profitability and tangibility can be positively related to gearing conditional on profitability is insufficient to finance growth while sufficient to attract loans or companies prefer using debt for financing even their profitability are sufficient to finance growth. Therefore, the British manufacturing SMEs normally fall into the group of companies whose profitability are insufficient to finance growth while sufficient to attract loans or preference to financing with debt is stubborn even their profitability are sufficient to finance growth. The reason for the former is that companies with insufficient profitability to finance growth will not be able to finance internally but have to finance through debt or equity. However, as their profitability is sufficient to attract debt, they would definitely choose debt (Pecking Order Theory, 1984) and thus the positive relationship between profitability and debt. Moreover, when profitability is agreeable from the perspective of outside debt financers, tangibility will work as a positive factor on borrowing and the more tangible the company is the safer the company is from the view of debt financers. Therefore, tangibility is positively related to leverage. The latter is the situation that companies just prefer to finance through although their profitability is sufficient for internal finance. The preference over debt can be attributed to Modigliani and Miller's taxation shield proposition (1963) which states that companies tend to finance through debt due to the tax advantage for debt over equity and internal profits. Therefore, Hypothesis 1 is correct while Hypothesis 2 is false according to the analyses and the regression result presented.

Although their relationships can be confirmed, how much profitability and tangibility contribute to gearing is still uncertain. The standardized coefficient from stratified sampling indicates that profitability is less important

than tangibility while the data from equally random sampling demonstrates the opposite. However, standardized coefficient of the profitability from the stratified sampling is too insignificant (Sig = 0.898) to believe. The evidence that the profitability is a more important factor over tangibility is more significant, if looking at the significance of the coefficients from the equally random sampling. The previous analyses also identified profitability as a factor that weights more than tangibility, because the relationship of profitability with gearing can be decided by profitability itself while the relationship of tangibility with gearing need to be decided by profitability to some extent. Moreover, the correlated coefficients present in Table III between profitability and tangibility with gearing are also more significant when profitability is identified as a more strong correlated factor with gearing and much less significant when tangibility is considered as being more important. Furthermore, the more significant standardized coefficient about the profitability from the regression result of equally random sampling also demonstrates that profitability is the most influencing determinant over other determinants on deciding gearing. Therefore, conclusion could be made that profitability is a determinant over other determinants on deciding capital structure for the SMEs of British manufacturing industry.

**Table VI**

Table VI (see next page) uncovers an important truth related to Hypothesis 6 that the relationship of each independent variable to the independent variable-gearing varies across different product categories. The different relationships of each product category result from the interaction between all the independent and dependent variable and the interaction of variables regarding gearing, profitability, growth and tangibility were discussed in the previous paragraphs and the variation of the relationship for each independent variable with gearing can be considered as the consequence of the previously explained interaction effects between profitability, growth, tangibility and gearing. However, there are two variables left (size and age) for the further analysis about why their relationship with gearing varies across different product category. Firstly, as the Hypothesis 5 about relationship of age with gearing is not lineal, it's pointless to discuss the different relationship about age and gearing form the lineal regression result of Table VI. For that reason, size will be discussed in particular upon the data from Table VI.

The first unexpected result is that seven out of twelve product categories demonstrate that profitability is negatively related to gearing although the correlation and regression results from both stratified sampling and equally random sampling confirmed that size is positively related gearing. If relate those product categories with negative or positive relationships to the data of Table III, interesting information is discovered that those product categories with positive relationship are with size mean above 150 (except Food & Drink) and those product categories with negative relationship are all with size mean below 135. This characteristic suggests that the size of SMEs inside manufacturing industry transfers from negative into positive relationship with gearing after a specific size point. The reason for this, if use the rationales discussed in literature review, is because the saved transaction cost of securing loans from the economic scale of company can only become explicit after company has grow up to a certain size or the debt above a certain amount can only be accessible for companies with size above a certain point. The latter explanation seems more proper, because it also can be used to interpret why the product categories with size below 135 have negative relationship between size and gearing and the interpretation is that when companies can not access the debt above a certain amount, they will have to resort to equity or self-finance to finance growth. When their size grows, their equity and self-finance will also grow until their size grow to the point sufficient for borrowing debt of certain amount and thus the negative relationship between gearing and size for product categories with size below 135. Additionally, as the positive effect on gearing from size above a certain point is much bigger than the negative effect from size below a certain point, the correlation and regression result presented before masked the two opposite relationships and just show the positive relationship. The Hypothesis 1 is thus correct if viewing the effects of size on gearing in the manufacturing industry as a whole while exceptions do exist if considering specific product category.

