



# Unicorns' growth and financial flexibility before and after the IPO

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## ABSTRACT

Increasing number of unicorns worldwide is attracting researchers' attention to analyze their phenomena from their growth and financial flexibility interaction perspective. Unicorns as young companies have many external and internal environment development elements affecting their financial performance while going public with an IPO. Thus in the paper, we target to analyze factors revealing unicorns' growth and the relationship between financial flexibility and unicorns' growth before and after the IPO process. The financial data of 20 unicorns from Asia with IPOs from 2009 to 2018 was collected for the research. A literature review was performed to develop the frame and variables of growth and financial flexibility for research design. OLS regression was used for the analysis. Our main findings show the significant negative impact of EBIT on the growth of unicorns before the IPO, which becomes positive after the IPO. The impact of cash or debt on the growth of unicorns is negative after the IPO. The growth of unicorns is significantly influenced by capital expenditures and current liabilities affected by their management policies. Our research fills the existing gap in the literature by analyzing the interaction between the growth and financial flexibility of the high-growth unicorns in the context of the IPO and enriches existing literature by the combination of different theories to support the research, thus further research could focus on a more in-depth analysis of these processes.

## 1. Introduction

The successful performance of companies and their growth are among the important catalysts of the growth of the economy, so the growth of companies and the factors that determine it receive a lot of attention from researchers, but their insights about the factors which have the most significant influence on the growth of companies are incredibly different. Most of studies analyzed in this research revealed the significant negative relationship between the growth of companies and financial leverage [1–4], comparatively to only a few evidence of positive impact observed by the authors [5]. Moreover, positive relationship between the growth and the short-term debt and negative relationship between the growth and long-term debt for companies is noticed [6]. Contradictory findings are observed when the relationship between the growth and profitability is analyzed as well. Profitability might have either positive [6–10], negative [11,12] or no impact [13] on the growth of companies based on different research. Different studies show that cash flows have no impact on companies growth in general [1], but significant positive relationship between the growth and cash flows is

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observed for small and young companies and for startups [1,14]. The latter statement is in line with existing discussion in the literature that companies which are younger in age and smaller in size manage to grow faster because they have better possibilities to adapt the changing environment, which is proved by negative relationship between companies' age and size observed in the literature [1,5,15]. The difference in such insights is determined by different theoretical justifications of aspects of company growth, different research coverage, and different models and tools used in empirical research. Four theoretical perspectives can be used to identify a company's growth: resource-based, motivational, strategic adaptation and configuration perspectives [16]. The resource-based perspective focuses on the resources, such as the expansion of business performance, financial resources, educated employees, etc. However, even conclusions regarding resources that determine a company's growth made by the researchers, who use the same theoretical approach - resource-based perspective - in their research, are quite contradictory. It often depends on which companies are chosen as the object of the study, i.e. young companies or companies that have been operating for a long time, small or large companies, etc. Young companies face considerable limitations of financial resources; for this reason, the ability to attract financial resources often becomes the guarantee of success and growth of young companies. In this context, the insufficient knowledge about the unicorns (private companies funded from external sources and with at least 1 billion USD market value [17]) and their ability to grow from small companies to giant worldwide unicorns are mysterious for the researchers, as most of such companies fail because of the fast growth and the lack of resources during the first years since their establishment (based on different authors the failure rate is  $2/3^{\text{rds}}$  [18] or 8 out of 10 [19] companies). The lifecycle of these companies is short [20], and being private results the high uncertainty and data limitation for the analysis of the unicorns. IPO was found to be essential for developing the unicorns as additional external funding is attracted, which opens the possibility of developing the business for these companies.

Moreover, companies become public after the IPO [21], which opens the possibility for the researchers to analyze the performance of those companies more precisely and increases the interest of the unicorns in the context of the IPO in the literature [22]. The issuance of an IPO reduces the constraints of the financial resources of the unicorns, and this raises the question – of how the factors that describe the ability to attract financial resources change the influence of the growth of unicorns when they issue an IPO. The ability of a company to attract financial resources is usually referred to as financial flexibility. However, there is a lack of research analyzing the relationship between financial flexibility and the growth of young companies that later grow into unicorns. Considering this, this research aims to identify and analyze factors revealing unicorns' growth and to find the relationship between financial flexibility and the growth of companies before and after the IPO process. Overall, this research is targeted to analyze relationships between financial flexibility and growth for fast-growth unicorns before and after IPOs.

The relationship between the growth and factors of financial flexibility of 20 unicorns with the IPOs from 2009 to 2018 operating in Asia is analyzed by using OLS regression to answer the research question. Different modifications of the model were used to analyze the impact of the current and previous financial performance on the growth of unicorns, or to analyze factors affecting the change in level of growth over the longer period of time. Moreover, all these models were tested to analyze the interaction between variables of interest over different IPO related periods (for full dataset, periods before and after the IPO) to be able to observe if there is an impact of the IPO event on the growth of unicorns. The main findings have showed that factors of financial flexibility have a significant impact on the growth of unicorns either before or after the IPO. Considering the existing fluctuation in relationships between the growth and factors of financial flexibility observed in the literature [23], our findings provide more knowledge about the tendencies in relationships over different periods of analysis. We found that the growth of unicorns have positive relationship with EBIT and cash and negative relationship with debt if all IPO periods were analyzed. We have also found the negative relationship between EBIT and growth of unicorns before the IPO and positive relationship between variables after the year of IPO. The results provided in this research are based on Trade-Off, Pecking Order, Resource-Based and Market Timing Theories, and supplement the existing literature by additional insights in direction or the strength in relationships between the growth and measures of financial flexibility for which contradictory results are observed in the literature. Moreover, this research provide more knowledge about the growth and financial flexibility of the rapidly growing unicorns, as there are not many research analyzing unicorns in such context. Thus, companies analyzed in this research operate in developing region, it is expected that this study would provide the insights about future prospects of growth and factors that have an impact on it. The remainder of the study is organized as follows. A brief literature review establishes the theoretical and empirical association between financial flexibility, other unicorns' financial characteristics and their growth. This is followed by a discussion of the research design and an explanation of the results. The last section concludes and presents the theoretical and practical implications of the study.

## 2. Theoretical framework

Several main growth theories explain the reasons and mechanisms of companies' growth. Some growth theories are based on the stochastic approach to the growth of companies. Authors [24–27] claim that the growth of companies depends not on structural and organizational characteristics but on idiosyncratic shocks that are inherently unpredictable. However, based on the findings of other authors [28,29], the growth of companies that operate for a more extended period follows a random-walk stochastic process, while the growth of young companies is characterized by positive autocorrelation. This means that different theories should be used to evaluate the processes and the reasons for the growth of young companies. Innovation theory could be one such theory, and based on it, the growth of companies is related to the growth of investments in research and development (R&D) activities and innovativeness [30,31]. By introducing new products, services or processes, firms can gain a competitive advantage and attract customers, thereby fueling growth. Resource Based Theories can be used to explain the growth of young companies, which is based on the attitude that the growth of companies is determined by the company-specific combination of internal resources enabling the company to find unique market positioning [32], to enhance performance [33] and to gain competitive advantage [34,35]. This theory was also used to analyze

growth for IPO companies [36]. Authors who rely on this theory claim that the growth rate of a company and its performance efficiency are determined by resource utilization quality [7]. This theory allows justifying the relationships between financial resources that companies have, the possibilities to attract new resources and the growth of companies.

Different theories discuss the importance of capital structure for companies' performance and growth, among which are the Trade-Off, Pecking Order and Market Timing Theories [37]. The Trade-Off Theory is related to the balance between the costs and equity to maintain optimal company value [37] and the benefits gained from external funding [38]. The trade-off model predicts that firms operating above the optimum leverage have higher expected marginal costs of bankruptcy that exceed the marginal tax benefits of debt. Noticed that high-growth companies are characterized by lower costs of debt and higher liquidity, because the growth of company constraints debt financing [39]. However, startup firms are less likely to take advantage of tax interest deductibility, or the tax exceed is quite small as some businesses generate little or no profit [40]. Based on Pecking Order Theory, companies' capital structure relies on internal and external funding [37], and companies are not trying to reach theoretically optimal capital structure but use available financing sources [41]. The importance of information asymmetry between external investors and managers of companies is emphasized in the literature. The issuance of the shares in case of information asymmetry might be a negative signal to investors about the actual value of investments; thus the issuance of shares is the final choice of funding companies use. The pecking-order theory also contradicts the observation that many companies issue new shares, even if they can finance themselves through additional indebtedness [42]. However, profitable companies use less external financing comparatively to non-profitable firms [34]. Research results of other authors [43] show that equity markets are more willing to fund currently unprofitable firms with good growth prospects. Market Timing Theory, on which the aim of the unicorns to issue their shares through the IPO is based, is associated with external funding attraction and explains that a company issues its shares in the public market at a time when the price of its shares is at a high level which ensures profit maximization [37].

Moreover, companies enter the public market to gain more funding to boost growth and business development. The literature review reveals a wide variety of theories and opinions related to the growth of companies. Moreover, different studies showed that the growth rates of young and more mature companies differ. Other theories also discuss that growth depends on the ability of companies to utilize the resources or the capital structure of a company which becomes more critical in the case of young and small businesses; thus factors affecting the growth are analyzed in the literature.

### 3. Literature review

A company's growth is a complex phenomenon which is influenced by a large amount of external and internal environmental factors. The impact of those factors on the growth of different companies is ambiguous. All those factors were grouped into individual, organizational and environmental determinants by the authors [44], who found that organizational determinants are the most significant. After summarizing the research of various researchers, they assigned the following factors to the group of organizational factors that determine the growth of companies: company attributes and strategies (e.g. market orientation or entrepreneurial orientation), the specific resources of a company, such as human capital, financial resources, organizational structure and dynamic capability. Similar factors of growth were noticed by other authors as well [45].

Traditionally, the significant influence of the company's age and its size on its growth rates is emphasized by many researchers when studying the factors determining the growth of companies. The negative relationship between a company's age and its growth rate and its size and growth rate was found [1,5,15]. Moreover, authors [5] noticed that its growth rate stabilizes at around the seventh year of the company's lifecycle.

