PREDICTING GROWTH OF SMES – A MULTILEVEL APPROACH

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Faculty of Economics in Osijek

International inter-university postgraduate interdisciplinary doctoral program
ENTREPRENEURSHIP AND INNOVATIVENESS

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Naziv studija: Međunarodni međusveučilišni poslijediplomski interdisciplinarni doktorski studij PODUZETNIŠTVO I INOVATIVNOST

Naslov rada: PREDICTING GROWTH OF SMES – A MULTILEVEL APPROACH

Mentorice rada: prof. dr. sc. Nataša Šarlija
prof. dr. sc. Mirta Benšić

U Osijeku, 10.02.2022. godine

Potpis: Ana Bilandžić

TEMELJNA DOKUMENTACIJSKA KARTICA

Sveučilište Josipa Jurja Strossmayera u Osijeku **Doktorska disertacija**
Ekonomski fakultet u Osijeku

Znanstveno područje: društvene znanosti
Znanstveno polje: ekonomija

PREDVIĐANJE RASTA MALIH I SREDNJIH PODUZEĆA – PRISTUP NA VIŠE RAZINA

Ana Bilandžić

Disertacija je izrađena u: Osijeku

Mentori: prof. dr. sc. Nataša Šarlija
prof. dr. sc. Mirta Benšić

Kratki sažetak doktorske disertacije: U većini zemalja broj malih i srednjih poduzeća daleko je veći od broja velikih poduzeća, ali što je još važnije, ona zapošljavaju većinu zaposlene radne snage. Što pak ima za posljedicu da se dobrobit ovih poduzeća odražava na stanje gospodarstva. Stoga je cilj ove disertacije izgraditi prediktivni model rasta malih i srednjih poduzeća. Rast je mjeren prodajom, dok su potencijalni prediktori pokrivali karakteristike poduzeća i okruženja. Uključene značajke poduzeća su inovativnost, izvoz, financijski omjeri i firmografske mjere. Obilježja okoliša uključuju BDP, inflaciju, zaposlenost, globalnu krizu i članstvo u EU. Značajne veze s rastom pronađene su među obje skupine karakteristika kroz modeliranje panel podataka.

Broj stranica: 188
Broj slika: 10
Broj tablica: 33
Broj literaturnih navoda: 245
Jezik izvornika: engleski
Ključne riječi: rast poduzeća, rast prodaje, karakteristike poduzeća, karakteristike okruženja, modeliranje panel podataka, učinak interakcije

Datum obrane: 01.04.2022.

Stručno povjerenstvo za obranu:
1. prof. dr. sc. Slavica Singer
2. prof. dr. sc. Sanja Pfeifer
3. prof. dr. sc. Mirjana Čižmešija
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Disertacija je pohranjena u: Nacionalnoj i sveučilišnoj knjižnici Zagreb, Ul. Hrvatske bratske zajednice 4, Zagreb;Gradskoj i sveučilišnoj knjižnici Osijek, Europska avenija 24, Osijek; Sveučilištu Josipa Jurja Strossmayera u Osijeku, Trg sv. Trojstva 3, Osijek; Ekonomskom fakultetu u Osijeku, Trg Lj. Gaja 7, Osijek

BASIC DOCUMENTATION CARD

Josip Juraj Strossmayer University of Osijek **PhD thesis**
Faculty of Economics in Osijek

Scientific Area: social sciences
Scientific Field: economics

PREDICTING GROWTH OF SMES –
A MULTILEVEL APPROACH

Ana Bilandžić

Thesis performed at: Osijek

Supervisor/s: Nataša Šarlija, PhD
Mirta Benšić, PhD

Short abstract: In most countries, the number of small and medium-sized enterprises is far greater than that of large enterprises, but more importantly they employ the majority of the employed workforce. Which in turn has the consequence that the wellbeing of these enterprises is reflected in the state of the economy. Therefore, the aim of this study is to build a predictive model of small and medium sized enterprise growth. Growth was measured by sales, while the potential predictors covered enterprise and environment characteristics. Enterprise characteristics include innovation, export, financial ratios and firmographic measures. Environment characteristics include GDP, inflation, employment, global crisis and EU membership. Significant relationships to growth were found among both groups of characteristics through panel data modelling.

Number of pages: 188
Number of figures: 10
Number of tables: 33
Number of references: 245
Original in: english
Key words: enterprise growth, sales growth, enterprise characteristics, environment characteristics, panel data modelling, interaction effect

Date of the thesis defense: 01.04.2022.