**Graph data**

**Diagram II**

The section of literature review has discussed the likely impacts from age on gearing and predicted that age would be in *N*-shaped relationship with gearing. As the relationship between age and gearing is not predicted as a lineal relationship, the relationship between them will be discussed upon the scatter diagram displayed in Graph II (see next page) instead of in the tables used for analyzing other hypotheses. Graph II displays the scatter diagram for the relationship between gearing and age. Scatter diagrams from both stratified sampling and equally random sampling conveyed a common peace of information that the gearing of SMEs varies evidently across different age groups. To be specific, there is an obvious up-and-down wave for the gearing of companies with

age ranged from 0 to 50. Afterwards, a sharp jump of gearing for companies with age after 50 and the proliferated gearing turned down for companies with age after 55. Finally, there are two smaller waves of gearing for companies with age ranged from 70 to 200. In general, the gearing of companies present itself as several up-and-down waves linked together throughout life span. This result stressed that the age of a company do not influence the gearing of a company in a consistent way and the gearing of a company reflects the need of that company at a specific time. Moreover, the wave-shaped change of gearing throughout different age group indicated particularly that the SMEs of manufacturing industry do put control on their gearing so as to prevent their gearing to go extreme. There are periods for company to grow with the increase of gearing for the sake of financing growth and expansion, which lead to a positive relationship between age and gearing. Oppositely, there are times when company need to reduce financial distress or go public to raise equity fund, which results in a negative relationship between age and gearing. However, both the positive and negative relationship is not because of age itself, but the specific need of the company on capital structure. The older firms in the above scatter diagrams do not see more geared than younger firms. Therefore, the Hypothesis 5 is correct to some extent, because it pointed out the inconsistent relation of age to gearing. It is also wrong in other respect because it is not age creates its inconsistent relation with gearing, but the concrete needs of company at the different age. .

**Conclusion**

In this paper, the determinants of the capital structure of the SMEs in the manufacturing industry have been studied. Profitability, growth, tangibility, size and age are identified as the determinants of capital structure and their relationships with gearing are tested for the sake of ascertaining the effects of them on capital structure. The main conclusions of this study are sorted out as follows:

The gearing ratio of SMEs is found to be positively related to profitability, tangibility and size and negatively with growth in the British manufacturing industry. This finding is in contradiction with both pecking order theory (Myers 1984) and the empirical research done by G. Hall et all (2000) in that profits are positively negatively related to leverage. However, it's consistent with the taxation shield theory (Modigliani and Miller, 1963) that firms try to use as much debt as possible to take tax deduction advantage. Tangibility plays the role of being a basic hedge against the default risk results from bankruptcy but not as the most important appeal to loans from debt financers. Profitability is the most attractive determinant to debt financers due to outside financer expects stable cash flow. There are actually more product categories with growth negatively related to gearing while the SMEs in manufacturing industry as a whole positively related to gearing as whole, the sign of the relationship between gearing and growth is dependent on whether profitability is sufficient to finance growth, which is agreed by G. Hall et al (2000,.p 300). Additionally, although size is positively related to gearing as predicted, there do exists a divisional point of size with two opposite signs of relationship between gearing and size at the both sides of the point and this point of size is related to the fact that the outside debt investors normally require minimum sum of borrowing or minimum scale of operation to access loans. Finally, age is in inconsistent relationship with gearing and the inconsistent relationship is influenced by the specific need of company through the life span of development.