Considering the existing innovativeness and fast growth of the unicorns, this research is firstly based on Economic Growth Theory which is related to the knowledge that technological innovations boost the growth of the economy [46] and that, in most cases, economies of different countries are related to innovations created by small businesses. This raises the interest of researchers in the development of such companies and factors affecting their performance. Existing studies [47] confirm the high importance for startups of profitability, retaining a competitive advantage based on disruptive/radical innovations provided by the market, growth and survival. The growth of companies in most cases highly depends on financial resources which can be used to finance the growth. Based on the author's opinion [48] financing obstacles are significant to firm growth across different sizes. Many researchers emphasize the importance of financial leverage on the growth of a company. However, the insights towards the impact of leverage on the growth of a company made by the researchers are different and, in most cases, depend on other characteristics of a company and the choice of an indicator for the growth measurement used as a dependent variable. Based on authors [2], different impacts of financial leverage on companies with varying potentials of growth exist: the negative impact of financial leverage is not observed on companies with high growth potential but negatively affects the growth rates of such companies whose growth potential is not recognized by the capital markets or are not sufficiently valuable to overcome the effects of their debt overhang. The authors made such conclusions after conducting the research with large companies. Researchers [5] who analyzed the growth of new companies in the manufacturing sector in Canada from a financial point of view, proved that the positive non-linear relationship between financial leverage and the growth rate of a company exists. The growth rates are more sensitive to the changes in financial leverage for such companies characterized by low or medium levels of financial leverage. Authors [4], who studied micro and small enterprises in Sweden, found a negative relationship between the debt-equity ratio and asset growth rates. Still, the relationship is solid and positive between the levels of debt and sales growth. The negative relationship between the financial leverage of companies with low potential for growth and the growth rates of these companies was confirmed [3]. A similar conclusion was made by authors [1], who proved that a negative relationship between the debt-to-assets ratio and the growth of the number of employees and the growth of assets exists, but the increasing level of debt positively impacts the growth of sales. Another study [6] revealed that short-term debt has a significant

positive impact on company growth. Still, the result of assessing the impact of long-term debt on company growth depended on the method used for the study: “The results of a fixed-effect model show the negative and significant influence of long-term debt on growth, the results according to OLS and random effects show long-term debt positively related to growth” [6].

Researchers [5] concluded that the growth perspectives of a young company are positively affected by its initial asset value, which is associated with the possibility of attracting external financial resources. The ability of a company to attract external financial resources depends on how a potential investor evaluates the future growth perspectives of a company. A high level of initial assets may indicate the greater potential for growth of the company and provide more significant opportunities to attract necessary financial resources for the financing of promising investment projects. However, the authors noticed that the usage of leverage has a low impact on the significance of the effect of age and size of young firms on their growth rates.

The ability of a company to accumulate internal funding sources is often associated with its profitability. Authors [49] noted that “growth not accompanied by profitability does not seem sustainable in the long term”. It might seem that profitability has a very clear direct effect on the growth of a company, but the results by different authors are different: some findings [6–10] show that profitability has a positive impact on the growth of a company, but [11,12] found the negative relationship between profitability and company’s growth. The significant impact of profitability on the growth of young manufacturing companies is not observed [13]. But researchers [50], who have separated unprofitable and profitable growth regimes of companies, concluded that small and young companies, even if unprofitable, have a higher possibility of successful growth compared to greater in size companies which operate for longer periods. This suggests that the relationship between profitability and growth depends on a company’s development stage. Profitability may provide the cash flow and resources necessary for growth assurance; however, sizeable profits may only appear after the growth is achieved [51].

In addition to frequently used company size, age and debt-to-asset ratio - an indicator used to evaluate the capital structure-the cash flow generated by the company’s main activities was included in the research on the factors which affect the growth of Japanese small and medium-sized companies [1]. Authors note that small and medium-sized companies can be either long-established companies that maintain relatively stable volumes of activity for a long time or young companies that face significant difficulties to expand their activities. According to these authors, the growth of young companies is mainly affected by the possibilities of accumulating internal financial resources since information asymmetry problems strongly limit the opportunities for such companies to attract external financial resources through the capital markets. Researchers [1] found no evidence that cash flow significantly affects the growth of small and medium-sized enterprises. Still, after researching a separate group of young and older companies, they found that cash flows generated by young enterprises have a statistically significant positive effect on their asset growth. Still, the impact of income on growth is not significant. It was noted [52] that startups frequently face difficulties in attracting external financial resources, and for this reason, they are forced to rely on internal funding. Internal funding is noticed by Ref. [53] as the main financial resource for new companies. Internal funding is based on the cash flow generated by the new company [5,52]. According to this author, startups that generate strong cash flows successfully continue their activities and grow, while startups with low cash flows are forced to stop their activities [52]. Innovation and the continuous flow of funds are the main factors impacting startups’ success [14]. According to these authors, many other factors affect these two factors. Their analysis showed that the growth of startups is affected by financing, which is highly related to turnover, internal market openness, government policies and market dynamics of a region.

The financing (or the growth capital, based on the authors) of rapidly growing private technology companies, such as unicorns, highly depends on the funding attracted from external investments, necessary before entering the public market through the IPO [17]. Based on the literature analysis by some authors, different funding sources are necessary for startups to grow into unicorns. Still, companies that received a high funding level, 2–4 years later managed to become the unicorns [54]. Unicorns are privately held startup companies valued at over 1 billion of USD [55]. Thus the strong growth rates of the unicorns are preferred by investors, they firstly pay attention to the unicorns with increasing revenues because they expect to absorb the losses, gain profit and high capital gains in the future [56]. Authors [40] who were analyzing the financing decisions made in the first year of the company’s activity, found that the structure of assets, the size of a company, selling products instead of providing services as well as the time of owners’ commitment and education determines the perspectives of the new company’s activity. Authors showed “that growth-oriented companies, companies with IP, and companies with high net worth owners use less debt than equity” [40]. In addition to this, companies which are greater in size, have lower costs of debt which is related with more information and less company related uncertainty noticed by the authors [39].

Specific financing aspects for young firms were found by Ref. [57], who noticed that small companies use less debt capital, but young private companies tend to borrow more. They have also identified that financing with short-term debt increases with the growth of young companies. A positive relationship between increasing short-term financial leverage and company growth, including growth in the number of employees and growth in revenue, was found under normal financing conditions. However, as financing conditions deteriorate, the short-term leverage has a negative impact on the number of employees, when young companies are forced to reduce their use of borrowed capital. Thus, it can be concluded that the growth of young companies is significantly influenced not only by the characteristics of the company itself, which describe its financing decisions but also by external environmental conditions.

Authors [58] found that the financial liquidity of a company is a crucial factor in its growth since the lower restrictions on financing conditions and more significant opportunities to carry out profitable investment projects are predicted by a higher level of liquidity and thus affect the growth of the number of employees of the company and its assets. This was also confirmed by the results of [59] research.

The factors mentioned above that impact companies’ growth include the possibility of attracting financial resources. The ability of a company to concentrate the financial resources needed in a timely response to unforeseen situations to maximize its value is usually characterized by its financial flexibility. Financial flexibility is defined by Ref. [60] as the ability of a company to respond to

unexpected changes in cash flows and investment opportunities promptly by maximizing the value. Financing costs was included in the definition of financial flexibility proposed by Ref. [61] and financial flexibility was related to the ability of a company to obtain or restructure financing with low transaction costs. The concept of financial flexibility proposed by Ref. [62] included both, the ability of a company to use the increase in income for investment opportunities and to deal with a decrease in income.

For this reason, financial flexibility can be defined not only as the ability of a company to attract the necessary funds in the event of unfavourable environmental conditions, with a decrease in cash flow, and to do this at costs as low as possible or no higher than in normal conditions, but also the ability to use them for investment opportunities when favourable conditions of realization arise, and at the same time ensuring the growth of a company. According to Ref. [63], financial flexibility is particularly important when access to capital resources is limited, as it can reduce underinvestment problems and help to avoid costs related to financial difficulties. Considering this, financial flexibility should be a particularly significant factor in determining the growth rates of young companies. Funds needed to finance the growth can be obtained by using available cash reserves and by using future cash inflows, so financial flexibility is associated with both available cash and potential cash flows. On the one hand, keeping cash reserves ensures faster utilization of investment opportunities, because cash holdings are considered as an important element for investment decisions [39]. Still, according to Ref. [64], cash holding is costly due to agency problems, so many companies choose to maintain relatively low cash balances and preserve unused financing capacity that can access sufficient cash in times of financial need [65] to reduce costs. Thus, potential cash inflows are most likely more critical than cash holding for a firm [66].

Debt capacity is considered one of the forms of financial flexibility [67]. Based on [68], a debt buffer can be viewed as a measure of financial flexibility, which is defined as the amount of debt that the company can still borrow without facing a high risk of credit reduction and is measured as the difference between the debt capacity and the debt ratio. However, the ability to attract external sources of financing through the issuance of shares is often ignored, when assessing financial flexibility. According to Ref. [66] external financing can come from either debt or equity. External equity financing is usually determined by the ability of a company to have initial public offerings (IPOs) or seasoned equity offerings (SEOs), and external debt financing is usually limited by the current leverage of a company [66]. As mentioned, the possibilities of borrowing for young companies are often limited. Hence, the ability to attract financial resources by issuing an IPO is critical and should significantly impact their growth.

At the same time, the possibilities of internal financing and its influence on the growth of a young company should not be forgotten. Based on the study conducted by Ref. [69], profitability is relatively higher for companies with higher financial flexibility than companies with less financial flexibility. This means that more excellent internal financial resources can be generated by the young companies with greater financial flexibility, which, in turn, should positively affect the company's growth rates.

The growth of a company is hardly imagined without investments. According to Ref. [70], "investment is vital for long-term success and could secure a competitive advantage for an organization". However, after the literature analysis, we have noticed that only a few researchers have included investments as one of the important factors determining the growth rates of companies in their research models.

The working capital management policy is one of the important aspects that have a significant impact on the success of operations for growing new companies with limited access to external sources of financing. The working capital investment and its financing policy should be distinguished in assessing working capital management policy on the growth of companies. Authors who analyze the strategies of working capital management, notice the importance of working capital management on the long-term growth and performance of companies in the economies that are based on knowledge [71]. The working capital investment policy is reflected by the level of current assets in the company's asset structure. In contrast, the working capital financing policy is reflected by the financing instruments used by the company to finance current assets [72]. The aggressive working capital investment policy maintains a lower level of current assets of a company. On the one hand, more significant cash flows can be generated by following such policy, which can be used for various payments or investments, as well as ensuring greater financial flexibility [73].

On the other hand, it can cause disruptions in the company's operations and, as a result, a decrease in the volume of operations. Based on [74], the liquidity of a company is reduced, the risk is increased, and solvency problems in the future may arise if a company uses an aggressive working capital investment policy. The possibility to increase sales and the opportunities to receive higher discounts for advance payments, which increases the profitability of the company, might be achieved by the high level of working capital [74]. On the other hand, more financing is required for a high level of operating capital, so companies may be forced to reduce investments. All short-term assets are tried to be financed with short-term financing sources, using an aggressive working capital financing policy, to extend the time of payment of debts to suppliers. In this way, the costs are often reduced, and a company's profitability is increased. However [75], argues that the company experiences all the difficulties of managing short-term liabilities; the risk of default and uncertainty is accepted when an aggressive policy of working capital financing is used.

The growth of startups, and the success of their operations, apart from the above-mentioned factors, can be significantly affected by the market situation (undervalued or overvalued market) [76], market expectations due to some political, social, technological challenges and the growth of unicorns [77], new trends observed in business processes on a market scale [78].

