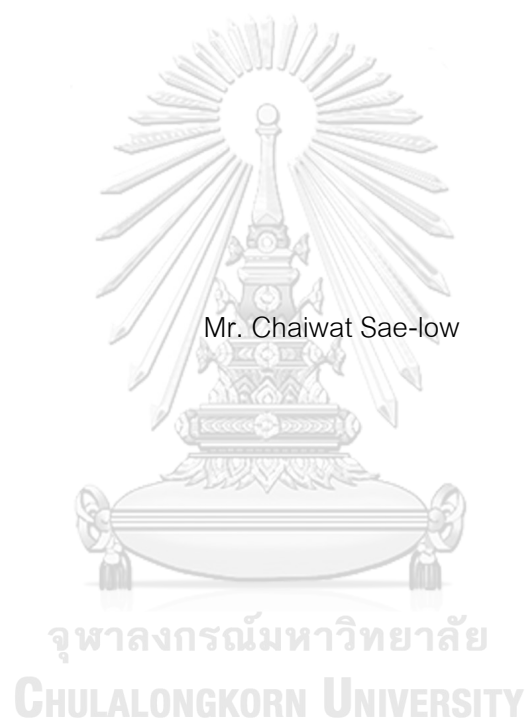Trade credit with firms' life cycle: Evidence from Stock Exchange of Thailand (SET)

Mr. Chaiwat Sae-low

An Independent Study Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science in Finance

Department of Banking and Finance

FACULTY OF COMMERCE AND ACCOUNTANCY

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By   Mr. Chaiwat Sae-low

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Accepted by the FACULTY OF COMMERCE AND ACCOUNTANCY,

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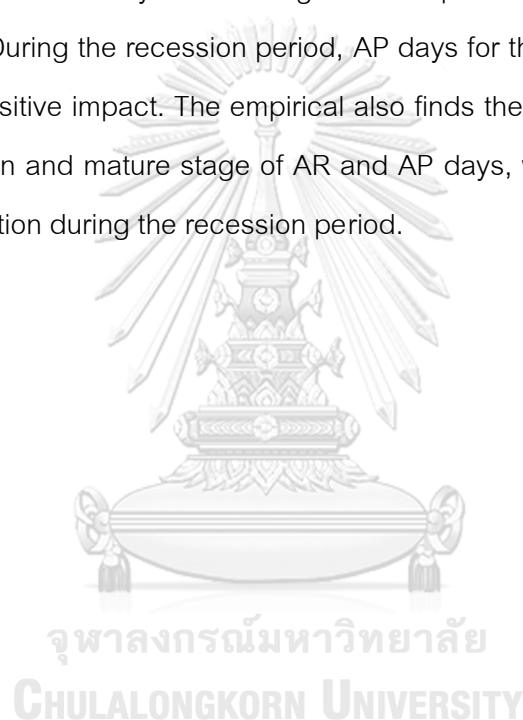
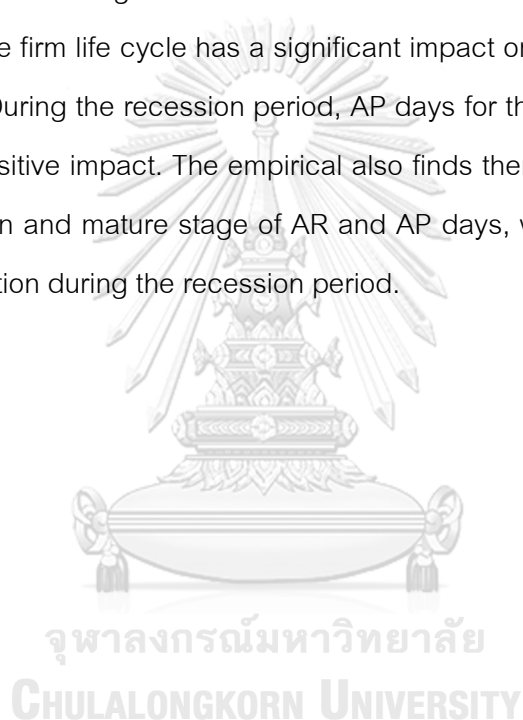|			
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1. Introduction

1.1) Background

Trade credit is a source of short term financing which is considered as external financing offered by suppliers to customers. Firms use trade credit to purchase goods or services as account payable (AP), representing the credit that a firm owes to their suppliers, and offer their financing to customers as account receivable (AR) which AR and AP are known as one of firm's working capital. When compared to other types of financing, such as bank loans as well as considering social and governance, risk and environmental trade credit have played a significant role in the firm expansion (Garmaise and Moskowitz 2003) and as a source of funds for both small and large businesses (Petersen and Rajan 1997). Moreover, suppliers could support the sustainability of their customer's supply chain while also collaborating in their financing by proposing benefits and incentives via terms and payment conditions (Bancilhon, Karge et al. 2018).

In term of trade credit usage, several papers have focused on the SME section (see e.g. (Matias Gama and Van Auken 2015); (McGuinness and Hogan 2016). McMillan and Woodruff (1999) and Marotta (2005) reveal that small firms with limited financial resources provide trade credit though their empirical evidence relies on rather small samples of survey information. According to, Fabbri and Klapper (2016), big corporations have more bargaining power in relationships with suppliers and customers than smaller companies. The identification's relationship between suppliers and clients present a mechanical size bias, as suppliers have significantly smaller asset sizes than their clients.

Market concentration is a count of the number of firms in a market and their respective shares of total production. It is related to industrial concentration, which refers to the distribution of production within an industry. A market's competitiveness decreases as it becomes more concentrated. A market with a low concentration of participants is not considered competitive since it is not dominated by any large players. As a result, market concentration may play a role in both the trade credit terms that suppliers offer to customers and the terms that customers actually utilize. Previous research has looked at the differences in trade credit between younger and older SMEs. Casey and O'Toole

(2014) discovered that age has a positive effect on trade credit. Age has no effect, according to Andrieu, Staglianò et al. (2018) and Yazdanfar and Öhman (2017). Conversely, Deloof and La Rocca (2015) and Canto-Cuevas, Palacín-Sánchez et al. (2016) find that age has a negative effect. In terms of the relationship between the life cycle of SME firms and the use of trade credit, Canto-Cuevas, Palacín-Sánchez et al. (2019) find a negative relationship between the life cycle of SME firms and the use of trade credit. As a result, younger manufacturing SMEs are more likely to use trade credit. The research focuses on manufacturing SMEs and uses the firm's variable age to define the life cycle. As aforementioned, previous papers appear to have some research gaps that need to be investigated further. As a consequence, my research used Dickinson (2011) to define the company life cycle, which is different from the single measurement of a business's age, and to analyze whether the firm life cycle affects trade credit on both the demand and supply sides. Furthermore, during normal and recessionary situations, trade credit strategies for different stages of businesses may change. This is an intriguing topic for additional investigation to see if the firm life cycle has an impact on trade credit during a recession. Furthermore, previous research hasn't looked into market concentrations or the life cycle of trade credit. According to Dias, Novaes et al. (2022), increasing market concentration reduces inherent risk and, as a result, lowers the implied cost of capital.

The purpose of this paper is to investigate the impact of firm life cycle to trade credit during Thailand during normal and recession periods, as well as examine the relationship between trade credit and market concentration during recession period. Our empirical analysis is based on a sample of Thai listed firms from 2001 to 2020.

1.2)   Objectives:
-    To examine the impact of firms' life cycle on trade credit
-    To examine the impact of firms' life cycle on trade credit during Thailand recession period.
-    To compare the behavior of trade credit between normal and recession periods.
-    To examine the impact of high market concentration on trade credit during recession period.