Another important contribution of this paper is the discovery of the existence of product category effects on capital structure. Profitability is considered as the most important medium through which product category influences the capital structure of British manufacturing SMEs due to the fact that different product market are differently profitable and debt financers value the profitability of company when lending. Other determinants are also related to product category. Tangibility is the basic requirement by outside financers for borrowing and the more tangible the product category is the more geared the product category would be. The effect of product category also influences capital structure through the interaction between the profitability and the growth rate of a certain product market. Where in the product market with growth rate sustainable by the profitability of that market, profitability is negatively related leverage and vice versa. Additionally, product categories with more tangible assets will surely have more debt, given that other determinants are controlled. Finally, some more maturely developed product market are more likely featured with the capital structure required by that developmental stage but age is not in itself a determinant exerting influence.

Finally, the interactions between profitability, growth and tangibility are the unexpected but important discovery of this paper. Pervious studies normally looked into the direct effects of the three variables on capital structure but not their interactive effects on capital structure. First, Profitability can influence gearing both negatively (if profitability is sufficient for internal finance or insufficient to attract loans) and positively (if profitability is insufficient for internal finance while sufficient to attract loans). Second, growth is likely to be positively related to gearing (if profitability is insufficient to finance growth) and to be negatively related to gearing (if

profitability is sufficient to finance growth). Finally, Tangibility works as a secondary but necessary factor influencing leverage indirectly through the relationship between profitability and leverage and will bring on both negative relationship between profitability and leverage (if tangibility is insufficient to hedge default risk) and positive relationship between profitability and leverage (if tangibility is sufficient to hedge default risk). However, the both negative and positive relationships caused by the degree of tangibility are only true if profitability is insufficient to finance growth, but if profitability is sufficient to finance growth and companies still want use debt to finance. Tangibility will be positively related to leverage. The explanations backing up the interactive effects of the three determinants are discussed in the result and analysis section and those interactive effects can be used to explain the capital structure of various product category.

**Limitation and future research**

In spite of all the efforts to be preciseness, errors are still unavoidable. The sample size of this research is the factor that causing bias against the tested results of this paper. The 100 samples for stratified sampling and the 120 samples for equally random sampling seem quite insufficient for testing out the real relationships between those explanatory variables and dependent variable, especially considering the previous relevant studies normally selected a sample size above 1000 (G. Hall et al. 2000; G. Cassar, S. Holmes 2003). Moreover, although a large volume of content has devoted into analyzing the tested results, the discussion on the reasons for the results of testing may still be partial. However, the same conclusion sometimes can be explained by numerous reasons and this paper just presented the most likely reasons. Given the one-sided result of this paper, future research could apply a much bigger sized sampling and use more reliable statistical techniques to provide further empirical evidence regarding the determinants of capital structure in British manufacturing industry. Moreover, future research could look into large and publicly quoted companies for further insights, because gearing is a more proper measure of the capital structure of quoted companies while many SMEs are inaccessible to equity market. Eventually, service industry is nowadays absorbing investments from all directions and is the hotspot of future economy and researchers should pay more attention into that area.

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Table I.

| product category | number of SMEs |
|---|---|
| Iron&Steel | 1490 |
| Bricks,Potter&Glass | 4265 |
| Chemicals&Pharmaceuticals | 2990 |
| Food&Drink | 5990 |
| Textiles&Clothing | 8290 |
| Wood | 7475 |
| Paper,Board&Print | 26965 |
| Plastics&Rubber | 6385 |
| Mechanical Engineering | 36770 |
| Electronics&Instrumentation | 11285 |
| Automotive,Aerospace,Rail&Ship | 4220 |
| Other | 16635 |

Table II. The descriptive means for stratified sampling

| | | Statistic | Std. Error |
|---|---|---|---|
| gearing | Mean | 46.1271 | 8.51940 |
| | Median | 26.3000 | |
| | Variance | 7258.018 | |
| | Std. Deviation | 85.19400 | |
| profitability | Mean | .1155 | 1.09651 |
| | Median | .0702 | |
| | Variance | 120.234 | |
| | Std. Deviation | 10.96513 | |
| growth | Mean | .4968 | .20773 |
| | Median | .0635 | |
| | Variance | 4.315 | |
| | Std. Deviation | 2.07728 | |
| tangibility | Mean | .4372 | .02245 |
| | Median | .4200 | |
| | Variance | .050 | |
| | Std. Deviation | .22452 | |
| size | Mean | 128.2800 | 9.05852 |
| | Median | 123.0000 | |
| | Variance | 8205.678 | |
| | Std. Deviation | 90.58520 | |
| age | Mean | 30.2700 | 3.54959 |
| | Median | 15.0000 | |
| | Variance | 1259.957 | |
| | Std. Deviation | 35.49587 | |