Based on the research results discussed above and our insights, we assume that the growth of young companies is significantly affected by their financial flexibility, investment, working capital investment and financing policies.

#### 4. Methodology

We used the OLS regression for the analysis as this method is frequently used for the analysis of startups [21,79–81]. It is also suitable for analyzing the relationship among different variables [82]. The financial data of the unicorns with the initial public offerings (hereafter, the IPO) was used for the research. We define unicorns as former startup companies which have reached a company

market value of 1 billion USD [56] and became public through an IPO.

Fast growth is one of the characteristics of startups most frequently mentioned in the literature. Several measures for the growth of such companies are used by different authors, among which the growth in revenues [52,83] or in the number of employees [84,85] are found. Revenue growth is also noticed among the variables of interest for investors [86] and is expected from startups at later stages of their development [87]. Considering this, two dependent variables – REV and EMPL, will be used for the growth measurement of the unicorns. The impact of financial flexibility and different financial performance factors on the growth of the unicorns by using several independent variables discussed in the literature review is tested. Thus, the research is focused on the impact of financial flexibility on the growth of the unicorns, OLS regression model performed is provided in Eq. (1).

$$\text{GROWTH}_{it} = \beta_1 * \text{EBIT}_{it} + \beta_2 * \text{DEBT}_{it} + \beta_3 * \text{CASH}_{it} + \beta_4 * \text{CAPEX}_{it} + \beta_5 * \text{CA}_{it} + \beta_6 * \text{CL}_{it} + \beta_7 * \text{PERIOD FE}_t + \beta_8 * \text{SECTOR FE}_i + \varepsilon_{it} \quad (1)$$

Different modifications of the model are performed. REV and EMPL are both used as GROWTH measures. Firstly, the relationship between the  $\text{GROWTH}_t$  and the measures of financial performance (EBIT, DEBT, CASH, CAPEX, CA and CL)<sub>t</sub> is observed for the current period (i.e.  $t$ ). With the second model, we analyze if the relationship between the  $\text{GROWTH}_t$  of the current period and the measures of financial performance<sub>t-1</sub> of the previous period ( $t-1$ ) exists. We further analyze if there is a relationship between the change in GROWTH (deltaGROWTH, counted as the change between periods  $t$  and  $t-1$ ) and the changes in independent variables for the third model. All the dependent and independent measures are transformed into the natural logarithm for the fourth model. The relationship between the changes of these variables (counted as the change between the natural logarithm of periods  $t$  and  $t-1$ ) is observed similarly to Model 3. Finally, the relationship between the deltaGROWTH and the independent variables<sub>t-1</sub> (of the previous period) is analyzed. We use time to IPO year related period (PERIOD FE) and business sector (SECTOR FE) related fixed effects as control variables. A set of dummy variables for the number of years before and after the IPO were used for Models 1–2 and four periods which indicate the changes between IPO periods (e.g. between IPO-1 and IPO-2 periods is Period 1 in our dataset) were used as fixed effects for Models 3–5. A set of dummy variables indicating business sector was based on two digits SIC codes.

IPO unicorns are analyzed for this research because most startup companies are private, and their financial data is not publicly available. Financial data for these companies become public after the IPO, which opens the possibility for the analysis. The 5 IPO-related year financial data of 20 unicorns operating in different regions of Asia were collected from COMPUSTAT database based on the list of Asian unicorns with IPOs from 2009 to 2018 announced by Ref. [88] (this list of companies was not updated since 2018 by Ref. [88]). Asian IPO unicorns were chosen for the analysis based on data availability and higher number of IPO unicorns operating in the region comparatively to other countries. We analyzed the unicorns from the IPO year perspective as they are highly distributed based on calendar year, which would not allow making comparisons from the calendar year perspective. Moreover, based on Market Timing Theory, IPO is an important strategic step for the unicorns opening possibilities to attract higher amounts of external funding and to become more visible in the market. The distributional statistics of the unicorns based on IPO year were collected from CB Insights database [88]. The number of IPOs for the unicorns varies based on the calendar year; however, the highest number of Asian unicorns with IPO exit was in 2010 ( $n = 5$ ), 2017 and 2018 year (for both,  $n = 4$ ) as for comparison, there was only one unicorn with the IPO in 2009 or 2016.

For this reason, the financial data for 5 IPO-related periods: 2 years before the IPO, IPO year and two years after the IPO, was collected. Such period of analysis was chosen because not many companies provide their financial statements for three or more years before and after the IPO publicly which limits the analysis of higher number of IPO periods. The distributional statistics of the unicorns based on the sector of operation (in terms of Standard Industrial Classification (hereafter, SIC) codes) shows that most of the unicorns from Asia (13) provide services for the business (SIC.73) (the classification of the unicorns based on SIC codes was obtained from COMPUSTAT database, and the names of SIC codes were collected from the website [www.siccode.com](http://www.siccode.com) [89]). More detailed sector analysis revealed that most of the unicorns which operate in the Business services sector create software, provide programming or other IT-related services. Based on existing practice, we excluded the companies which operate in financial or real estate-related sectors [90]. The abbreviations of the variables used for the research are provided in Table 1.

A high deviation from the mean is observed in the data. Data winsorizing at 1% and 99% levels were made based on existing methodology [83] to reduce this deviation. The highest deviation among financial variables is observed for TA as the lowest for CAPEX. There are  $N = 89$  total observations in the dataset of 20 Asian unicorns collected. However, some data is missing for these companies and some data was removed by the authors. The most of missing values are found for the number of employees ( $n = 10$ ).

**Table 1**  
Explanation and abbreviations of the variables.

Variable	Abbreviations	Explanation, units of measurement
Revenues	REV	The book value of revenues, mln. of USD
Employees	EMPL	The number of employees, thousands
EBIT	EBIT	Earnings before interest and tax, mln. of USD
Debt	DEBT	The book value of total debt, mln. of USD
Cash	CASH	The book value of cash, mln. of USD
Capital Expenditures	CAPEX	The book value of capital expenditures, mln. of USD
Current Assets	CA	The book value of current assets, mln. of USD
Current Liabilities	CL	The book value of current liabilities, mln. of USD
Total assets	TA	The book value of total assets, mln. of USD

The descriptive statistics of the full dataset (both, initial and winsorized values of financial variables) are provided in Table 2.

**Table 2**  
Descriptive statistics of the entire dataset (initial and winsorized values).

Descriptive statistics for the initial values									
	CA	TA	CAPEX	CASH	EBIT	EMPL	CL	REV	DEBT
Valid	84	89	88	88	88	79	84	89	88
Null	0	0	0	0	0	0	0	2	30
Missing	5	0	1	1	1	10	5	0	1
Min	7.64	10.30	0.34	1.70	-1590	0.19	2.16	0	0
Max	26500	73600	2550	20900	6980	50.10	13600	23000	12500
Median	428	740	7.97	144.00	2.52	2.52	117	185	8.96
Mean	1920	3370	106	1050	178	6.04	912	1320	655
Std.Dev	4620	10700	357	3400	1170	10	2100	3530	1910
Winsorized values									
	CA	TA	CAPEX	CASH	EBIT	EMPL	CL	REV	DEBT
Valid	84	89	88	88	88	79	84	89	88
Null	0	0	0	0	0	0	0	2	30
Missing	5	0	1	1	1	10	5	0	1
Min	13.90	24.20	0.45	4.04	-1240.62	0.19	4.77	0	0
Max	13400	20100	1240	4560	3281.89	50.10	6490	13800	4700
Median	428	740	7.97	144	2.52	2.52	117	185	8.96
Mean	1560	2120	85.60	568	114.41	6.04	807	1200	482
Std.Dev	3010	4240	243	1110	824.06	10	1600	2880	1110

Note: EMPL – number of employees; REV - revenues; EBIT – earnings before interest and taxes; DEBT – total debt; CASH – cash; CAPEX – capital expenditures; CA – current assets; CL –current liabilities; TA – total assets.

Removing several companies based on SIC codes has also reduced the number of observations. A different number of observations will be used for further analysis based on the variables used.

All models were performed for different datasets. Models in Panel A were performed for the full dataset. Models in Panel B were performed for the periods before the IPO (from IPO-2 to IPO). And Models in Panel C were performed for the periods after the IPO (from IPO to IPO+2).

## 5. Results

### 5.1. Correlation matrix

Based on the OLS assumptions, Pearson correlation analysis is performed to check for possible correlation problems. The matrix of correlation is provided in Table 3.

The highest correlation result is observed between CASH and CA and equals 0.900. A positive strong correlation is observed between REV and CASH, CA and CL; CA and CL or CASH and CL which varies but is higher than 0.8 in all cases. Considering the existing methodology, Variance inflation factors (hereafter, VIF) was analyzed for each model to check if multicollinearity among different variables exists [90]. Further analysis showed that VIFs vary but are below  $VIF = 10$  [91], indicating that multicollinearity is not an issue for this research. Various statistical tests were used to test regressions' assumptions (i.e. Hausman test, Lagrange Multiplier test, F-test or Durbin-Watson test) which all showed that OLS method is appropriate for analysis and that there are no endogeneity or autocorrelation problems.

### 5.2. The impact of financial flexibility on the growth of unicorns

Firstly, all models were performed for the full dataset to find the existing tendencies in relationships between the factors of financial

**Table 3**  
Pearson correlation results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) EMPL	1.000							
(2) REV	0.546	1.000						
(3) EBIT	0.338	0.671	1.000					
(4) DEBT	0.494	0.587	0.551	1.000				
(5) CASH	0.509	0.843	0.720	0.659	1.000			
(6) CAPEX	0.450	0.719	0.668	0.688	0.731	1.000		
(7) CA	0.458	0.855	0.683	0.629	0.900	0.796	1.000	
(8) CL	0.521	0.840	0.515	0.676	0.804	0.565	0.826	1.000

Note: EMPL – number of employees; REV - revenues; EBIT – earnings before interest and taxes; DEBT – total debt; CASH – cash; CAPEX – capital expenditures; CA – current assets; CL –current liabilities; TA – total assets.

flexibility which impact the growth of the unicorns. The number of observations differs for each model because not all unicorns have the financial information for each of the analyzed five IPO periods. Moreover, the number of observations for the deltas and the logarithmic variables used for Models 3 to 5 are lower based on the specifics of the calculations. Thus there is a significant number of zeros in DEBT, this variable was removed from Models 3 and 4. Only the results of the valid models are provided in the paper. The regression results for all IPO periods are provided in Table 4.