2. Literature review

The conventional explanation is that trade credit serves a non-financial function. Trade credit lowers transaction costs (Ferris 1981), permits price discrimination between customers with varying creditworthiness (Brennan, Maksimovics et al. 1988), and even provides a quality guarantee when customers are unable to observe product characteristics (Long, Malitz et al. 1993). Recently, financial theories claim that suppliers have a lending benefit over financial institutions due to superior information (Biais and Gollier 1997), lower borrower's opportunism (Burkart and Ellingsen 2004), or a liquidation advantage (Fabbri and Menichini 2010). Trade credit is widely used all around the world. In the study of 34 nations, Levine, Lin et al. (2018) discovered on the average portion of trade credit contribute to 25% of the total liabilities. Several research, including Schwartz (1974), Biais and Gollier (1997), and Burkart and Ellingsen (2004), have found that when businesses are facing to acquire bank credit during recession periods, they receive greater trade credit as matching with Petersen and Rajan (1997) who discovered that they will increase trade credit when businesses experience negative cash flows and sales losses. Ferris (1981) reveals that firms will reduce their inventory and finished goods unbalance by trying to adjust the maturity of account payables and receivables. While firms are having a high level of inventories, raw material or finished goods, they will buy less and wait for the lower in finished goods. According to Choi and Kim (2005), tightening monetary policy raises both accounts payable and receivable. A reduction in the money supply during periods of strong economic growth, where trade credit can assist firms in absorbing the effect of credit contraction. Wilner (2000) finds that in order to sustain a long-term commercial relationship, suppliers' trade credit are inclined to support customers during times of financial distress.

During a recession period, trade credit, which has the potential to act as alternative finance offered by raw material of suppliers, should become a more essential source of financing, and its usage should rise because suppliers might know their customer's information and regulation than financial institutions (Love and Zaidi 2010). Coulibaly, Sapriza et al. (2013) find that during economic downturns, trade credit will be

used more than bank loan as well as Policymakers will be able to explore the development of trade credit, which may not be interesting in a normal situation but could be advantageous during times of recession when credit markets constrict.

The product market interaction of rival firms is referred to as product market competition. The concentration ratio of a market, known as the Herfindahl-Hirschman Index (HHI), is the most commonly used indicator of product market competition (Kim and Joo 2013). HHI is a method for assessing firm competition in the product market. According to Giroud and Mueller (2010), HHI is calculated as the sum squared of the industry's 50 largest company market shares. If an industry has fewer than 50 companies, the HHI is calculated using all of the companies in that industry.

There is a relationship between the trade credit and the potential for a company to develop through various stages of the firm life cycle. Dickinson (2011) stated the method to measure the stages of firms as our primary independent variable by using the different of cash flow characteristic. In the firm life cycle research, many indicators are expected to be the characteristic of the different stages such as firm age, growth and size which follow the linear or sequential patterns. Some papers such as Lester, Parnell et al. (2003), Miller and Friesen (1984) pointed out that the firm life cycle does not follow the logical patterns which are possible reason come from the theory of strategic choice, describing the role of leading groups play in influencing an organization through decision-making in a dynamic political process. However, most empirical studies measure the firm life cycle by applying firm age, growth, and size.

Dickinson (2011) proposes a cyclical measure of a firm's life cycle stage based on cash flow patterns, the cash flow patterns-based model has two key benefits over original life cycle models. Firstly, it totally represents company's financial information rather than using a single indicator of firm's characteristics such as firm age, sales, growth, size, and strategies. Secondly, cash flow patterns are cyclical in nature and reflects the current state of the business cycle. As a result, cash flow patterns are a better proxy for the stages of the corporate life cycle. The most successful firm might never experience a downturn or reset to the introduction. However, if the company has stable

flow of new products or innovation, company's business cycle is between growth and maturity. The cyclical measurement is divided into five stages as Introduction growth, matures, decline and shake-out.

To conclude, we contribute to the existing literature in both ways. Firstly, we determine the factor of trade credit by exploring the relation of different firm life cycle stages during both normal and recession periods. Secondly, we broaden the scope to examine the impact of market concentration on trade credit during recession period.

3. Theory and Hypotheses

The study of the relationship between the financial resources and the life cycle is that there is a certain degree of consensus with respect to firm's life cycle. Consequently, their financial needs and the availability of financial resources also change.

Hypotheses development

H1a: Firms in the introduction stage have fewer AR days than mature stage.

H1b: Firms in the growth stage have fewer AR days than the mature stage.

H1c: Firms in the introduction stage have more AP days than the mature stage.

H1d: Firms in the growth stage have more AP days than the mature stage.

Firm life cycle theory suggests that during different firm life cycle stages every firm has different resources and capabilities. In the introduction and growth stages find the large opportunities in the market. They need to invest in the high growth project as new product innovation, a capacity increasing to compete with their competitors. Therefore, they have faced a scarcity of resources as financial constraints. In order to prevent illiquidity or working capital problem, they require more AP days, borrowing more, and supply less AR days, which they can maintain the minimum working capital. than mature firms that they firms are usually large and face lower working capital risk, mainly due to diversification and a large consumer base.
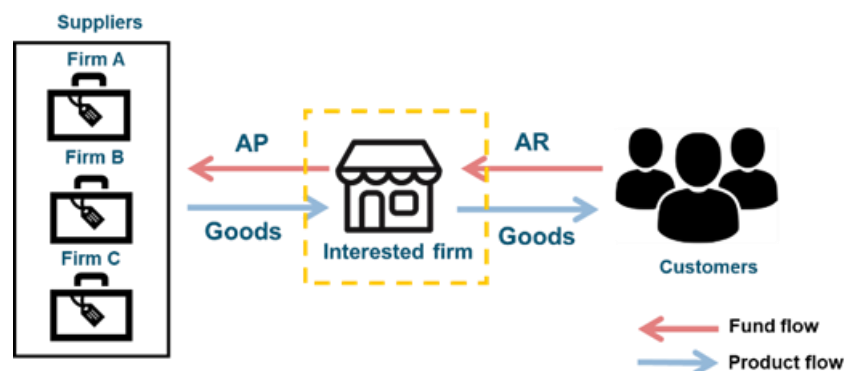
Figure 1: Focused scope

H2a: Firms in the introduction stage have a significantly positive impact on AP days during Thailand recession period.

H2b: Firms in the growth stage have a significantly positive impact on AP days during Thailand recession period.

H2c: Firms in the mature stage have no impact on AP days during Thailand recession period.

When introduction or growth firms face the uncertainty of economic as the recession period, they might suffer from lack of liquidity because it is difficult to obtain external capital. Therefore, to maintain the minimum level of liquidity, introduction or growth firms require more AP days from their suppliers.

In the product market, introduction or growth firms have received credit from their suppliers as introduction, growth, mature and declining firms. However, most partnerships of introduction and growth firms are mature firms due to the large customer base, which mature firms have more strong financial position than introduction and growth firms because of their diversification. As the result, during recession period mature firms can offer more credit terms to introduction or growth firms to keep their relationship with them.

H3a: Firms in the introduction, growth, or mature stage, which have high market concentration, are a significantly negative impact on AR days during Thailand recession period.

H3b: Firms in introduction, growth, or mature stage, which have high market concentration, are a significantly positive impact on AP days during Thailand recession period.

Market concentration is the degree of competition in the product market. When companies have high market concentration, which the product market is not much competition, a few firms supply the same products. Companies are in a strong position to enforce shorter AR days from their partners. On the other hand. Suppliers of high market

concentration firms know that even during the RCI period product still be needed, therefore, they would allow more AP to high market concentration firms.