The descriptive means for equally random sampling

| | | Statistic | Std. Error |
|---|---|---|---|
| gearing | Mean | 63.3935 | 12.33527 |
| | Median | 28.2350 | |
| | Variance | 18259.078 | |
| | Std. Deviation | 135.12615 | |
| profitability | Mean | .1819 | 1.30867 |
| | Median | .2653 | |
| | Variance | 205.513 | |
| | Std. Deviation | 14.33574 | |
| growth | Mean | .2979 | .13409 |
| | Median | .0770 | |
| | Variance | 2.158 | |
| | Std. Deviation | 1.46891 | |
| tangibility | Mean | .4153 | .02414 |
| | Median | .3950 | |
| | Variance | .070 | |
| | Std. Deviation | .26441 | |
| size | Mean | 133.5500 | 6.92521 |
| | Median | 143.0000 | |
| | Variance | 5755.023 | |
| | Std. Deviation | 75.86187 | |
| age | Mean | 29.7667 | 3.08247 |
| | Median | 16.0000 | |
| | Variance | 1140.197 | |
| | Std. Deviation | 33.76681 | |


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Table III. The descriptive arithmetic mean table for the independent and dependent variables of each product category in manufacturing industry

| Product category | Gearing | Profitability | Growth | Tangibility | Size | Age |
|---|---|---|---|---|---|---|
| **Food & Drink** | **47.8640** | **-3.0700** | **1.1872** | **0.7150** | **99.4000** | **28.6000** |
| **Textiles & Clothing** | **79.7200** | **13.2901** | **-0.0231** | **0.3331** | **100.1000** | **44.8000** |
| **Wood** | **144.2875** | **3.1370** | **0.2138** | **0.4663** | **167.4000** | **33.0000** |
| **Paper & Board** | **105.5950** | **0.8538** | **0.1072** | **0.4440** | **109.6000** | **10.6000** |
| **Chemicals & Pharmaceuticals** | **25.8120** | **-6.1050** | **0.1608** | **0.3779** | **177.4000** | **20.3000** |
| **Plastic and Rubber** | **32.9580** | **-1,9350** | **0.1375** | **0.5434** | **131.5000** | **37.9000** |
| **Bricks, Pottery & Glass** | **46.8940** | **4.4190** | **-0.0048** | **0.4719** | **153.0000** | **37.3000** |
| **Iron & Steel** | **87.8790** | **2.8940** | **0.2030** | **0.1636** | **113.7000** | **18.1000** |
| **Mechanical & Engineering** | **67.9140** | **0.0740** | **0.0365** | **0.4027** | **163.4000** | **45.6000** |
| **Electronics & Instrumentation** | **36.7750** | **-0.5360** | **-0.0117** | **0.2888** | **135.2000** | **16.4000** |
| **Automotive, Aerospace, Rail & Ship** | **54.8790** | **-5.4496** | **1.3939** | **0.3551** | **109.9000** | **43.5000** |
| **Unclassified manufactured products** | **26.5460** | **-3.4500** | **0.2250** | **0.3766** | **134.0000** | **19.6000** |

The above table is of 95% confidence interval for the mean displayed in each cell.