The impact of EBIT and CL of the current period and period lagged by one year on the growth of unicorns is positive and statistically significant ( $p < 0.01$ ) for both Models 1 and 2. The results for all other variables included in these two models are similar. The growth of unicorns based on Models 1 and 2 has significant positive relationship with CAPEX ( $p$  vary from 1 to 5%) and CA ( $p < 0.1$ ). Literature analysis showed that unicorns continuously invest in their development with the aim to boost the growth. These findings suggest that capital expenditures made by unicorns in the current (t) or previous periods (t-1) are efficient and increase the growth of the current period (t). Regression results show that growth is also increased by CASH, but is negatively affected by the level of DEBT (this finding is similar to the results observed in the literature [1–4]), although, in both cases these relationships are not statistically significant. The results obtained by Models 3 and 4 show that only CL has statistically significant positive relationship with the change in REV over the period analyzed. Positive relationship between the changes in REV based on these models was found with EBIT and CASH (for both relationships are not significant). The directions of relationship between the change in REV and CAPEX or CA vary based on the model, but this finding is not statistically significant. The results of all four models revealed that in all cases the growth of unicorns have positive relationship with EBIT, CASH, and CL, but the direction of relationship slightly vary in terms of CAPEX for Model 3 and CA for Model 4, although, these findings are not significant. Our findings supplement the existing literature analyzing the relationship between the growth and profitability [6–10,13], the impact of CASH on the growth of young companies and startups [1,14] and the negative relationship between growth and DEBT [1–4]. Regression results obtained from Models 1 and 2 are in line with Pecking Order, Resource Based and Market Timing Theories, because variables analyzed in the models are used efficiently to increase the growth, the combination of internal and external resources are used for growth assurance and this allows maximizing the level of growth for these companies.

The dataset was split into different pre- and post-IPO periods for more precise analysis to analyze the existing relationships between the factors of financial flexibility and the growth of the Asian unicorns before and after the IPO. The financial flexibility impact on the growth of unicorns before the IPO is discussed in section 4.3.

### 5.3. The impact of financial flexibility on the growth of the unicorns before the IPO

As literature analysis revealed, IPO has a huge impact on the financial performance of unicorns. For this reason, the factors impacting these companies' growth before the IPO (the periods analyzed in this section are from IPO-2 to IPO) are summarized in

**Table 4**  
The relationships between the factors of financial flexibility and the growth of unicorns.

Panel A. All IPO periods	Model 1	Model 2	Model 3	Model 4
Dependent variable	REV/TA(t) <sup>a</sup>	REV/TA(t) <sup>b</sup>	Delta REV <sup>c</sup>	Delta LNREV <sup>d</sup>
EBIT	1.151*** (0.272)	1.037*** (0.263)	0.001 (0.015)	0.069 (0.047)
DEBT	-0.288 (0.182)	-0.235 (0.176)		
CASH	0.083 (0.317)	0.113 (0.327)	0.117 (0.070)	0.069 (0.125)
CAPEX	4.070*** (1.208)	2.678** (1.136)	-0.014 (0.032)	0.057 (0.052)
CA	0.506* (0.283)	0.572* (0.292)	0.094 (0.147)	-0.107 (0.287)
CL	1.203*** (0.300)	0.796*** (0.294)	0.232* (0.123)	0.340** (0.144)
PERIOD FE	YES	YES	YES	YES
SECTOR FE	YES	YES	YES	YES
Observations	83	64	63	33
R2	0.730	0.749	0.662	0.854
Adjusted R2	0.660	0.665	0.547	0.747
Residual Std. Error	0.475 (df = 66)	0.426 (df = 48)	0.661 (df = 47)	0.246 (df = 19)
F Statistic	10.497*** (df = 17; 66)	8.940*** (df = 16; 48)	5.758*** (df = 16; 47)	7.969*** (df = 14; 19)

Note: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ . Dependent variable GROWTH is measured by revenues (REV); EBIT – earnings before interest and taxes; DEBT – total debt; CASH – cash; CAPEX – capital expenditures; CA – current assets; CL – current liabilities; TA – total assets. Time to IPO related period (number of years before and after the IPO or the change between IPO periods; PERIOD FE) and business sector (based on SIC 2 digits codes; SECTOR FE) are fixed effects used as control variables.

<sup>a</sup> All independent variables (t) are divided by total assets (t).

<sup>b</sup> All independent variables (t-1) are divided by total assets (t-1).

<sup>c</sup> All independent variables are counted as the change between periods t and t-1.

<sup>d</sup> All independent variables are counted as the change between the natural logarithm of periods t and t-1.



Table 5.

OLS results indicate the existing negative relationship between the change in REV and EBIT for both models. This finding supplements the existing literature [11,12]. However, this relationship is statistically significant only for Model 5 ( $p < 0.01$ ). Based on the results, the growth of unicorns significantly increases by the level of CASH generated in the previous period ( $p < 0.1$ ). This finding is in line with Pecking Order Theory and suggests that unicorns use available financial sources to support their growth before the IPO, to show their intention to grow fast and to become interesting for future investors. Differently from results in the previous table which incorporated all IPO periods, the relationship between the change in REV and CA becomes negative and not significant and between the change in REV and CL becomes not statistically significant before the IPO. Such results suggest that IPO event and external funding attracted through the IPO has a significant impact on the growth of such companies. The results obtained from Model 5 differ from Model 3. The level of CA has significant positive relationship ( $p < 0.1$ ) with the change in LNREV, but the impact of CL becomes negative ( $p < 0.1$ ). The negative relationship between the growth and CL is in line with Trade-Off Theory and suggests that unicorns use more risky aggressive working capital policy [34] by financing CA with CL. Results also show that the level of growth has positive relationship with DEBT and CAPEX, and negative relationship with CASH, but these findings are not statistically significant.

Thus there are plenty of discussions in the literature that the IPO has a huge impact on the financial performance of the unicorns, the impact of financial flexibility on the growth of the unicorns after the IPO was further tested for the post-IPO periods (periods from IPO to IPO+2) and the results are discussed in the next section.

#### 5.4. The impact of financial flexibility on the growth of the unicorns after the IPO

The factors which impact the growth of the unicorns after the IPO are summarized in Table 6.

Four models were valid for the post-IPO analysis. In most of cases models performed show positive relationship between the REV and EBIT (relationship is significant only for Model 3;  $p < 0.05$ ), except for Model 2 (relationship is negative, although not significant). This negative relationship indicates that the growth of unicorns in current period (t) is negatively affected by EBIT gained in the previous period (t-1), but the positive relationship shows the existing positive impact of EBIT on growth over the current period or the impact on the change in growth. This finding shows that financial performance of the unicorns is very dynamic. Nevertheless, the level of EBIT increases the growth after the IPO. Pecking Order Theory is focused on the capital structure of companies. Debt capital is another source to finance the business used by unicorns. Regression  $\beta$  coefficients of DEBT are negative and higher comparatively to previous findings ( $p$  vary from 1 to 5%) which indicates about the increase in level of debt by the unicorns which alone highly reduces the level of growth from the revenue generation perspective. In addition to this, debt capital is used by the unicorns to support CAPEX ( $p < 0.01$ , for all models except Model 2, for which is not significant) and these expenditures boost the growth of unicorns after the IPO. The constant positive relationship between REV and CL is noticed for all models performed ( $p$  vary from 1 to 5%) and this finding is similar to the findings observed in the literature [6]. The relationship between the growth and CA in most of cases is positive, except for Model 2. The level of significance varies based on the model. Different from existing literature [1,14] we have found negative and not

Table 5

The relationships between the factors of financial flexibility and the growth of unicorns before the IPO.

Panel B. Period from IPO-2 to IPO	Model 3	Model 5
Dependent variable	Delta REV <sup>b</sup>	Delta LNREV <sup>a</sup>
EBIT	-0.007 (0.019)	-0.751*** (0.231)
DEBT		0.276 (0.182)
CASH	0.251* (0.129)	-0.512 (0.356)
CAPEX	-0.175 (0.138)	0.285 (1.297)
CA	-0.061 (0.221)	0.612* (0.293)
CL	0.283 (0.245)	-0.815* (0.273)
PERIOD FE	YES	YES
SECTOR FE	YES	YES
Observations	31	31
R2	0.720	0.894
Adjusted R2	0.543	0.818
Residual Std. Error	0.806 (df = 19)	0.291 (df = 18)
F Statistic	4.064*** (df = 12; 19)	11.738*** (df = 13; 12)

Note: \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ . Dependent variable GROWTH is measured by revenues (REV); EBIT – earnings before interest and taxes; DEBT – total debt; CASH – cash; CAPEX – capital expenditures; CA – current assets; CL – current liabilities; TA – total assets. Time to IPO related period (number of years before and after the IPO or the change between IPO periods; PERIOD FE) and business sector (based on SIC 2 digits codes; SECTOR FE) are fixed effects used as control variables.

<sup>a</sup> All independent variables (t-1) are divided by total assets (t-1).

<sup>b</sup> All independent variables are counted as the change between periods t and t-1.

**Table 6**

The relationships between the factors of financial flexibility and the growth of unicorns after the IPO.

Panel C. Period from IPO to IPO+2	Model 1	Model 2	Model 3	Model 4
Dependent variable	REV/TA(t) <sup>a</sup>	REV/TA(t) <sup>a</sup>	Delta REV <sup>c</sup>	Delta LNREV <sup>d</sup>
EBIT	0.299 (0.247)	-0.051 (0.425)	0.043** (0.017)	0.069 (0.040)
DEBT	-1.186*** (0.396)	-1.822** (0.784)		
CASH	-0.307 (0.186)	-0.094 (0.252)	-0.052 (0.038)	-0.027 (0.082)
CAPEX	4.198*** (0.927)	2.103 (1.394)	0.076*** (0.023)	0.163*** (0.045)
CA	0.039 (0.180)	-0.154 (0.311)	0.679*** (0.150)	0.545** (0.217)
CL	1.492*** (0.394)	2.064** (0.728)	0.563*** (0.096)	0.243** (0.100)
PERIOD FE	YES	YES	YES	YES
SECTOR FE	YES	YES	YES	YES
Observations	32	32	32	17
R2	0.950	0.909	0.930	0.951
Adjusted R2	0.916	0.838	0.882	0.880
Residual Std. Error	0.156 (df = 19)	0.217 (df = 18)	0.249 (df = 19)	0.110 (df = 7)
F Statistic	27.877*** (df = 13; 19)	12.863*** (df = 14; 18)	19.369*** (df = 13; 19)	13.469*** (df = 10; 7)

Note: \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01. Dependent variable GROWTH is measured by revenues (REV); EBIT – earnings before interest and taxes; DEBT – total debt; CASH – cash; CAPEX – capital expenditures; CA – current assets; CL – current liabilities, TA – total assets. Time to IPO related period (number of years before and after the IPO or the change between IPO periods; PERIOD FE) and business sector (based on SIC 2 digits codes; SECTOR FE) are fixed effects used as control variables.

<sup>b</sup> All independent variables (t-1) are divided by total assets (t-1).

<sup>a</sup> All independent variables (t) are divided by total assets (t).

<sup>c</sup> All independent variables are counted as the change between periods t and t-1.