4. Data

4.1) Data and sample

My sample is from Thai listed firms on the Stock Exchange of Thailand (SET), 253 firms, excluding Banks and Financial services, Real estate investment trusts, during January 2000 to December 2020 and use period 2007 – 2009 for Thailand recession period, which GDP was negative and downward sloping. Data regarding financial statement is collected from DATASTREAM which all listed companies are required to provide every year. Furthermore, examples for firms in each stage, as well as the number of enterprises in each stage every year, are provided in Appendix 1 - 7.
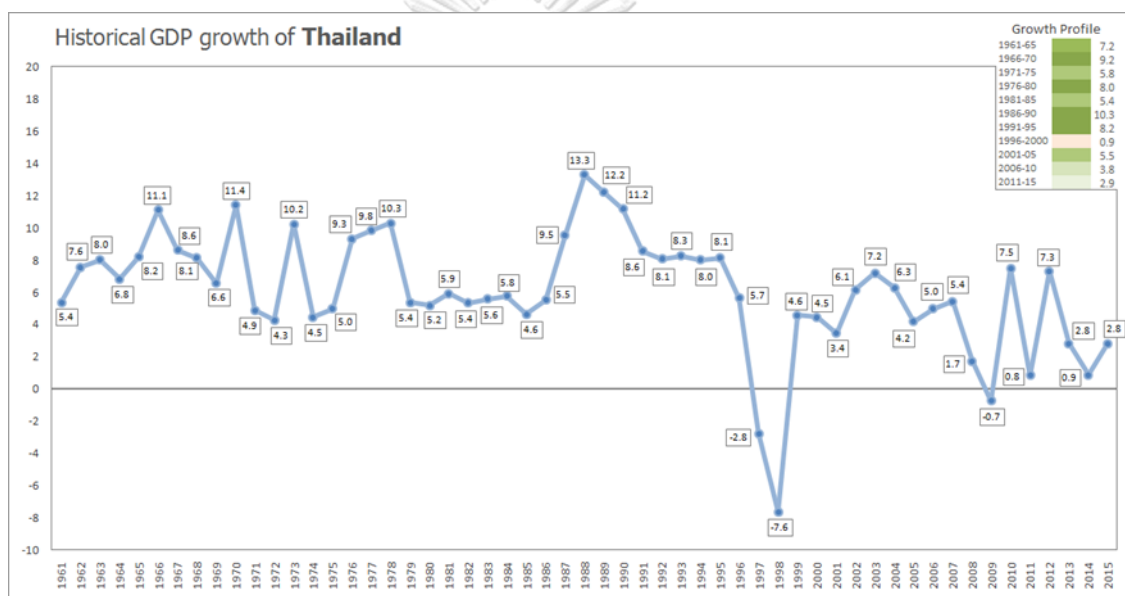
Figure 2: Historical Thailand's GDP

4.2) Dependent variable: Trade credit

Trade credit is defined as an agreement between company and company that can purchase products without payment in advance, which could pay to the supplier at a later scheduled date. In this paper, we focus on 2 dimensions which are the company's supply side as AR, the payment that the company will obtain from customers, and demand side as AP, the payment that company will have to pay to suppliers. AR measure as AR days per year the ratio of average AR at the beginning and ending of the year to total revenue and multiply by 365 days. AP days per year is the ratio of average AP at the beginning and ending of the year to Cost of Goods Sold and multiply by 365 days.

4.3) Independent variable:

4.3.1) Firm life cycle stages

This study uses Dickinson (2011) method for measuring the firm's life cycle in each year, namely the introduction, growth, maturity, decline stages and shake-out which are based on the operating (CFO), investing (CFI), and financing (CFF) cash flow in each year. Cash flow can reflect the difference in the profitability, risk and growth of the company. Moreover, this classification of the life cycle phase combines the meaning of various research areas of economic research ((Tan and Ma 2016); (Wernerfelt 1984)).

The methodology set up on the subsequent cash flow pattern following Table 1. Where CFO, CFI and CFF represent Operating Cash Flow, Investment Cash Flow and Financing Cash Flow respectively.

Table 1: The methodology constructed on the cash flow pattern

	CFO	CFI	CFF
1. Introduction	<0	<0	>0
2. Growth	>0	<0	>0
3. Mature	>0	<0	<0
4. Decline	<0	>0	<0 or >0
5. Shake-out		Remaining firms	

4.3.2) Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI) is calculated using formula ((Ginevičius and Čirba 2007); (Ginevičius and Krivka 2009); (Ginevičius, Petraškevičius et al. 2010)):

$$\text{HHI} = \sum_{i=1}^{N} d_i^2$$

Where d_i is the market share of the company i. N are the total numbers of companies in the market. The HHI values range from 0 (perfect competition, in which all companies' market shares are close to 0) to 1 (pure monopoly). According to the US Department of Justice's antitrust regulations, when HHI ≤ 0.100, a market is considered competitive.

When 0.100 ≤ HHI ≤ 0.250, a market is moderately concentrated. When HHI ≥ 0.250, a market is highly concentrated ((Deltuvaitė and Vaškelaitis 2015); (Hays, DeLurgio et al. 2009)). The HHI is a cumulative concentration indicator that uses company market shares as weights, resulting in the sum of the squared attribute values, implying that larger companies gain a larger proportion of the HHI's value.

4.4) Control variables

We consider firm size (Size), Investment opportunity (TOBINQ), leverage (LEV), dividend Payout ratio (PAYOUT), Debt capacity (DC), Return on Assets (ROA), Book to Market (BTM), Herfindahl-Hirschman index (HHI), Operating Cash Flow (OCF) and Sale Growth Rate (SGR) and Cash (CASH) as shown in Table 2.

Table 2: Variable description

Control variables	Description	Unit
Firm Size	The natural logarithm of the total asset	MTHB
TOBINQ	Total market value divided by the net asset	%
Leverage	The ratio of total debt to total asset	%
Debt capacity	The ratio of fixed assets to total assets	%
Payout ratio	The ratio of dividend per share to earning per share	%
Return On Asset	The ratio of net income to total asset	%
Book to Market	The ratio of common shareholders' equity to market capital	%
Herfincahl-Hirschman index	Market concentration of industry by ranging from 0 - 1, meaning if 1 is only one company operating in the industry	-
Sale Growth Rate	Sales in year t minus sales in year t-1, scaled by sales in year t-1	%
Cash holding	The ratio of cash holding to total assets	%

4.5) Empirical model

There are 3 different sets of regression models. Firstly, we will examine the impact of firms' life cycle on trade credit, demand and supply side, by using data from a normal period. Second, we will further expand scope to examine the impact of firms' life cycle on trade credit during recession period by using pooled data of both normal and recession periods. Lastly, we will examine the impact of market concentration on trade credit during recession period. According to empirical testing, we proceed to multivariate analyses and employ fixed effect model.

4.5.1) The impact of firms' life cycle on trade credit.

The objective is to investigate whether introduction or mature firms have less AR or more AP days than mature firms. We apply the regression model from Esqueda and O'Connor (2020).

$$AR_{i,t} = \beta_1(Introduction_{i,t}) + \beta_2(Growth_{i,t}) + \beta_3(Mature_{i,t}) + \beta_4(Controls) + Year\ dummies_t + \alpha_i + \mu_{i,t} \quad \text{--- (1)}$$

$$AP_{i,t} = \beta_5(Introduction_{i,t}) + \beta_6(Growth_{i,t}) + \beta_7(Mature_{i,t}) + \beta_8(Controls) + Year\ dummies_t + \alpha_i + \mu_{i,t} \quad \text{--- (2)}$$

Regarding to equations (1) and (2), AR is the account receivable company i at time t and AP is the account payable company i at time t. Introduction, Growth and Mature are the stages of the life cycle. Year dummies are added by equal to 1 for a particular year and 0 otherwise. α_i represents the firm fixed effects to capture any other time-invariant firm characteristic and $\mu_{i,t}$ represents error term of company i at time t.

To examine the H1a, the hypothesis can be written as

$$H_{0,1}: \beta_1 - \beta_3 = 0$$

$$H_{1,1}: \beta_1 - \beta_3 < 0$$

If Reject $H_{0,1}$ interprets the introduction stage has fewer AR days than the mature stage.