Table IV. Correlations for independent and dependent variables from stratified sampling

| | | gearing | profitability | growth | tangibility | size | age |
|---|---|---|---|---|---|---|---|
| gearing | Pearson Correlation | 1 | .018 | -.044 | .124 | .017 | .004 |
| | Sig. (2-tailed) | | .859 | .666 | .220 | .868 | .967 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |
| profitability | Pearson Correlation | .018 | 1 | -.006 | .032 | .015 | -.008 |
| | Sig. (2-tailed) | .859 | | .955 | .750 | .882 | .940 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |
| growth | Pearson Correlation | -.044 | -.006 | 1 | .000 | -.028 | -.117 |
| | Sig. (2-tailed) | .666 | .955 | | 1.000 | .782 | .245 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |
| tangibility | Pearson Correlation | .124 | .032 | .000 | 1 | .055 | .173 |
| | Sig. (2-tailed) | .220 | .750 | 1.000 | | .586 | .084 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |
| size | Pearson Correlation | .017 | .015 | -.028 | .055 | 1 | .306(**) |
| | Sig. (2-tailed) | .868 | .882 | .782 | .586 | | .002 |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |
| age | Pearson Correlation | .004 | -.008 | -.117 | .173 | .306(**) | 1 |
| | Sig. (2-tailed) | .967 | .940 | .245 | .084 | .002 | |
| | N | 100 | 100 | 100 | 100 | 100 | 100 |

** Correlation is significant at 0.01 level (2-tailed).

Correlations for independent and dependent variables from equally random sampling

| | | gearing | profitability | growth | tangibility | size | age |
|---|---|---|---|---|---|---|---|
| gearing | Pearson Correlation | 1 | .107 | .092 | .091 | .072 | -.006 |
| | Sig. (2-tailed) | | .245 | .320 | .325 | .434 | .949 |
| | N | 120 | 120 | 120 | 120 | 120 | 120 |
| profitability | Pearson Correlation | .107 | 1 | .053 | .023 | -.023 | .182(*) |
| | Sig. (2-tailed) | .245 | | .569 | .804 | .806 | .047 |
| | N | 120 | 120 | 120 | 120 | 120 | 120 |
| growth | Pearson Correlation | .092 | .053 | 1 | .125 | -.064 | -.083 |
| | Sig. (2-tailed) | .320 | .569 | | .173 | .485 | .366 |
| | N | 120 | 120 | 120 | 120 | 120 | 120 |
| tangibility | Pearson Correlation | .091 | .023 | .125 | 1 | -.003 | .101 |
| | Sig. (2-tailed) | .325 | .804 | .173 | | .974 | .272 |
| | N | 120 | 120 | 120 | 120 | 120 | 120 |
| size | Pearson Correlation | .072 | -.023 | -.064 | -.003 | 1 | .118 |
| | Sig. (2-tailed) | .434 | .806 | .485 | .974 | | .198 |
| | N | 120 | 120 | 120 | 120 | 120 | 120 |
| age | Pearson Correlation | -.006 | .182(*) | -.083 | .101 | .118 | 1 |
| | Sig. (2-tailed) | .949 | .047 | .366 | .272 | .198 | |
| | N | 120 | 120 | 120 | 120 | 120 | 120 |

* Correlation is significant at 0.05 level (2-tailed).


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Table V. Coefficients (a) and regression for stratified sampling

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 25.935 | 22.383 | | 1.159 | .250 |
| | profitability | .102 | .795 | .013 | .129 | .898 |
| | growth | -1.906 | 4.222 | -.046 | -.451 | .653 |
| | tangibility | 48.348 | 39.408 | .127 | 1.227 | .223 |
| | size | .016 | .101 | .017 | .159 | .874 |
| | age | -.069 | .263 | -.029 | -.260 | .795 |

a Dependent Variable: gearing

Coefficients (a) and regression for equally random sampling

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 28.029 | 32.655 | | .858 | .392 |
| | profitability | 1.033 | .886 | .110 | 1.166 | .246 |
| | growth | 7.148 | 8.614 | .078 | .830 | .408 |
| | tangibility | 42.087 | 47.759 | .082 | .881 | .380 |
| | size | .150 | .166 | .084 | .907 | .367 |
| | age | -.151 | .382 | -.038 | -.395 | .693 |

a Dependent Variable: gearing

Table VI. The output of multivariable regression against gearing for each product category