<sup>d</sup> All independent variables are counted as the change between the natural logarithm of periods t and t-1.

statistically significant relationship between CASH and the growth of unicorns (not significant relationship is also found by other researchers [1]).

### 5.5. Robustness check

The dependent variable of REV is changed for the EMPL as the measure of the growth of the unicorns. A different number of models are valid for the EMPL regression. Other models with the EMPL used as the measurement for growth performed for the other pre- and post-IPO periods were invalid. One of the explanations for this might be the lower number of observations for these models. The relationship between the factors of financial flexibility and the growth measured in terms of the number of employees of the Asian unicorns is summarized in Table 7.

The analysis of factors affecting the growth of the unicorns from the employees' perspective shows that in most of cases the growth of unicorns has positive relationship with the growth in EBIT, although these findings are not statistically significant (this is similar to all models and periods analyzed, except for Models 1 and 5 in Panel A). Differently from previous analysis the growth of unicorns measured in the number of employees is positively affected by EBIT before the IPO as well as after the IPO. The positive relationship between the growth and CASH (for all models, except Model 4 in Panel C; but significant only for all IPOs dataset in Panel A, Model 1 (p < 0,05)) indicates that unicorns are using available sources to support the growth of companies' (this finding is explained by Pecking Order Theory). Differently from previous analysis, results in most of cases show negative, although mostly not statistically significant relationship between CAPEX and EMPL. Mixed relationships are also observed between the growth and CA over different periods of analysis (p varies based on the model), but considering the lower number of valid models and lower number of observations for the employees in our dataset, we are not able to make more detailed insights about the impact of CL on the growth of unicorns measured in number of employees. Positive and in most of cases significant (p vary from 1 to 5%) relationship is found between the growth and CL (except for Model 5 in Panel A and Model 4 in Panel C). These results confirm that CL which unicorns have increase their growth either before or after the IPO, which is also found in the previous analysis and is similar to the findings by other authors [6].

## 6. Discussion

Our results show that the growth of unicorns is related to different factors of financial performance and financial flexibility during different IPO-related periods. We found a positive relationship between the EBIT and the growth of revenues for most of the models, which contributes to the findings by different authors who have also found a positive relationship between profitability and growth [6–8,10,13]. For more detailed analysis of factors of financial flexibility affecting the growth of the unicorns we have divided the dataset into periods before and after the year of IPO. The results obtained indicated that EBIT have a negative impact on the growth of

**Table 7**  
Robustness check.

Dependent variable	Panel A. All IPO periods				Panel B. Period from IPO-2 to IPO	Panel C. Period from IPO to IPO+2	
	Model 1	Model 3	Model 4	Model 5	Model 3	Model 3	Model 4
	EMPL (t) <sup>a</sup>	Delta EMPL <sup>c</sup>	Delta LNEML <sup>d</sup>	Delta LNEML <sup>b</sup>	Delta EMPL <sup>c</sup>	Delta EMPL <sup>c</sup>	Delta LNEML <sup>d</sup>
EBIT	-2.310 (5.728)	0.024 (0.017)	0.045 (0.053)	-0.168 (0.213)	0.006 (0.040)	0.030 (0.022)	0.033 (0.054)
DEBT	-3.867 (3.991)			0.206 (0.147)			
CASH	17.972** (7.025)	0.009 (0.032)	0.022 (0.109)	0.360 (0.282)	0.019 (0.057)	0.006 (0.050)	-0.045 (0.112)
CAPEX	-6.338 (28.739)	-0.002 (0.014)	0.023 (0.055)	-1.769* (1.025)	-0.005 (0.061)	0.000 (0.030)	-0.017 (0.061)
CA	-12.411** (5.806)	-0.129* (0.072)	-0.138 (0.253)	0.060 (0.232)	-0.131 (0.102)	-0.138 (0.197)	0.689* (0.298)
CL	20.719*** (7.035)	0.584*** (0.080)	0.468*** (0.124)	-0.249 (0.269)	0.482** (0.172)	0.633*** (0.126)	0.188 (0.137)
PERIOD FE	YES	YES	YES	YES	YES	YES	YES
SECTOR FE	YES	YES	YES	YES	YES	YES	YES
Observations	75	57	31	57	25	32	17
R2	0.529	0.787	0.822	0.600	0.842	0.745	0.829
Adjusted R2	0.392	0.704	0.675	0.431	0.696	0.571	0.585
Residual Std. Error	9.276 (df = 58)	0.296 (df = 41)	0.210 (df = 17)	0.317 (df = 40)	0.328 (df = 13)	0.328 (df = 19)	0.151 (df = 7)
F Statistic	3.839** (df = 17; 58)	9.460*** (df = 16; 41)	5.608*** (df = 14; 17)	3.535*** (df = 17; 40)	5.770*** (df = 12; 13)	4.271*** (df = 13; 19)	3.398* (df = 10; 7)

Note: \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01. Dependent variable GROWTH is measured by number of employees (EMPL); EBIT – earnings before interest and taxes; DEBT – total debt; CASH – cash; CAPEX – capital expenditures; CA – current assets; CL – current liabilities, TA – total assets. Time to IPO related period (number of years before and after the IPO or the change between IPO periods; PERIOD FE) and business sector (based on SIC 2 digits codes; SECTOR FE) are fixed effects used as control variables.

<sup>a</sup> All independent variables (t) are divided by total assets (t).

<sup>b</sup> All independent variables (t-1) are divided by total assets (t-1).

<sup>c</sup> All independent variables are counted as the change between periods t and t-1.

<sup>d</sup> All independent variables are counted as the change between the natural logarithm of periods t and t-1.

revenues before the IPO. We have also found a statistically significant negative relationship between the change in EBIT of a prior year and logarithmic change in revenues of the subsequent-year before the IPO. This finding suggests that the level of EBIT alone is not sufficient to increase the growth of revenues of unicorns before the IPO. Negative relationship is also observed in the literature [11,12]. These findings are in line with existing knowledge that even mature unicorns might be unprofitable at later stages of development [92, 93] which would reduce the level of growth for traditional businesses. But, literature also shows that most of unicorns these days are not profitable after the IPO [94], and even unprofitable unicorns manage to grow, and external financing attracted through the IPO event increase the profitability [56] and boost the level of growth after the IPO. Previous research of Korean IT startups showed that the performance of such companies has a significant positive relationship with the profit after the IPO [21]. This confirms and supplements our findings regarding the positive and statistically significant relationship between the EBIT and growth found for different models after the IPO. And such findings are in line with Market Timing Theory discussed in this research.

Nevertheless, the general tendencies indicate that the growth of the unicorn's revenue is positively related to financial flexibility measured in terms of EBIT. Considering the impact of the other measures of flexibility on the growth of the unicorns, we have identified the negative and statistically significant relationship between debt and revenue after the IPO, which is different from the strong positive relationship between the debt and revenues found by Refs. [1,4,23]. Such different findings might be related to the nature of companies analyzed in different research (i.e. traditional SMEs or manufacturing companies analyzed in other studies) and existing knowledge that high-growth oriented unicorns analyzed in this research are different from traditional businesses [56,95]. Also, the debt related costs might be higher for the unicorns with higher level of leverage, which negatively impact the growth which is especially evident for developing countries [96]. The relationship between debt and revenue in most models during post-IPO periods and the entire IPO-related period analyzed is still negative, although, in most cases, it is not significant. The negative, although not statistically significant, relationship between the change in company size and the debt-to-asset ratio of the previous period was found by Ref. [97], who analyzed the public companies in Taiwan. But we have found an existing positive, although not statistically significant relationship between the debt and revenues growth before the IPO. There is evidence that cash is an essential factor driving the growth rate of a company found by different authors, the results of our research indicate the mixed impact of cash on the growth of revenues of unicorns. Positive relationship found for full dataset is similar to the findings by other authors who have analyzed the growth of young companies and startups [1,14] and for companies during the first two years since their establishment [23] and suggests of higher level of cash reserves held by unicorns. The level of cash for unicorns indicates about efficient financial performance [98] and is in line with Resource Based Theory suggesting efficient usage of cash for business growth assurance. Negative relationship

between the growth of revenues and cash observed after the IPO found in this analysis is in line with the research analyzing the growth of SMEs over different years of development which found the negative impact of cash holdings on the growth in sales for companies older than three years since establishment [23] and can be explained by the fact that Asian unicorns keep small cash reserves, but try to invest free funds in growth and thus ensure operational success faster.

Our research has shown that the simple indicators of financial flexibility, such as debt and cash, which other authors frequently use, have fluctuating tendencies either in terms of the direction or the strength of the relationship during different pre- and post-IPO periods analyzed which does not fully support the Resource Based Theory. Fluctuating results were found by other authors who have analyzed SMEs over different periods of development, but the approach which they used was to analyze companies from the number of years since establishment perspective instead of the IPO [23]. The fluctuation in relationships between the growth and factors affecting it observed in this research and in the literature encourages analyzing the growth of companies (and especially rapidly growing unicorns and startups) over longer period of their lifecycle. Considering this, other, more complex measures of financial flexibility, which would allow assessing the capacity of such companies to attract financial resources more reliably, should be used to assess the financial flexibility of unicorns.

We have noticed that the volume of investments is rarely included in the research models, designed by different authors to identify the factors that determine the growth of companies. However, based on the opinion of the authors of this research, the volume of investments is an essential factor that significantly impacts a company's competitiveness and growth. The statistically significant positive effect of investments on the growth of revenues of the unicorns after the IPO was confirmed by this research. The obtained results are in line with the Market Timing Theory and prove that Asian unicorns, which have raised funds through the stock market and thus reached a new stage of development, even though most of them are active in the service sector, where investments play a more minor role than in the manufacturing sector, can ensure faster revenue growth by increasing the extent of investments in long-term assets.

Our statements regarding the importance of working capital management policy on the young growing companies were confirmed by the results of our research, which proved that working capital investment policy and working capital financing policy has a statistically significant impact on the growth of unicorn revenue both before and after the IPO. This finding is in line with the statements about the need of working capital management policy observed in the literature [34]. A statistically significant impact of the working capital financing policy on the growth of unicorns was also found when the growth was measured as the growth of the number of employees. However, the financial flexibility of the unicorns had no significant impact on their growth neither before nor after the IPO when the growth was measured as the growth of a number of employees. This may be related to the fact that the success of Asian unicorns is affected not by the available human resources, but by increasing the investments made by these companies, which requires significantly more funds than increasing the number of employees.

## 7. Conclusion

### 7.1. Research conclusions

The growth of a company is a complex phenomenon influenced by a large number of both external environmental factors and internal factors. The impact of those factors on the growth of young companies and companies that have been operating for a long time is ambiguous. In most cases, the growth of companies depends on the financial resources which can be used to finance the growth. The internal sources of financing for young companies are minimal at the beginning of their activity. The possibilities to attract external financial resources, both in the form of debt and equity capital, are very limited, so many companies do not survive. However, the high growth rates of some young companies allow them to grow into unicorns.