To examine the H1b, the hypothesis can be written as

$$H_{0,2}: \beta_2 - \beta_3 = 0$$

$$H_{1,2}: \beta_2 - \beta_3 < 0$$

If Reject $H_{0,2}$ interprets the growth stage has fewer AR days than mature stage

To examine the H1c, the hypothesis can be written as

$$H_{0,3}: \beta_5 - \beta_7 = 0$$

$$H_{1,3}: \beta_5 - \beta_7 > 0$$

If Reject $H_{0,3}$ interprets the introduction stage has more AP days than the mature stage.

To examine the H1d, the hypothesis can be written as

$$H_{0,4}: \beta_6 - \beta_7 = 0$$

$$H_{1,4}: \beta_6 - \beta_7 > 0$$

If Reject $H_{0,4}$ interprets the growth stage has more AP days than the mature stage.

4.5.2) The impact of firms' life cycle on trade credit during Thailand recession period.

The objective is to inspect whether introduction, growth and mature firms have positive or negative impacts on AP days during Thailand recession period.

$$AP_{i,t} = \beta_1(Introduction_{i,t}) + \beta_2(Introduction_{i,t})*RCI_t + \beta_3(Growth_{i,t}) + \beta_4(Growth_{i,t})*RCI_t + \beta_5(Mature_{i,t}) + \beta_6(Mature_{i,t})*RCI_t + \beta_7(Controls) + \alpha_i + \mu_{i,t} \qquad \text{--- (3)}$$

According to equation (3), RCI_t is a dummy variable for recession period at time t.

To examine the H2a, The hypothesis can be written as

$$H_{0,1}: \beta_2 = 0$$

$$H_{1,1}: \beta_2 > 0$$

If Reject $H_{0,1}$ interprets the introduction stage has significant positive impact on AP days during Thailand recession period.

To examine the H2b, the hypothesis can be written as

$$H_{0,2}: \beta_4 = 0$$

$$H_{1,2}: \beta_4 > 0$$

If Reject $H_{0,2}$ interprets the growth stage has significant positive impact on AP days during Thailand recession period.

To examine the H2c, the hypothesis can be written as

$$H_{0,3}: \beta_6 = 0$$

$$H_{1,3}: \beta_6 \neq 0$$

If Reject $H_{0,3}$ interprets the mature stage has no impact on AP days during Thailand recession period.

4.5.3) The impact of market concentration on trade credit during recession period.

The objective is to investigate whether introduction or growth or mature firms, which have high market concentration, are a significantly negative impact on AR days or a positive impact on AP days during recession period.

$$AR_{i,t} = \beta_1(Introduction_{i,t})^*HHI_{j,t} + \beta_2(Introduction_{i,t})^*RCI_t^*HHI_{j,t} + \beta_3(Growth_{i,t})^* HHI_{j,t} + \beta_4(Growth_{i,t})^*RCI_t^* HHI_{j,t} + \beta_5(Mature_{i,t})^* HHI_{j,t} + \beta_6(Mature_{i,t})^*RCI_t^* HHI_{j,t} + \beta_7(Controls) + Year\ dummies_t + \alpha_i + \mu_{i,t}$$
--- (4)

$$AP_{i,t} = \beta_8(Introduction_{i,t})^* HHI_{j,t} + \beta_9(Introduction_{i,t})^*RCI_t^* HHI_{j,t} + \beta_{10}(Growth_{i,t})^* HHI_{j,t} + \beta_{11}(Growth_{i,t})^*RCI_t^* HHI_{j,t} + \beta_{12}(Mature_{i,t})^* HHI_{j,t} + \beta_{13}(Mature_{i,t})^*RCI_t^* HHI_{j,t} + \beta_{14}(Controls) + Year\ dummies_t + \alpha_i + \mu_{i,t}$$
--- (5)

According to equations (4) and (5), $HHI_{j,t}$ measures market concentration at industrial j time t.

To examine the H3a, the hypothesis can be written as

$$H_{0,1}: \beta_2 \text{ and } \beta_4 \text{ and } \beta_6 = 0$$

$$H_{1,1}: \beta_2 \text{ or } \beta_4 \text{ or } \beta_6 < 0$$

If Reject $H_{0,1}$ interprets introduction or growth or mature firms have negative impact on AR days during recession period.

To examine the H3b, the hypothesis can be written as

$$H_{0,2}: \beta_8 \text{ and } \beta_{11} \text{ and } \beta_{13} = 0$$

$$H_{1,2}: \beta_8 \text{ or } \beta_{11} \text{ or } \beta_{13} > 0$$

If Reject $H_{0,2}$ interprets introduction or growth or mature firms have positive impact on AP days during recession period.

5. Empirical results

5.1) Descriptive statistic results

The statistic for the listed firms in Thailand excluding Banks and Financial services, Real estate investment trusts is 253 companies with an observation of 5,313 points from 2000 to 2020. The descriptive statistics of all variables before filtering outliers are reported in Table 1. The results show that average AP and AR days are 348.97 and 155.18 days respectively. The maximum value of AP and AR days is 486,855 and 106,690 days, significantly higher than 1 year which hardly believes that operating firms can allow very long AR and AP days so we decide to delete AP and AR days outliers. Tobin q (%), leverage (%), debt capacity (%), payout ratio (%), ROA (%), BTM (%), Sale growth (%), and Cash holding (%) are also considered to eliminate the outliers' values. For example, maximum Tobin q 79,094.04 % and minimum -3,370.32 % are filtered out from the data as well as maximum sale growth 24,464 % is eliminated due to hardly appearing in the general business.

After removing the outlier, the descriptive statistics in Table 4 show that over a 20-year period, the average AP days and AR days are 49.88 days and 63.63 days, respectively, indicating that generally listed firms will have no balance account, the duration of AR and AP days are not equal, and firms are required to pay the invoice within 49.88 days while waiting for customers' payment for 53.63 days. In terms of company performance, the average of sales growth, Tobin Q, and ROA are 11.10%, 1.33, and 7.21%, respectively. In terms of debt capacity, the leverage ratio is 29.9% and the debt capacity is 55.8% under normal business circumstances. Furthermore, all variables are evaluated for normal distribution and P-value 0.05 is reported; as a result, all parameters are normal distribution.

The majority of Thailand's listed companies from 2001 to 2020 are in Table 5, one of five stages: shake-out (77.50%), decline (12.37%), mature (6.48%), introduction (3.30%), or growth (0.35%). There are very few growing enterprises in Thailand during the recessionary years of 2007 to 2009, which may make it difficult to analyze the effects of trade credit driven by these firms.

Table 3: Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	5,313	2010	6.056	2000	2020
Company ID	5,313	127	73.041	1	253
AP days	3,627	348.971	9798.527	0.000	486855.000
AR days	3,542	155.187	2489.668	0.000	106590.000
Firm size	3,728	21.888	1.607	16.757	27.355
RCI	5,313	0.143	0.350	0.000	1.000
Tobinq	3,729	202.987	2631.058	-3370.320	79074.040
Leverage	3,728	25.839	27.141	0.000	730.420
Debt capacity	3,728	55.789	22.382	-27.240	100.000
Dividend payout ratio	3,054	37.576	30.685	0.000	907501.000
ROA	3,557	0.072	0.092	-142.470	995.950
BTM	3,021	0.903	1.310	-33.330	33.330
HHI	5,255	0.656	0.475	0.000	1.000
Sale growth rate	3,466	0.111	0.475	-100.000	24464.000
Cash holding	3,724	0.260	0.227	0.000	97.960
Introduction	5,313	0.023	0.149	0	1
Growth	5,313	0.002	0.049	0	1
Shakeout	5,313	0.535	0.499	0	1
Mature	5,313	0.045	0.207	0	1
Decline	5,313	0.085	0.280	0	1