Food & Drink

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 9.331 | 21.216 | | .440 | .683 |
| | profitability | .439 | 1.219 | .098 | .360 | .737 |
| | growth | 5.351 | 3.494 | .457 | 1.531 | .200 |
| | tangibility | 13.244 | 18.032 | .186 | .734 | .503 |
| | size | .103 | .133 | .291 | .773 | .483 |
| | age | .485 | .353 | .533 | 1.375 | .241 |

Textiles & Clothing

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 77.795 | 85.239 | | .913 | .413 |
| | profitability | -.082 | 1.707 | -.017 | -.048 | .964 |
| | growth | 35.744 | 69.364 | .155 | .515 | .634 |
| | tangibility | 45.022 | 248.557 | .123 | .181 | .865 |
| | size | -.567 | .431 | -.543 | -1.318 | .258 |
| | age | 1.019 | 1.223 | .528 | .833 | .452 |

Wood

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -1327.672 | 689.008 | | -1.927 | .126 |
| | profitability | 85.392 | 35.678 | 1.123 | 2.393 | .075 |
| | growth | 780.187 | 591.120 | .578 | 1.320 | .257 |
| | tangibility | -564.542 | 454.409 | -.404 | -1.242 | .282 |
| | size | 9.055 | 3.275 | 1.595 | 2.765 | .051 |
| | age | -6.525 | 3.651 | -.619 | -1.787 | .148 |

Paper & Board

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -390.558 | 362.557 | | -1.077 | .342 |
| | profitability | 90.991 | 50.854 | 1.197 | 1.789 | .148 |
| | growth | -382.294 | 229.250 | -.754 | -1.668 | .171 |
| | tangibility | 1365.994 | 536.045 | 1.138 | 2.548 | .063 |
| | size | -2.236 | 1.915 | -.643 | -1.168 | .308 |
| | age | 9.249 | 8.029 | .466 | 1.152 | .314 |

a Dependent Variable: gearing


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Chemicals & Pharmaceuticals

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 21.699 | 23.262 | | .933 | .404 |
| | profitability | 1.031 | .702 | .606 | 1.469 | .216 |
| | growth | 3.394 | 27.241 | .049 | .125 | .907 |
| | tangibility | -19.124 | 37.240 | -.232 | -.514 | .635 |
| | size | .134 | .105 | .480 | 1.269 | .273 |
| | age | -.327 | .299 | -.439 | -1.093 | .336 |

Plastic and Rubber

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 20.793 | 33.012 | | .630 | .563 |
| | profitability | .147 | .600 | .144 | .245 | .818 |
| | growth | -25.576 | 34.013 | -.532 | -.752 | .494 |
| | tangibility | 59.946 | 62.724 | .430 | .956 | .393 |
| | size | -.157 | .106 | -.676 | -1.481 | .213 |
| | age | .106 | .228 | .293 | .467 | .665 |

Bricks, Pottery & Glass

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -95.718 | 168.179 | | -.569 | .600 |
| | profitability | -8.802 | 5.245 | -1.166 | -1.678 | .169 |
| | growth | 262.508 | 162.337 | .756 | 1.617 | .181 |
| | tangibility | 296.981 | 278.266 | .777 | 1.067 | .346 |
| | size | .232 | .390 | .347 | .594 | .584 |
| | age | .191 | .448 | .180 | .427 | .691 |

Iron & Steel

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 67.915 | 64.439 | | 1.054 | .351 |
| | profitability | 12.251 | 29.953 | .159 | .409 | .703 |
| | growth | -233.445 | 109.020 | -.636 | -2.141 | .099 |
| | tangibility | 2013.682 | 462.068 | 1.542 | 4.358 | .012 |
| | size | -2.089 | .435 | -1.424 | -4.808 | .009 |
| | age | -3.314 | 2.658 | -.223 | -1.247 | .281 |

a Dependent Variable: gearing

Mechanical & Engineering

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -224.689 | 151.301 | | -1.485 | .212 |
| | profitability | -1155.378 | 528.735 | -.897 | -2.185 | .094 |
| | growth | 545.687 | 232.595 | .978 | 2.346 | .079 |
| | tangibility | 241.659 | 183.528 | .439 | 1.317 | .258 |
| | size | 1.780 | .750 | .696 | 2.374 | .077 |
| | age | -.659 | .868 | -.225 | -.759 | .490 |