The ability of young companies to attract necessary financial resources has been linked to their financial flexibility in this research. The financial flexibility of young companies can be analyzed by assessing the amount of cash they have, the level of indebtedness, and profitability. The analysis was made to identify and analyze factors revealing unicorns' growth and financial flexibility before and after the IPO process. It also shows corporate financial performance dynamics before and after young firms raise significant funds through IPOs.

The research results indicated the significant impact of EBIT - the element of financial flexibility, which indicates the company's internal sources of financing - on the growth of revenues of the unicorns both before and after the IPO. We found that profitability has a negative impact on the growth of unicorns before the IPO, but this relationship becomes positive after the year of IPO. The mixed impact of the level of cash holdings - another indicator of a firm's available financial resources, was found on the revenues of unicorns either, before and after the IPO. The general tendencies revealed the fluctuating impact of cash on the growth before the IPO, but negative impact is found for the periods after the IPO. Still, the effect on the growth of revenues was not significant for the entire period of analysis. The significant negative effect of the level of debt, which limits the financial flexibility of a company, on the revenues after the IPO was found, but no statistically significant impact on the growth of revenue of the unicorns is observed before the IPO. We concluded that more complex measures of financial flexibility should be used to evaluate the financial flexibility of unicorns, allowing for a more comprehensive analysis of the ability of unicorns to attract financial resources as fluctuating tendencies and a lack of significance in some cases were found for this research.

Our research showed that the growth of unicorns is significantly influenced by investment and working capital management policies, therefore, in addition to financial flexibility indicators, we recommend including indicators of investment and working capital management policy in the models that will be used to study the financial factors determining the growth of unicorns.

## 7.2. Policy implications

Firstly, we have combined Resource Based Theory with the theories of capital structure into one theoretical framework, which enriches the theoretical mechanism of the study of financial resources and their limitations that determine the growth of companies. Secondly, in formulating the research design, we assessed the specific characteristics of unicorns in terms of attracting their financial resources and included in the study those most relevant to unicorns. Third, instead of the traditionally used financial leverage, we included the components of financial flexibility in the research model, which are crucial for the rapid growth of unicorns, related to the use of promising investment opportunities. Fourth, unlike other researchers, we included capital investment as a necessary factor for the growth and success of unicorns in the research model of the determinants of growth rates of unicorns, and also, evaluating the importance of working capital management for financial stability, we included factors indicating of working capital management policies. Fifth, we constructed a research model to evaluate the influence of all the above-mentioned financial factors before the IPO, when unicorns face extreme financial resource constraints. After the IPO, when the deficit of financial resources decreased or disappeared, we supplemented the Resource Based Theory with our obtained results. All this provides new theoretical perspectives for future research. Based on our findings, unicorns should pay more attention to capital investments and working capital management to assure their growth rate after the IPO. Moreover, these findings might be helpful for investors in taking investment decisions, for owners of younger but rapidly growing companies and for governmental institutions in taking decisions oriented to support such companies.

## 7.3. Limitations and future studies

The limitations of this paper come from the study of a specific context and a small number of unicorns with the IPOs operating in the world and a limited number of those operating in the region. However, this research could be extended in the future by analyzing additional questions, such as whether the current instability of the external environment impacts the relationships between the financial flexibility of the unicorns and the stages of their development. Moreover, current research could be supplemented by additional elements that would ensure a more objective evaluation of the financial flexibility of unicorns. A higher number of observations could help evaluate the relationships between financial flexibility and the growth of unicorns more comprehensively. Additional methods might be used for further research to strengthen the existing findings. A higher number of observations would allow separating unicorns by the stages of growth, which would allow analyzing the factors affecting the success or failure of unicorns at different stages of growth. An analysis of unicorns operating in other regions would be helpful for comparative purposes, as the research of unicorns are novel and raises the interest of academia, investors and the founders of young but rapidly growing startups. In addition, the analysis of non-IPO unicorns would allow comparing the tendencies and relationships between financial flexibility and growth of unicorns which have slightly different capital structures and those which have chosen different ways of development.

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## Author contribution statement

Man Zhou; Bohdan Kovalov: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Inga Kartanaitė; Rasa Norvaišienė; Rytis Krušinskas: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

## Data availability statement

Data will be made available on request.

## Additional information

No additional information is available for this paper.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## References

- [1] Y. Honjo, N. Harada, SME policy, financial structure and firm growth: evidence from Japan, *Small Bus. Econ.* 27 (4) (Oct. 2006) 289–300, <https://doi.org/10.1007/S11187-005-6703-0>.
- [2] L. Lang, E. Ofek, R.M. Stulz, Leverage, investment, and firm growth, *J. Financ. Econ.* 40 (1) (Jan. 1996) 3–29, [https://doi.org/10.1016/0304-405X\(95\)00842-3](https://doi.org/10.1016/0304-405X(95)00842-3).