Table 4: Descriptive statistics of variables after filtrate outliers

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	5,313	2010	6.056	2000	2020
Company ID	5,313	127	73.041	1	253
AP days	3,578	49.876	41.654	0	359
AR days	3,493	63.63	48.686	0	365
Firm size	3,728	21.888	1.607	16.757	27.355
RCI	5,313	0.143	0.35	0	1
Tobinq	3,031	1.332	1.31	-1.21	16.79
Leverage	3,124	0.299	0.202	0.01	1.49
Debt capacity	3,726	0.558	0.223	0.01	1
Dividend payout ratio	3,050	37.576	30.685	0	100
ROA	3,550	0.072	0.092	-0.85	0.987
BTM	3,014	0.903	1.31	-16.67	16.67
HHI	5,255	0.656	0.475	0	1
Sale growth rate	3,360	0.111	0.475	-1	8.33
Cash holding	3,724	0.26	0.227	0	0.98
Introduction	5,313	0.023	0.149	0	1
Growth	5,313	0.002	0.049	0	1
Shakeout	5,313	0.535	0.499	0	1
Mature	5,313	0.045	0.207	0	1
Decline	5,313	0.085	0.28	0	1

Table 5: Number of firms 'observation during normal and recession period

Stages of firm	Normal period	Recession period	Total	Portion (%)
Introduction	112	9	121	3.30
Growth	11	2	13	0.35
Shake-out	2,501	344	2,845	77.50
Mature	217	21	238	6.48
Decline	401	53	454	12.37
Total	3,242	429	3,671	100.00

Table 6 and 7 display Spearman and Pearson correlation for all variables in order to examine whether AR and AP days have any correlation with firm cycle stages as proxies as well as control variables or not. The results reveal that AR and AP days are significantly positive with most of the firm's stages except the shake-out stage. Moreover, there is no correlation coefficient among all variables that show more than 0.7, therefore, there is no multicollinearity problem. As a result, we can construct and measure the model for this study.

Test heteroscedasticity

We use The Breusch-Pagan test to determine whether there is heteroscedasticity problem in the model or not. The result report Probability > Chi2 equal to 0.000 so it implies that the models faced the heteroscedasticity problem. Therefore, the robust standard error is applied to all models in this paper.

<u>Table 6: Spearman correlation</u>

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ardays	1						
(2) apdays	0.394	1					
(3) introduction	0.097	0.046	1				
(4) growth	0.034	0.013	-0.01	1			
(5) shakeout	-0.137	-0.048	-0.332	-0.107	1		
(6) mature	0.042	0.015	-0.046	-0.015	-0.495	1	
(7) decline	0.083	0.009	-0.063	-0.02	-0.676	-0.094	1

Spearman rho = -0.094

Table 7: Pearson correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) apdays	1												
(2) ardays	0.268***	1											
(3) firmsize	0.017	0.065***	1										
(4) rci	-0.031*	-0.038**	-0.038**	1									
(5) tobinq	-0.038**	-0.118***	0.084***	-0.121***	1								
(6) leverage	-0.094***	0.005	0.237***	-0.012	-0.045**	1							
(7) debtcapacity	-0.031*	-0.176***	0.294***	-0.024	0.046**	0.282***	1						
(8) divpayoutratio	-0.194***	-0.194***	0.132***	-0.013	0.208***	-0.248***	-0.089***	1					
(9) roa	-0.192***	-0.203***	0.047***	-0.018	0.149***	-0.113***	-0.077***	0.365***	1				
(10) btm	-0.081***	0.014	-0.084***	0.070***	-0.299***	-0.156***	-0.011	-0.082***	-0.029	1			
(11) salegrowthrate	-0.077***	-0.026	0.035***	-0.039**	-0.028	0.040***	0.034*	-0.036*	0.121***	-0.007	1		
(12) cashholding	-0.007	-0.101***	0.120***	-0.077***	0.217***	-0.167***	0.090***	0.179***	0.147***	-0.042**	-0.019	1	
(13) d_hhi	0.018	0.088***	0.030*	-0.029**	-0.106***	-0.017	-0.185***	-0.064***	-0.045***	0.001	-0.028*	-0.148***	1

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

5.2) Empirical findings

5.2.1) Analysis of the impact of firms' life cycle on trade credit.

In order to analyze the relationship between firms' life cycle and trade credit following the first hypothesis (H1). We use the fixed effect model with robust standard error to see whether firms in the introduction and growth stage have AR days but higher AP days than the mature stage or not. Also, to ensure that the fixed effect model fits this study, the Hausman test is performed which showed P value at 0.000, meaning that the fixed effect model can be applied.

The results in Table 8 show all firm life cycles have significantly positive effects on AR days at the significant level 1%. The coefficient of the introduction stage is likely to be higher than growth, shakeout, maturity, and decline which reflects that when introduction firms do business, they are likely to give higher AR to customers. However, the coefficient of growth, shakeout, maturity, and decline is not much different. Regarding H1a and H1b, P-value from hypothesis testing are 0.0608 and 0.71602 respectively, one -side hypothesis test, given P-Value 1 - (0.0608/2) = 0.9696 and (1 – 0.7160/2) = 0.8568, we cannot reject the null hypothesis H1a and H1b at the significant level 10%, meaning that firms in the introduction and growth stage don't have fewer AR days than the mature stage at the confident interval 90%.

On the other hand, the stage of firms except growth has a significantly positive impact on AP days at P-value below 0.1. which the coefficient of AP days in the introduction stage is the highest as similar to AR days, the coefficient of growth, shakeout, maturity and decline are not much different. According to one -side hypothesis test for H1c and H1d, it finds that P-value are 0.6181/2 = 0.3091 and 0.9811/2 = 0.4906 respectively. According to H1c and H1d, we cannot reject the null hypothesis, firms in the introduction and growth stages don't have more AP days than the mature stage. Our finding is aligned with Hasan, Cheung et al. (2021) that the trade credit significantly varies across the life cycle. However, there is no clear evidence that AR day's introduction and growth stages are lower than mature stage or AP day's introduction and growth stages are higher than mature stage. It could be that in order to create the significant difference,

introduction and growth stage might use more direct and indirect cost which is higher than loaning.

Regarding to control variable in Table 8, Leverage is significantly negative for AP days at significant level 10% that may imply when firm have high leverage, high risk factors, they will might force to lower AP days from suppliers. Debt capacity is negatively related with AR days at significant level 1% which imply firms, high debt capacity, will have low AR days. The impact of ROA and sale growth rate are negatively impacted with both AR and AP days at significant level 5% and 11%, respectively which also aligned with Chalil and Siregar (2021) mentioned that the cost required by the company to receive more AP days is significant than benefit obtained so when companied has poor profitability performance record, suppliers can mark up the prices of the products because they might foresee the delay in payment.

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Table 8: The regression result of AR and AP days with the firm life cycle

VARIABLES	(1) ardays	(2) apdays
introduction	50.87***	19.73**
	(9.94)	(8.27)
growth	38.79***	15.97
	(8.43)	(10.89)
shakeout	37.27***	13.29**
	(7.34)	(6.74)
mature	37.23***	15.77**
	(7.53)	(7.46)
decline	35.57***	13.34**
	(5.99)	(6.42)
firmsize	11.09***	4.589
	(3.01)	(3.16)
tobinq	-2.007*	-3.638***
	(1.09)	(0.96)
leverage	-15.61	-22.40*
	(12.11)	(12.50)
debtcapacity	-56.36***	29.4
	(15.66)	(19.23)
divpayoutratio	-0.0664*	-0.0745
	(0.04)	(0.05)
roa	-61.70***	-29.69**
	(17.74)	(14.12)
btm	-0.45	-0.718
	(0.68)	(0.61)
d_hhi	-7.461*	-6.641**
	(4.07)	(3.26)
salegrowthrate	-15.53***	-9.704***
	(4.31)	(2.44)
cashholding	-35.92***	-3.493
	(12.30)	(13.97)
Constant	-157.8**	-58.66
	(61.11)	(62.33)
Observations	2,052	2,057
R-squared	0.122	0.085
Number of companyid	220	220

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.2.2) Analysis of the impact of firms' life cycle on trade credit during recession period.