Electronics & Instrumentation

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -7.841 | 36.990 | | -.212 | .842 |
| | profitability | -3.460 | 1.767 | -.543 | -1.958 | .122 |
| | growth | 109.064 | 59.405 | .516 | 1.836 | .140 |
| | tangibility | 207.807 | 91.165 | .912 | 2.279 | .085 |
| | size | -.124 | .370 | -.132 | -.335 | .754 |
| | age | .048 | .920 | .011 | .053 | .961 |

Automotive, Aerospace, Rail & Ship

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 59.147 | 28.854 | | 2.050 | .110 |
| | profitability | .989 | .829 | .373 | 1.194 | .298 |
| | growth | 11.188 | 4.578 | .653 | 2.444 | .071 |
| | tangibility | 68.249 | 85.113 | .234 | .802 | .468 |
| | size | -.085 | .178 | -.123 | -.477 | .658 |
| | age | -.676 | .438 | -.376 | -1.541 | .198 |

Unclassified manufactured products

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 23.987 | 17.356 | | 1.382 | .239 |
| | profitability | -.055 | .182 | -.097 | -.299 | .780 |
| | growth | 31.013 | 11.202 | 1.033 | 2.769 | .050 |
| | tangibility | 9.655 | 30.500 | .093 | .317 | .767 |
| | size | -.157 | .083 | -.658 | -1.898 | .131 |
| | age | .651 | .357 | .690 | 1.826 | .142 |