- [3] H.T. Dinh, D.A. Mavridis, B.B. Nguyen, The binding constraint on Firms' Growth in developing countries [Online]. Available: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1714898](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1714898), 2010. (Accessed 17 December 2022).
- [4] A. Heshmati, On the growth of micro and small firms: evidence from Sweden, 173, *Small Bus. Econ.* 17 (2001) 213–228, <https://doi.org/10.1023/A:1011886128912>, 2001.
- [5] K.P. Huynh, R.J. Petrunia, Age effects, leverage and firm growth, *J. Econ. Dynam. Control* 34 (5) (May 2010) 1003–1013, <https://doi.org/10.1016/J.JEDC.2010.01.007>.
- [6] H. Kachlami, D. Yazdanfar, Determinants of SME growth: the influence of financing pattern. An empirical study based on Swedish data, *Manag. Res. Rev.* 39 (9) (2016) 966–986, <https://doi.org/10.1108/MRR-04-2015-0093/FULL/PDF>.
- [7] P. Davidsson, P. Steffens, J. Fitzsimmons, Growing profitable or growing from profits: putting the horse in front of the cart? *J. Bus. Ventur.* 24 (4) (Jul. 2009) 388–406, <https://doi.org/10.1016/J.JBUSVENT.2008.04.003>.
- [8] A. Coad, Testing the principle of 'growth of the fitter': the relationship between profits and firm growth, *Struct. Change Econ. Dynam.* 18 (3) (Sep. 2007) 370–386, <https://doi.org/10.1016/J.STRUECO.2007.05.001>.
- [9] S. Liang, R. Yu, Z. Liu, W. Wang, L. Wu, X. Hu, An empirical study on the asset-light operation and corporate performance of China's tourism listed companies, *Heliyon* 9 (2) (Feb. 2023), e13391, <https://doi.org/10.1016/J.HELIYON.2023.E13391>.
- [10] V. Subramaniam, S. Wasuzazzam, Geographical diversification, firm size and profitability in Malaysia: a quantile regression approach, *Heliyon* 5 (10) (Oct. 2019), e02664, <https://doi.org/10.1016/J.HELIYON.2019.E02664>.
- [11] F.R. Kaen, H.D. Baumann, Firm Size, Employees and Profitability in U.S. Manufacturing Industries, Jan. 2003, <https://doi.org/10.2139/SSRN.382402>.
- [12] A. Coad, J. Frankish, R.G. Roberts, D.J. Storey, Growth paths and survival chances: an application of Gambler's Ruin theory, *J. Bus. Ventur.* 28 (5) (Sep. 2013) 615–632, <https://doi.org/10.1016/J.JBUSVENT.2012.06.002>.
- [13] J.S. Federico, J.L. Capelleras, The heterogeneous dynamics between growth and profits: the case of young firms, *Small Bus. Econ.* 44 (Feb. 2015) 231–253, <https://doi.org/10.1007/S11187-014-9598-9/TABLES/8>.
- [14] J. Okrah, A. Nepp, E. Agbozo, Exploring the factors of startup success and growth, *Bus. Manag. Rev.* 9 (2018) 229–237.
- [15] S.G. Anton, Leverage and firm growth: an empirical investigation of gazelles from emerging Europe, *Int. Entrepren. Manag. J.* 15 (1) (2019) 209–232, <https://doi.org/10.1007/s11365-018-0524-5>.
- [16] P.D. Gupta, S. Guha, S.S. Krishnaswami, Firm growth and its determinants, *J. Innov. Entrep.* 2 (15) (Jun. 2013) 1–14, <https://doi.org/10.1186/2192-5372-2-15>.
- [17] K.C. Brown, K.W. Wiles, In search of Unicorns: private IPOs and the changing markets for private equity investments and corporate control, *J. Appl. Corp. Financ.* 27 (3) (2015) 34–48 [Online]. Available: [https://www.researchgate.net/profile/Ken-Wiles-2/publication/318420591\\_In\\_Search\\_of\\_Unicorns\\_Private\\_IPOs\\_and\\_the\\_Changing\\_Markets\\_for\\_Private\\_Equity\\_Investments\\_and\\_Corporate\\_Control/links/59a47a43a6fdcc773a374393/In-Search-of-Unicorns-Private-IPOs-and-t](https://www.researchgate.net/profile/Ken-Wiles-2/publication/318420591_In_Search_of_Unicorns_Private_IPOs_and_the_Changing_Markets_for_Private_Equity_Investments_and_Corporate_Control/links/59a47a43a6fdcc773a374393/In-Search-of-Unicorns-Private-IPOs-and-t).
- [18] C.P. Nawir, N. Christiani, The effect of entrepreneurial passion and opportunity awareness toward the sustainability of startup businesses, *J. Entrep. dan Entrep.* 8 (1) (2019) 33–40, <https://doi.org/10.37715/jee.v8i1.1115>.
- [19] Š. Slavik, The business model of start-up-structure and consequences, *Adm. Sci.* 9 (3) (2019) 69, <https://doi.org/10.3390/admsci9030069>.
- [20] R. Berman, C. Easley, S. Blank, "Startup genome report 01," [Online]. Available: [https://canada.paristech-alumni.org/global/gene/link.php?news\\_link=2011084343\\_startup-genome.pdf&fg=1](https://canada.paristech-alumni.org/global/gene/link.php?news_link=2011084343_startup-genome.pdf&fg=1), 2011.
- [21] Y. Kim, A. Heshmati, Analysis of Korean IT startups' initial public offering and their post-IPO performance, *J. Prod. Anal.* 34 (2) (Apr. 2010) 133–149, <https://doi.org/10.1007/s11123-010-0176-0>.
- [22] N. Yalçın, U. Ünlü, A multi-criteria performance analysis of initial public offering (IPO) firms using critic and vikor methods, *Technol. Econ. Dev. Econ.* 24 (2) (Mar. 2018) 534–560, <https://doi.org/10.3846/20294913.2016.1213201>.
- [23] G. Andrieu, M. La Rocca, T. La Rocca, R. Staglianò, Debt Financing and Firm Growth: European Evidence on Startups, 2021 [Online]. Available: <https://papers.ssrn.com/sol3/Delivery.cfm?abstractid=3919521>.
- [24] R. Gibrat, *Les Inegalités Economiques*, Sirey, 1931. <https://cir.nii.ac.jp/crid/1573950399584830336>. (Accessed 28 June 2023).
- [25] P.A. Geroski, Understanding the implications of empirical work on corporate growth rates, *Manag. Decis. Econ.* 26 (2) (Mar. 2005) 129–138, <https://doi.org/10.1002/MDE.1207>.
- [26] E. Stam, Growth beyond Gibrat: firm growth processes and strategies, *Small Bus. Econ.* 35 (2) (Jul. 2010) 129–135, <https://doi.org/10.1007/S11187-010-9294-3/FIGURES/1>.
- [27] H. Zhou, R. Zondo, Do firms' growth rates follow a random walk? Evidence from incubated small and medium enterprises in South Africa, *African J. Inter/Multidisciplinary Stud.* 5 (1) (2023) 1–12, <https://doi.org/10.51415/AJIMS.V5I1.1091>.
- [28] I. Giotopoulos, G. Fotopoulos, Intra-industry growth dynamics in the Greek services sector: firm-level estimates for ICT-producing, ICT-using, and non-ICT industries, *Rev. Ind. Organ.* 36 (1) (Feb. 2010) 59–74, <https://doi.org/10.1007/S11151-010-9241-0>, 2010 361.
- [29] A. Coad, S.O. Daunfeldt, D. Halvarsson, Bursting into life: firm growth and growth persistence by age, *Small Bus. Econ.* 50 (1) (Jan. 2018) 55–75, <https://doi.org/10.1007/S11187-017-9872-8/TABLES/7>.
- [30] C.Y. Lee, A theory of firm growth: learning capability, knowledge threshold, and patterns of growth, *Res. Policy* 39 (2) (Mar. 2010) 278–289, <https://doi.org/10.1016/J.RESPOL.2009.12.008>.
- [31] M. Mazzucato, S. Parris, High-growth firms in changing competitive environments: the US pharmaceutical industry (1963 to 2002), *Small Bus. Econ.* 44 (1) (Jan. 2015) 145–170, <https://doi.org/10.1007/S11187-014-9583-3/TABLES/8>.
- [32] E.T. Penrose, *The Theory of the Growth of the Firm*, Oxford University Press., NY, 1959.
- [33] A.M. Habib, Do business strategies and environmental, social, and governance (ESG) performance mitigate the likelihood of financial distress? A multiple mediation model, *Heliyon* 9 (7) (Jul. 2023), e17847, <https://doi.org/10.1016/J.HELIYON.2023.E17847>.
- [34] A.M. Habib, T. Dalwai, Does the efficiency of a firm's intellectual capital and working capital management affect its performance? *J. Knowl. Econ.* (Mar. 2023) 1–37, <https://doi.org/10.1007/S13132-023-01138-7>, 2023.
- [35] A.M. Habib, U.N. Kayani, Does the efficiency of working capital management affect a firm's financial distress? Evidence from UAE, *Corp. Gov.* 22 (7) (Oct. 2022) 1567–1586, <https://doi.org/10.1108/CG-12-2021-0440/FULL/PDF>.
- [36] V. Lefebvre, The growth process of IPO firms, *J. Bus. Ventur.* Insights 19 (Jun. 2023), e00377, <https://doi.org/10.1016/J.JBVI.2023.E00377>.
- [37] M.N. Uddin, Leverage structure decisions in Bangladesh: managers and investors' view, *Heliyon* 7 (6) (Jun. 2021), e07341, <https://doi.org/10.1016/J.HELIYON.2021.E07341>.
- [38] W.E. Melesse, E. Berihun, F. Baylie, D. Kenubih, The role of public policy in debt level choices among small-scale manufacturing enterprises in Ethiopia: conditional mixed process approach, *Heliyon* 7 (12) (Dec. 2021), e08548, <https://doi.org/10.1016/J.HELIYON.2021.E08548>.
- [39] T. Dalwai, A.M. Habib, S.S. Mohammadi, K. Hussainey, Does managerial ability and auditor report readability affect corporate liquidity and cost of debt? *Asian Rev. Account.* 31 (3) (Jun. 2023) 437–459, <https://doi.org/10.1108/ARA-06-2022-0151/FULL/PDF>.
- [40] S. Coleman, C. Cotei, J. Farhat, The debt-equity financing decisions of U.S. startup firms, *J. Econ. Finance* 40 (1) (Jan. 2016) 105–126, <https://doi.org/10.1007/S12197-014-9293-3/TABLES/6>.
- [41] A. Jahanzab, A. Ahmadimousaabad, N. Hafiz Bajuri, M. Karami, F. Of management, and U. Teknologi Malaysia, "trade-off theory, pecking order theory and market timing theory: a comprehensive review of capital structure theories," *Int. J. Manag. Commer. Innov.* 1 (2013) 11–18. [Online]. Available: [https://www.researchgate.net/profile/Agha-Jahanzab/publication/264422625\\_Trade-Off\\_Theory\\_Pecking\\_Order\\_Theory\\_and\\_Market\\_Timing\\_Theory\\_A\\_Comprehensive\\_Review\\_of\\_Capital\\_Structure\\_Theories/links/53de2a730cf216e4210c4ed1/Trade-Off-Theory-Pecking-Order-Theo](https://www.researchgate.net/profile/Agha-Jahanzab/publication/264422625_Trade-Off_Theory_Pecking_Order_Theory_and_Market_Timing_Theory_A_Comprehensive_Review_of_Capital_Structure_Theories/links/53de2a730cf216e4210c4ed1/Trade-Off-Theory-Pecking-Order-Theo). (Accessed 28 June 2023).
- [42] E.F. Fama, K.R. French, Testing trade-off and pecking order predictions about dividends and debt, *Rev. Financ. Stud.* 15 (1) (2002) 1–33 [Online]. Available: <https://www.jstor.org/stable/2696797>. (Accessed 28 June 2023).
- [43] M.Z. Frank, et al., Capital structure decisions: which factors are reliably important? *Financ. Manag.* 38 (1) (Mar. 2009) 1–37, <https://doi.org/10.1111/J.1755-053X.2009.01026.X>.