As following Table 10, the regression results display that during the recession period firms in the shakeout stage are statically negatively correlated at the significant level 1% to both AR and AP days as well as Decline stage is negatively related to AR days at the significant level 5%. For all stages' AR and AP days in recession, the period is likely to be lower than the normal period. Consistent with Horng, Chou et al. (2014), the recession period overall negatively impacted trade credit, AR and AP. The reasoning behind this was supply-side faced a shortage of financial access to bank loans so they compel the firms to decrease the supply of trade credit to customers and buyers become less willing to take more trade credit. Base on table 9, implies that introduction firms try to balance trade credit for the demand and supply- side but the mature firms seem to keep their AP days and reduce AR days instead

Table 9: The comparison of AR and AP's coefficient during normal and recession period

	AR days	AP days	AP - AR days	Meaning
Introduction	49.54	22.17	(27.37)	Deficit
Growth	37.55	14.76	(22.79)	Deficit
Shake-out	37.22	13.76	(23.46)	Deficit
Mature	36.29	14.11	(22.18)	Deficit
Decline	37.13	13.38	(23.75)	Deficit
Introduction*RCI	3.32	-24.14	(27.46)	Deficit
Growth*RCI		No data		
Shake-out*RCI	-6.48	-5.98	0.50	Surplus
Mature*RCI	-1.03	13.16	14.19	Surplus
Decline*RCI	-18.79	-2.1	16.69	Surplus

According to Table 10 with H2, we fail to reject H2a and H2c which means that AP days of firms in the introduction and mature stage don't have a positively and no impact during Thailand recession period at the significant level 1%, 5% and 10%. It is able to see from the table that the AP days coefficients are -24.15 and 13.17 which are not statistically

significant at 1%, 5%, and 10%. Our findings are insignificant in comparison to the expected hypothesis, which could be during the recession period, all firms encounter the same situation, which is difficult to gain external funding. As the introduction stage has a small sales volume, they would have minor bargaining power, even if they would like to extend AP but the suppliers cannot provide it with opposition to the mature stage. In addition, models (3) and (4) applied the same set of control variables which are included in the previous model.

Table 10: The regression result of AR and AP days with the firm life cycle during recession period

VARIABLES	(3) ardays	(4) apdays
intro	49.54***	22.17***
	(9.43)	(8.39)
growth	37.55***	14.77
	(8.34)	(10.96)
shakeout	37.23***	13.77**
	(7.26)	(6.67)
mature	36.30***	14.12*
	(7.55)	(7.54)
decline	37.13***	13.39**
	(6.08)	(6.32)
Intro*RCI	3.322	-24.15
	(25.00)	(15.57)
Growth*RCI	-	-
Shake*RCI	-6.484***	-5.974***
	(2.12)	(1.73)
Mature*RCI	-1.036	13.17
	(4.53)	(12.17)
Decline*RCI	-18.80**	-2.1
	(8.46)	(5.67)
firmsize	10.45***	4.163
	(2.98)	(3.14)
tobinq	-2.060*	-3.857***
	(1.10)	(0.97)
leverage	-15.16	-23.12*
	(12.04)	(12.40)
debtcapacity	-56.29***	29.67
	(15.71)	(19.05)
divpayoutratio	-0.0646*	-0.0737
	(0.04)	(0.05)
roa	-62.24***	-29.90**
	(18.23)	(14.47)
btm	-0.343	-0.657
	(0.70)	(0.64)
d_hhi	-8.059*	-7.505**
	(4.16)	(3.39)
salegrowthrate	-15.79***	-10.30***
	(4.24)	(2.52)
cashholding	-37.38***	-5.374
	(12.30)	(13.78)
Constant	-142.1**	-47.52
	(60.78)	(62.35)
Observations	2,052	2,057
R-squared	0.133	0.094
Number of companyid	220	220

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.2.3) Analysis of an impact of market concentration on trade credit during recession period.

We have already investigated the impact of firms' life cycle on trade credit during recession period. So, we broaden the study to combine market concentration factor in order to further examine whether the firms' trade credit in high market concentration are impact during recession period.

Based on the result in models (1), (2), (5), and (6) which summarize in Table 11 illustrates the AR and AP days' coefficient include and do not include high market concentration. It seems that net trade credit, AP – AR days, reverses from deficit to surplus that reflects firms with high market concentration, low competition, have strong bargaining power which results in the same direction as Cunat (2007).

<u>Table 11: The comparison of AR and AP's coefficient during normal and high market concentration</u>

	AR days	AP days	AP - AR days	Meaning
Introduction	49.54	22.17	(27.37)	Deficit
Growth	37.55	14.76	(22.79)	Deficit
Shake-out	37.22	13.76	(23.46)	Deficit
Mature	36.29	14.11	(22.18)	Deficit
Decline	37.13	13.38	(23.75)	Deficit
Introduction*HHI	9.538	11.25	1.71	Surplus
Growth*HHI	-11.24	6	17.181	Surplus
Shake-out*HHI	-7.069	-6.293	0.78	Surplus
Mature*HHI	-6.45	-5.449	1.00	Surplus
Decline*HHI	-6.647	-10.24	(3.59)	Deficit

The regression results from Table 12 display that we fail to reject the null Hypothesis (H3a and 3b) which interpret the introduction and mature stage which have high market concentration are insignificantly related to trade credit during a recession period at any significant level of 1%, 5%, and 10%.However, the coefficient sign of AR days' introduction and mature as well as AP days 'introduction and mature seem to be in

the opposite direction which might imply that in recession period, the strong position companies i.e., mature stage have the ability to shorter AR days and extend AP days conversely with the introduction stage even in high market concentration.

Table 12: The regression result of AR and AP days with the firm life cycle for high market concentration

VARIABLES	(5) ardays	(6) apdays
Intoduction*HHI	9.538	11.25*
	(8.28)	(6.38)
Growth*HHI	-11.24*	5.941
	(5.95)	(10.11)
Shakeout*HHI	-7.069*	-6.293*
	(4.06)	(3.22)
Mature*HHI	-6.45	-5.449
	(4.46)	(4.39)
Decline*HHI	-6.647	-10.24**
	(5.90)	(4.70)
Intoduction*HHI*RCI	14.15	-38.21
	(41.50)	(24.60)
Growth*HHI*RCI	-	-
Shakeout*HHI*RCI	-4.082	-4.732**
	(3.28)	(2.22)
Mature*HHI*RCI	-3.184	5.436
	(5.05)	(11.99)
Decline*HHI*RCI	-24.25**	-3.372
	(10.94)	(5.75)
firmsize	10.52***	4.262
	(3.02)	(3.13)
tobinq	-1.775	-3.642***
	-1.14	-0.963
leverage	-15.31	-23.30*
	-11.88	-12.37
debtcapacity	-54.88***	29.21
	(15.37)	(19.44)
divpayoutratio	-0.0614*	-0.0702
	(0.04)	(0.05)
roa	-65.54***	-34.72**
	(18.36)	(14.78)
btm	-0.293	-0.622
	(0.70)	(0.62)
salegrowthrate	-15.59***	-10.33***
	(4.15)	(2.45)
cashholding	-35.67***	-4.566
	(12.06)	(13.99)
Constant	-109.1*	-36.98
	(60.42)	(62.60)
Observations	2,052	2,057
R-squared	0.133	0.101
Number of companyid	220	220

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

This paper examines the impact of the stage of firms listed in the Stock Exchange of Thailand (SET) on trade credit regarding firm risk and firm performance. The study uses firm-level data on about 253 listed firms and performs over 20 years from 2000 to 2020.