a Dependent Variable: gearing


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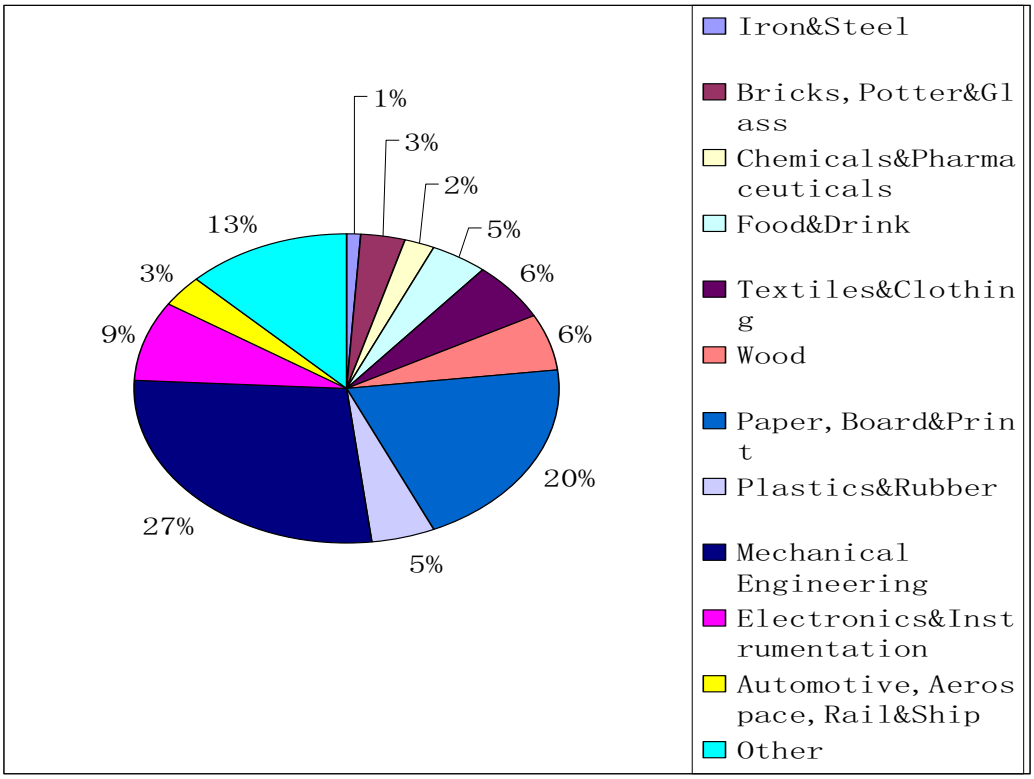
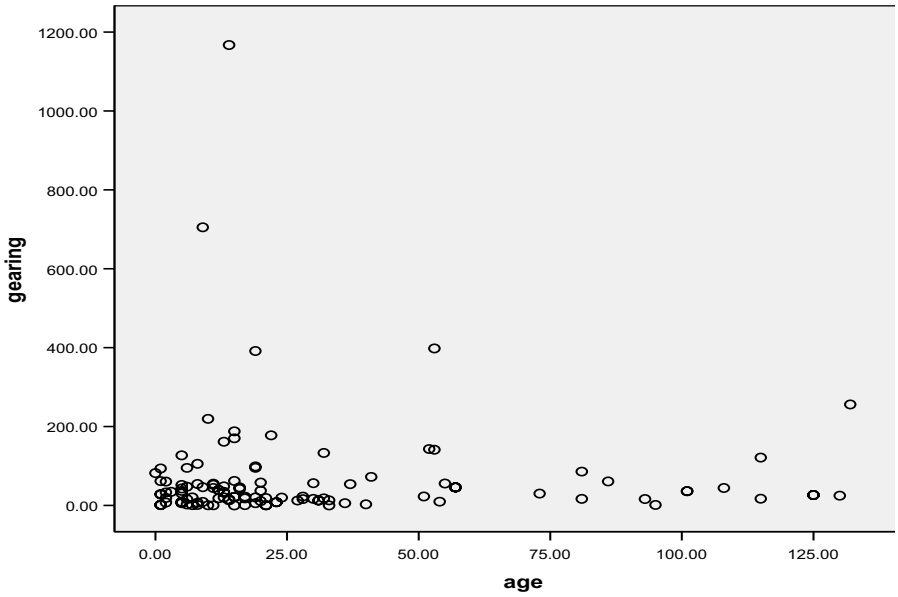
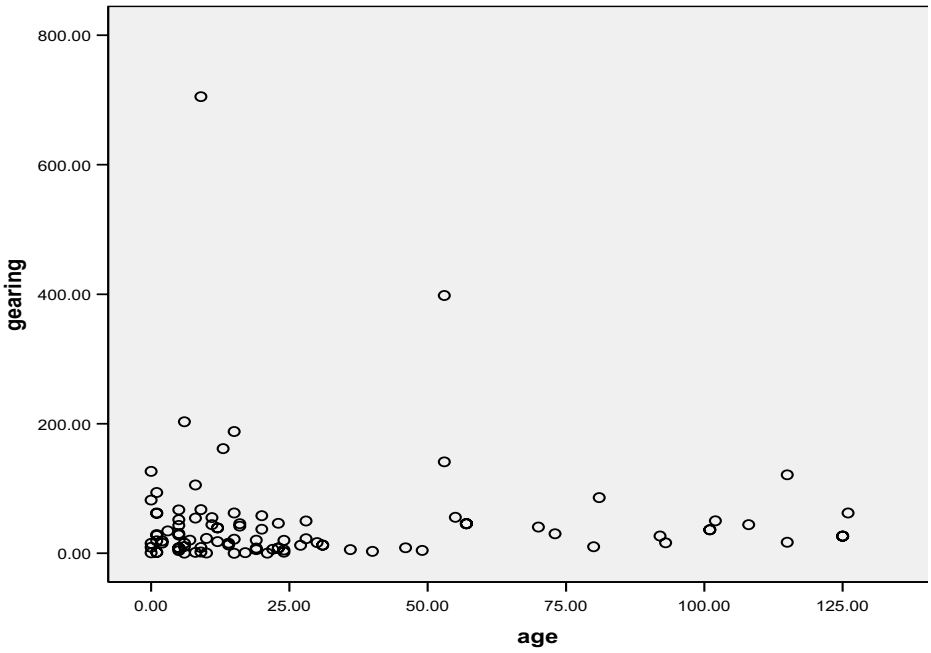



Diagram I.




Graph II. Stratified sampling




Graph II. Equally random sampling