- [44] H. Zhou, G. de Wit, Determinants and dimensions of firm growth, *SSRN Electron. Journal. SCALES EIM Res. Reports* (Feb. 2009), <https://doi.org/10.2139/SSRN.1443897>.
- [45] V.O. Okolo, M.I. Ohanagorom, E.R. Okocha, O.B. Muoneke, K.I. Okere, Does financing SMEs guarantee inclusive growth and environmental sustainability in the European Union? *Heliyon* 9 (4) (Apr. 2023), e15095 <https://doi.org/10.1016/J.HELIYON.2023.E15095>.
- [46] W. Li, W. Pang, Digital inclusive finance, financial mismatch and the innovation capacity of small and medium-sized enterprises: evidence from Chinese listed companies, *Heliyon* 9 (2) (Feb. 2023), e13792, <https://doi.org/10.1016/J.HELIYON.2023.E13792>.
- [47] P.P. Iglesias-Sánchez, A. Fayolle, C. Jambriño-Maldonado, C. de las Heras-Pedrosa, Open innovation for entrepreneurial opportunities: how can stakeholder involvement foster new products in science and technology-based start-ups? *Heliyon* 8 (12) (Dec. 2022), e11897 <https://doi.org/10.1016/J.HELIYON.2022.E11897>.
- [48] A.T. Bui, T.P. Pham, L.C. Pham, T.K. Van Ta, Legal and financial constraints and firm growth: small and medium enterprises (SMEs) versus large enterprises, *Heliyon* 7 (12) (Dec. 2021), e08576, <https://doi.org/10.1016/J.HELIYON.2021.E08576>.
- [49] Y. Fuertes-Callén, B. Cuellar-Fernández, Inter-relationship between firm growth and profitability in a context of economic crisis, *J. Bus. Econ. Manag.* 20 (1) (Feb. 2019) 86–106, <https://doi.org/10.3846/JBEM.2019.6928>.
- [50] S. Mansikkamäki, Firm growth and profitability: the role of age and size in shifts between growth–profitability configurations, *J. Bus. Ventur. Insights* 19 (Jun. 2023), e00372, <https://doi.org/10.1016/J.JBVI.2023.E00372>.
- [51] F. Delmar, A. McKelvie, K. Wennberg, Untangling the relationships among growth, profitability and survival in new firms, *Technovation* 33 (8–9) (Aug. 2013) 276–291, <https://doi.org/10.1016/J.TECHNOVATION.2013.02.003>.
- [52] E.K. Laitinen, Discounted cash flow (DCF) as a measure of startup financial success, *Theor. Econ. Lett.* 9 (8) (2019) 2997–3020, <https://doi.org/10.4236/tel.2019.98185>.
- [53] L. Zingales, Survival of the fittest or the fattest? Exit and financing in the trucking industry, *J. Finance* 53 (3) (Jun. 1998) 905–938, <https://doi.org/10.1111/0022-1082.00039>.
- [54] K. Guo, T. Zhang, Research on the development path and growth mechanism of unicorn enterprises, *Math. Probl Eng.* 2021 (2021), <https://doi.org/10.1155/2021/9960828>.
- [55] D. Lee, K.C. Lin, How to transform sustainable energy technology into a unicorn start-up: technology review and case study, *Sustainability* 12 (7) (Apr. 2020) 3018, <https://doi.org/10.3390/SU12073018>.
- [56] C. Bock, C. Hackober, Unicorns-what drives multibillion-dollar valuations? *Bus. Res.* 1 (36) (2020) <https://doi.org/10.1007/s40685-020-00120-2>.
- [57] E. Dinlersoz, Şebnem Kalemli-Özcan, H. Hyatt, V. Penciakova, Leverage over the Firm Life Cycle, Firm Growth, and Aggregate Fluctuations, Federal Reserve Bank of Atlanta, Nov. 2019, <https://doi.org/10.29338/WP2019-18>.
- [58] P. Musso, S. Schiavo, The impact of financial constraints on firm survival and growth, *J. Evol. Econ.* 18 (Feb. 2008) 135–149, <https://doi.org/10.1007/s00191-007-0087-z>.
- [59] M.M. Rahaman, Access to financing and firm growth, *J. Bank. Finance* 35 (3) (Mar. 2011) 709–723, <https://doi.org/10.1016/J.JBANKFIN.2010.09.005>.
- [60] D.J. Denis, Financial flexibility and corporate liquidity, *J. Corp. Finance* 17 (3) (Jun. 2011) 667–674, <https://doi.org/10.1016/J.JCORPFIN.2011.03.006>.
- [61] A. Gamba, A. Triantis, The value of financial flexibility, *J. Finance* 63 (5) (Oct. 2008) 2263–2296, <https://doi.org/10.1111/J.1540-6261.2008.01397.X>.
- [62] J. Ang, A. Smedema, Financial flexibility: do firms prepare for recession? *J. Corp. Finance* 17 (3) (Jun. 2011) 774–787, <https://doi.org/10.1016/J.JCORPFIN.2011.02.001>.
- [63] M.S. Rapp, T. Schmid, D. Urban, The value of financial flexibility and corporate financial policy, *J. Corp. Finance* 29 (Dec. 2014) 288–302, <https://doi.org/10.1016/J.JCORPFIN.2014.08.004>.
- [64] H. DeAngelo, L. DeAngelo, Capital Structure, Payout Policy, and Financial Flexibility, Elsevier BV, Oct. 2007, <https://doi.org/10.2139/SSRN.916093>.
- [65] N.D. Daniel, D.J. Denis, L. Naveen, Sources of financial flexibility: evidence from cash flow shortfalls [Online]. Available: [https://www.researchgate.net/profile/Naveen-Daniel/publication/228597401\\_Sources\\_of\\_financial\\_flexibility\\_Evidence\\_from\\_cash\\_flow\\_shortfalls/links/00463521aad4003712000000/Sources-of-financial-flexibility-Evidence-from-cash-flow-shortfalls.pdf](https://www.researchgate.net/profile/Naveen-Daniel/publication/228597401_Sources_of_financial_flexibility_Evidence_from_cash_flow_shortfalls/links/00463521aad4003712000000/Sources-of-financial-flexibility-Evidence-from-cash-flow-shortfalls.pdf), 2010. (Accessed 17 December 2022).
- [66] C.A. Ma, Y. Jin, What drives the relationship between financial flexibility and firm performance: investment scale or investment efficiency? Evidence from China, *Emerg. Mark. Finance Trade* 52 (9) (Sep. 2016) 2043–2055, <https://doi.org/10.1080/1540496X.2015.1098036>.
- [67] M. Kuti, Cash flow at risk, financial flexibility and financing constraint, *Publ. Finance Q.* 56 (4) (2011) 505–517 [Online]. Available: <https://www.researchgate.net/publication/254441781>. (Accessed 17 December 2022).
- [68] D. Hess, P. Immenkötter, How Much Is Too Much? Debt Capacity and Financial Flexibility, Elsevier BV, Mar. 2014, <https://doi.org/10.2139/SSRN.1990259>.
- [69] Y. Cai, Y. Wu, “The influence of financial flexibility on enterprise’s profitability in the future.”, in: In 1st Africa-Asia Dialogue Network (AADN) International Conference (AADNIC 2019), Oct. 2019, pp. 20–25, <https://doi.org/10.2991/ASSEHR.K.201012.004>, 476.
- [70] M. Perić, J. Đurkin, Determinants of investment decisions in a crisis: perspective of Croatian small firms, *Management* 20 (2) (Dec. 2015) 115–133 [Online]. Available: <https://hrcak.srce.hr/file/221547>. (Accessed 17 December 2022).
- [71] A.M. Habib, U.N. Kayani, Evaluating the super-efficiency of working capital management using data envelopment analysis: does COVID-19 matter? *Oper. Res. Forum* 4 (2) (Jun. 2023) 1–20, <https://doi.org/10.1007/S43069-023-00217-4/TABLES/7>.
- [72] R. Rasyid, Impact of the aggressive working capital management policy on firm’s profitability and value: study on non-financial listed firms in Indonesia stock exchange, in: In International Conference on Business and Management Research, ICBMR, Nov. 2017, pp. 207–216, <https://doi.org/10.2991/ICBMR-17.2017.20>, 2017.
- [73] S. Baños-Caballero, P.J. García-Teruel, P. Martínez-Solano, How does working capital management affect the profitability of Spanish SMEs? *Small Bus. Econ.* 39 (2) (Sep. 2012) 517–529, <https://doi.org/10.1007/S11187-011-9317-8/TABLES/7>.
- [74] H. Masri, Y. Abdulla, A multiple objective stochastic programming model for working capital management, *Technol. Forecast. Soc. Change* 131 (Jun. 2018) 141–146, <https://doi.org/10.1016/J.TECHFORE.2017.05.006>.
- [75] O.A. Thakur, D. Mukhtadir-Al-Mukit, Working capital financing policy and profitability: empirical study on Bangladeshi listed firms, *Br. J. Econ. Manag. Trade* 17 (1) (Apr. 2017) 1–6, <https://doi.org/10.9734/BJEMT/2017/32595>.
- [76] S. Pysarenko, V. Alexeev, F. Tapon, Predictive blends: fundamental indexing meets markowitz, *J. Bank. Finance* 100 (Mar. 2019) 28–42, <https://doi.org/10.1016/J.JBANKFIN.2018.12.016>.
- [77] A. Bielykh, S. Pysarenko, D.M. Ren, O. Kubatko, Market expectation shifts in option-implied volatilities in the us and UK stock markets during the brexit vote, *Invest. Manag. Financ. Innovat.* 18 (4) (2021) 366–379, [https://doi.org/10.21511/IMFI.18\(4\).2021.30](https://doi.org/10.21511/IMFI.18(4).2021.30).
- [78] L. Satalkina, G. Steiner, Digital entrepreneurship and its role in innovation systems: a systematic literature review as a basis for future research avenues for sustainable transitions, *Sustain. Times* 12 (7) (Apr. 2020) 2764, <https://doi.org/10.3390/SU12072764>, 2020, Vol. 12, Page 2764.
- [79] T.J. Chemmanur, K. Krishnan, D.K. Nandy, How does venture capital financing improve efficiency in private firms? A look beneath the surface, *Rev. Financ. Stud.* 24 (12) (Dec. 2011) 4037–4090, <https://doi.org/10.1093/rfs/hhr096>.
- [80] E.K. Laitinen, Profitability ratios in the early stages of a startup, *J. Entrep. Financ.* 19 (2) (2017) 1–28 [Online]. Available: <https://digitalcommons.pepperdine.edu/jef/vol19/iss2/3>. (Accessed 9 November 2020).
- [81] C.P. Tang, T.C.K. Huang, S.T. Wang, The impact of Internet of things implementation on firm performance, *Telematics Inf.* 35 (7) (Oct. 2018) 2038–2053, <https://doi.org/10.1016/j.tele.2018.07.007>.
- [82] M. Rossi, J. Chouaibi, D. Graziano, G. Festa, Corporate venture capitalists as entrepreneurial knowledge accelerators in global innovation ecosystems, *J. Bus. Res.* 142 (Mar. 2022) 512–523, <https://doi.org/10.1016/J.JBUSRES.2022.01.003>.
- [83] P.A. Gloor, A. Fronzetti Colladon, F. Grippa, B.M. Hadley, S. Woerner, The impact of social media presence and board member composition on new venture success: evidences from VC-backed U.S. startups, *Technol. Forecast. Soc. Change* 157 (2020), 120098, <https://doi.org/10.1016/j.techfore.2020.120098>.
- [84] Eurostat, “Glossary:High-growth Enterprise - Statistics Explained,” 2020. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-growth\\_enterprise](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-growth_enterprise). (Accessed 27 September 2020).

- [85] T. Kollmann, C. Stockmann, J. Linstaedt, J. Kensbock, European startup monitor [Online]. Available: [https://deuschestartups.org/research/fileadmin/presse/download/esm\\_2015.pdf](https://deuschestartups.org/research/fileadmin/presse/download/esm_2015.pdf), 2015.
- [86] J. Kengelbach, U. Berberich, T. Schmid, D. Degen, A. Dickenbrok, What Really Matters for a Premium IPO Valuation?, 2018 [Online]. Available: [https://image-src.bcg.com/Images/BCG-What-Really-Matters-for-a-Premium-IPO-Valuation-July-2018\\_tcm96-196864.pdf](https://image-src.bcg.com/Images/BCG-What-Really-Matters-for-a-Premium-IPO-Valuation-July-2018_tcm96-196864.pdf).
- [87] J.R. Ritter, Growth capital-backed IPOs, *Financ. Rev.* 50 (4) (Nov. 2015) 481–515, <https://doi.org/10.1111/fire.12075>.
- [88] C.B. Insights, Top Unicorn Exits Tracker, 2020. <https://www.cbinsights.com/research-unicorn-exits>. (Accessed 25 November 2020).
- [89] SICCODE.com, SIC Code Lookup | SIC Code Search Tool, 2022. <https://siccode.com/sic-code-lookup-directory>. (Accessed 15 May 2022).
- [90] R. van Emous, R. Krusinskas, W. Westerman, Carbon emissions reduction and corporate financial performance: the influence of country-level characteristics, *Energies* 14 (19) (Sep. 2021) 6029, <https://doi.org/10.3390/EN14196029>, 2021, Vol. 14, Page 6029.
- [91] R.M. O'Brien, A caution regarding rules of thumb for variance inflation factors, *Qual. Quantity* 41 (5) (Mar. 2007) 673–690, <https://doi.org/10.1007/S11135-006-9018-6>, 2007 415.
- [92] X. Gao, J.R. Ritter, Z. Zhu, Where have all the IPOs gone? *J. Financ. Quant. Anal.* 48 (6) (2013) 1663–1692, <https://doi.org/10.1017/S0022109014000015>.
- [93] L. Casanova, K.P. Cornelius, S. Dutta, Technology startups, innovation, and the market for venture capital, in: *Financing Entrepreneurship and Innovation in Emerging Markets*, 2018, pp. 185–218.
- [94] R. Moro-Visconti, *Augmented Corporate Valuation*, first ed., Palgrave Macmillan, Cham, 2022.
- [95] C.V.C. Casnici, The rise of unicorn companies: a magical growth? in: S.H. Park, M.A. Gonzalez-Perez, D.E. Floriani (Eds.), *The Palgrave Handbook of Corporate Sustainability in the Digital Era* Palgrave Macmillan, Cham, 2021, pp. 581–593.
- [96] T. Mittal, R. Scholar, G. Kangri Vishvidhalaya, M. Pankaj, D. Head, P. Madan, Impact of Financing Patterns on Profitability of e-Startups in India: a study of selected organizations, *Int. J. Res. Econ. Soc. Sci.* 8 (3) (2018) [Online]. Available: <http://www.euroasiapub.org>. (Accessed 7 March 2023).
- [97] W.C. Lu, R.L. Jhuang, Cash flow and growth considering different ownership structure, *J. Model. Manag.* 9 (1) (2014) 5–17, <https://doi.org/10.1108/JM2-04-2011-0028>.
- [98] Y. Fuertes-Callén, B. Cuellar-Fernández, C. Serrano-Cinca, Predicting startup survival using first years financial statements, *J. Small Bus. Manag.* (2020) 1–37, <https://doi.org/10.1080/00472778.2020.1750302>.