The regression results reveal that the firm life cycles have significantly positive effects on AR and AP days, except for AP's growth. However, the Introduction and Growth stages don't have fewer AR days and more AP days than the mature stage. Then we further investigate the effect of the firm's stage on trade credit during the recession period and the result shows that net trade, AP - AR days, from deficit reversed to surplus but AP days' introduction and mature stage have no positive impact.

Finally, we investigate the impact of market concentration on trade credit throughout the economic downturn. We find that net trade credit, AP - AR days, appears to turn from deficit to surplus, indicating significant bargaining power. However, the introduction and mature stage of AR and AP days, which have a high level of market concentration, are insignificantly negative and positive related to trade credit during a recession period, respectively.

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7. Appendix:

Appendix 1: Example of firms in each stages

| Company name	Introduction	Growth	Shake-out	Maturity	Decline
1	SPVI PCL	CK POWER PCL	TTCL PCL	LOXLEY PCL	THONBURI MEDICAL
2	T ENGINEERING CORP	CAPITAL ENGINEERING	COM7 PCL	SINO THAI ENG	JAY MART
3	NEP REALTY	MBK PCL	WP ENERGY PCL	MALEE GROUP PCL	AJ ADVANCE TEC

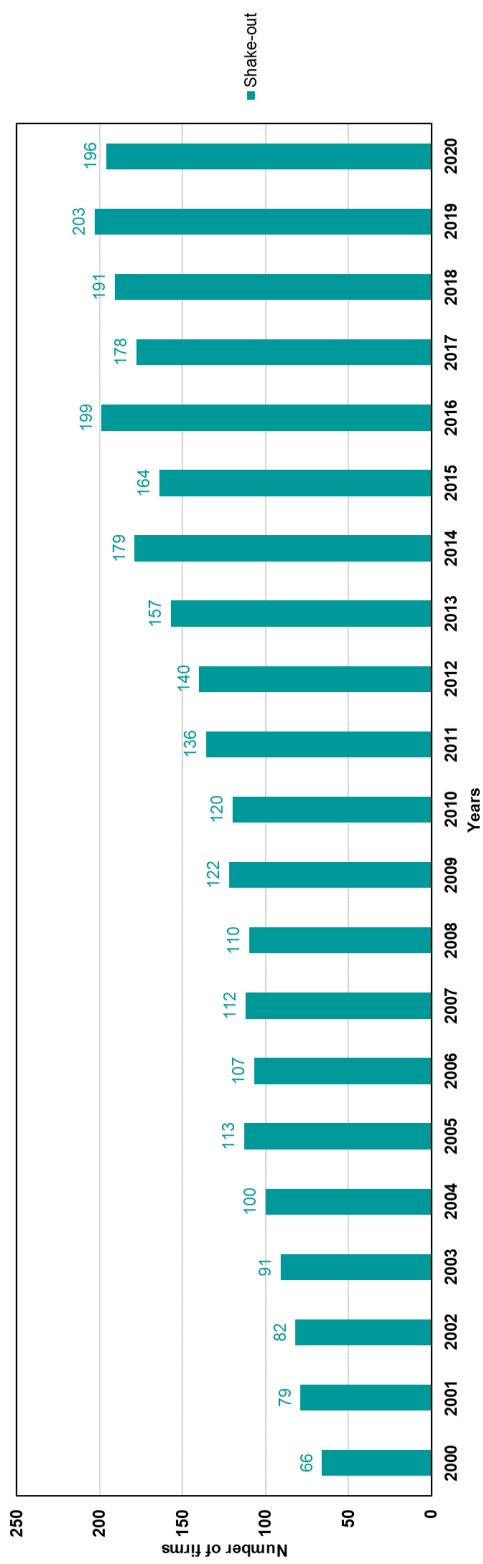Appendix 2: Number of firms' stage during 2000 – 2020
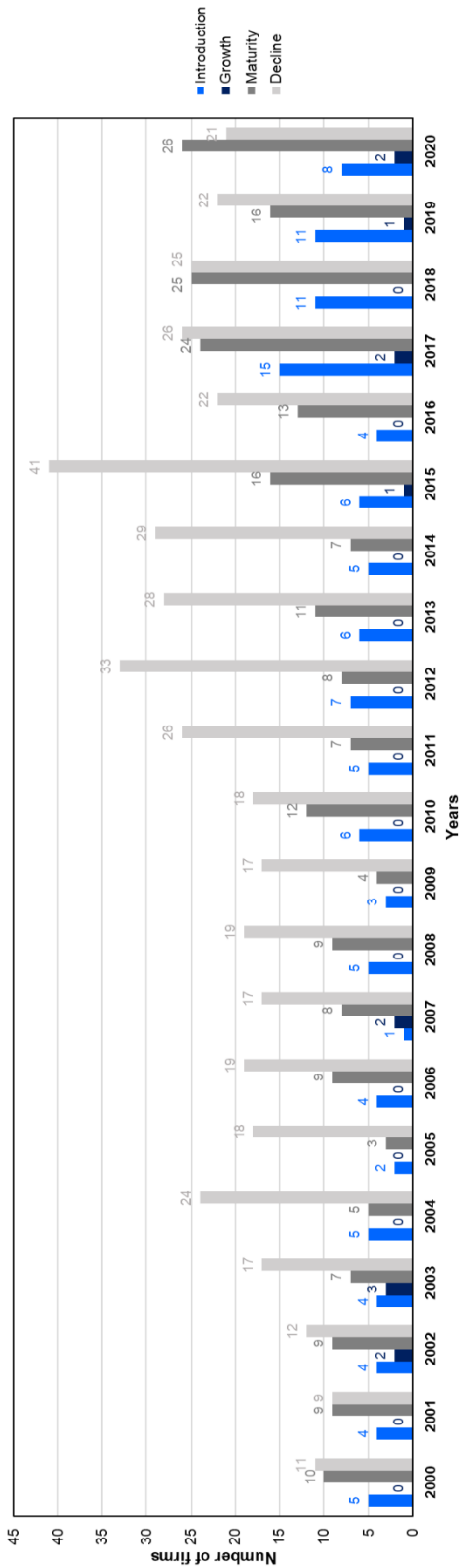
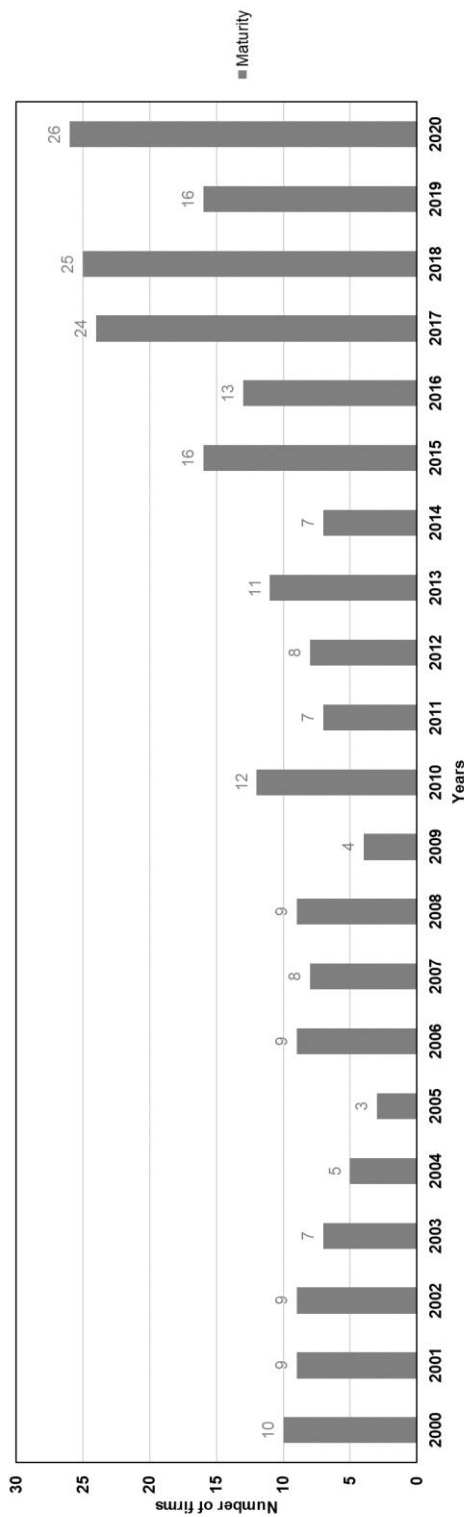Appendix 3: Number of introduction firms during 2000 – 2020
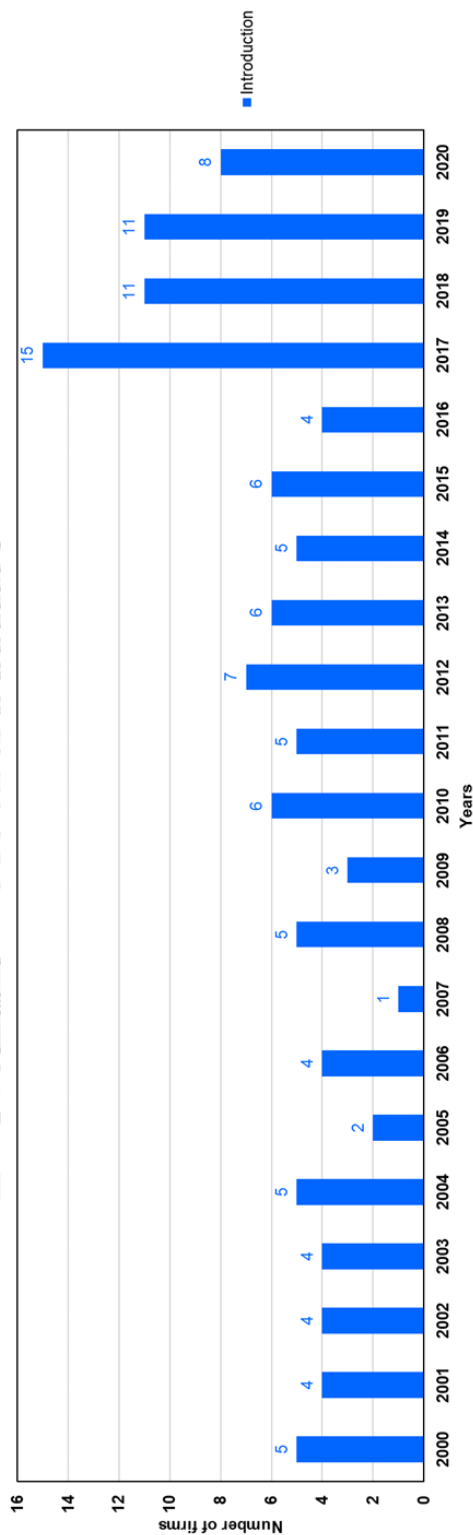
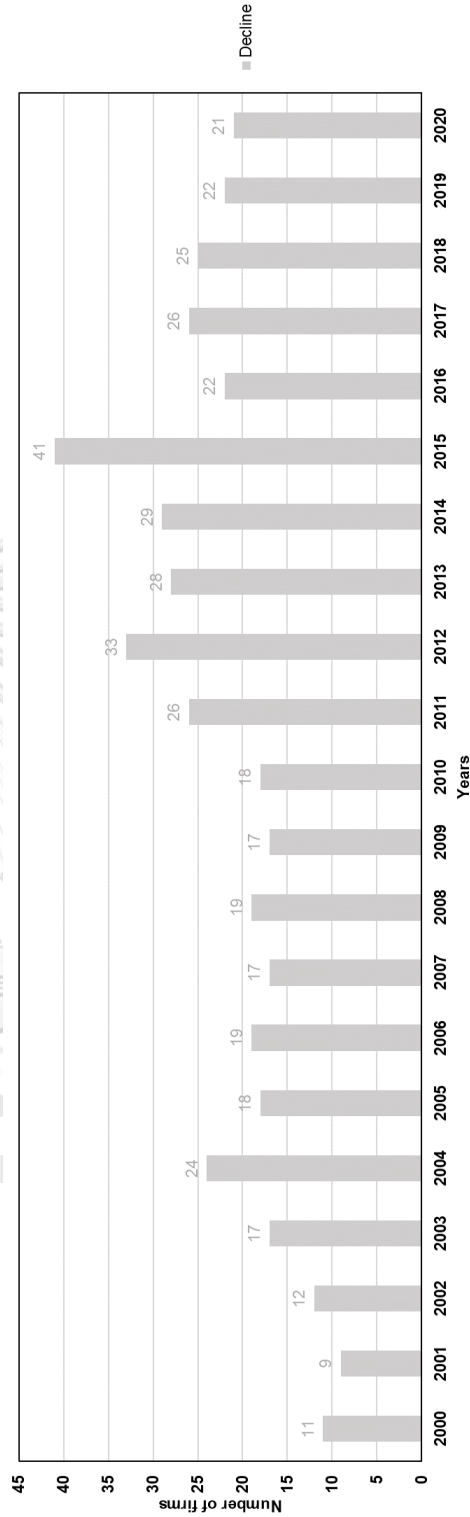Appendix 4: Numbers of growth firms during 2000 – 2020
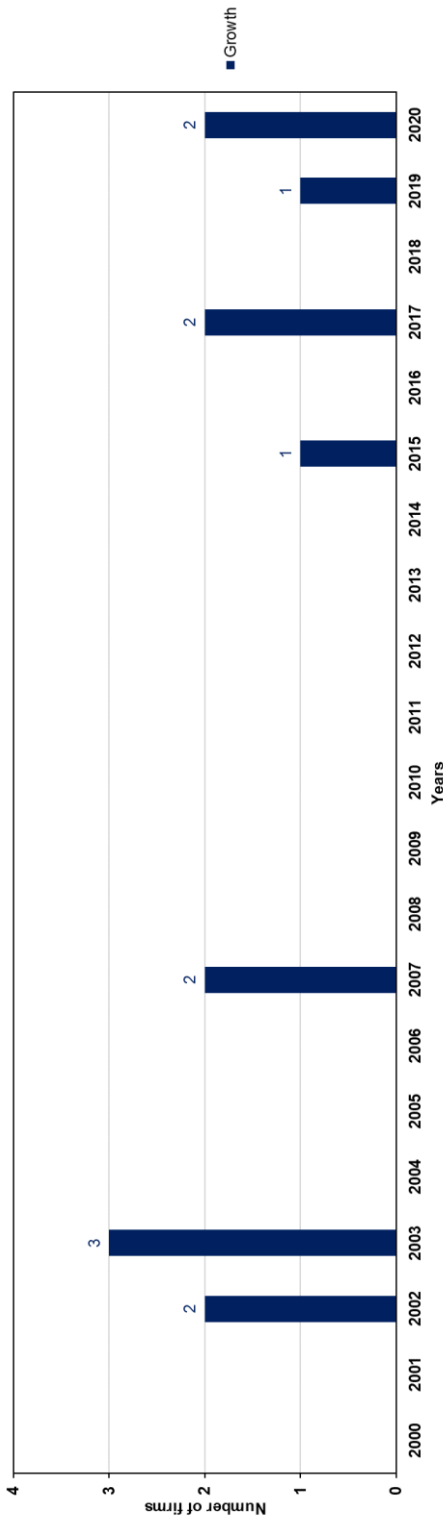
Appendix 5: Number of shake-out firms during 2000 – 2020

Appendix 6: Number of mature firms during 2000 – 2020

Appendix 7: Number of decline firms during 2000 - 2020

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