Reviewers:
1. Slavica Singer, PhD
2. Sanja Pfeifer, PhD
3. Mirjana Čižmešija, PhD
4. Mirna Leko Šimić, PhD (substitute)

Thesis deposited in: National and University Library in Zagreb, Ul. Hrvatske bratske zajednice 4, Zagreb; City and University Library of Osijek, Europska avenija 24, Osijek; Josip Juraj Strossmayer University of Osijek, Trg sv. Trojstva 3, Osijek; Faculty of Economics in Osijek, Trg Lj. Gaja 7, Osijek

ABSTRACT

Small and medium-sized enterprises are more efficient, more adaptable, contribute more to employment and are more resistant to the economic crisis compared to large enterprises. The Croatian economy, like the economies of most other countries, consists mainly of small and medium-sized enterprises. Therefore, the overall state of these enterprises has a strong impact on the whole economy and the well-being of its members. It is in the interest of the economy that small and medium-sized enterprises grow. How they grow, what affects their growth, and whether it is possible to predict that growth has become a popular research topic.

Early studies assumed that it was primarily the characteristics of the owner or manager that influenced enterprise growth. Today, characteristics of the enterprise are gaining more attention, while the characteristics of the environment are very unduly underrepresented.

The aim of this study is to build a predictive model for growth, measured by sales, that considers enterprise and environment characteristics as predictors. The enterprise characteristics include innovation, export, financial ratios, and firmographic characteristics. Environment characteristics include the global crisis of 2008, membership in the European Union, and macroeconomic indicators - gross domestic product, inflation, and unemployment rate.

To obtain the growth model, two datasets were used. The first was a balanced panel dataset of 13808 Croatian small and medium-sized enterprises over the period between 2001 and 2015. The second dataset included macroeconomic indicators and variables related to EU membership and the global crisis. Panel modelling techniques were used to build the models. A total of 7 models is presented, 6 of which are static models and one dynamic model. Out of the 6 static models three are fixed effects models, and three are random effects models.

The models confirmed that sales growth can be predicted by using enterprise and environment characteristics. Increasing values of innovation, export, financial ratios, gross domestic product, EU accession, and the global crisis had a positive effect on sales growth of Croatian enterprises. On the other hand, the increase in the inflation rate and unemployment rate had a negative impact on sales growth. Moreover, it was confirmed that inflation and export mutually reinforce i.e., amplify, the impact of growth.

The most notable contribution lies in the use of a large number of variables covering many groups. They range from those that appear in many studies, such as innovation and export, to those which are rarely included, such as financial ratios. The results on factors influencing growth at the macroeconomic level are of particular interest, some of which have not previously been included in quantitative models of small and medium-sized enterprise growth. Another advantage over other studies is the use of interaction effects, which provide insight into how variables influence each other's impact on sales growth. Finally, the use of a panel dataset allowed for analysis of a better quality and more reliable results.

Key words: enterprise growth, sales growth, enterprise characteristics, environment characteristics, panel data modelling, interaction effect

SAŽETAK

Mala i srednja poduzeća su učinkovitija, prilagodljivija, više pridonose zapošljavanju i otpornija su na gospodarsku krizu u odnosu na velika poduzeća. Hrvatsko gospodarstvo, kao i gospodarstva većine drugih zemalja, uglavnom čine mala i srednja poduzeća. Stoga cjelokupno stanje ovih poduzeća ima snažan utjecaj na cjelokupno gospodarstvo i dobrobit njegovih sudionika. Gospodarstvu je u interesu da mala i srednja poduzeća postižu što veći rast. Kako ta poduzeća rastu, što utječe na njihov rast i je li moguće predvidjeti njihov rast je postala popularna tema znanstvenih istraživanja.

Rana istraživanja pretpostavljale su da su prvenstveno karakteristike vlasnika ili menadžera te koje utječu na rast poduzeća. Danas se sve više pažnje posvećuje karakteristikama poduzeća, dok su karakteristike okoliša gotovo nezastupljene.

Cilj ove studije je izgraditi prediktivni model rasta, mjeren prodajom, koji koristi karakteristike poduzeća i okruženja kao prediktore. Karakteristike poduzeća uključuju inovacije, izvoz, financijske omjere i firmografske karakteristike. Obilježja okoliša uključuju globalnu krizu iz 2008. godine, članstvo u Europskoj uniji, te makroekonomske pokazatelje - bruto domaći proizvod, inflaciju i stopu nezaposlenosti.

Za dobivanje modela rasta korištena su dva skupa podataka. Prvi je bio balansirani skup panel podataka od 13808 hrvatskih malih i srednjih poduzeća u razdoblju od 2001. do 2015. godine. Drugi skup podataka uključivao je makroekonomske pokazatelje i varijable vezane uz članstvo u EU i globalnu krizu. Za izradu modela korištene su tehnike modeliranja panela. Predstavljeno je ukupno 7 modela, od kojih su 6 statički panel modeli i jedan dinamički panel model. Od šest statičkih modela tri su modelirana s fiksnim efektima a tri sa slučajnim efektima.

Modeli su potvrdili da se rast prodaje može predvidjeti korištenjem karakteristika poduzeća i okruženja. Povećanje vrijednosti inovacija, izvoza, financijskih pokazatelja, bruto domaćeg

proizvoda, ulazak u EU i globalna kriza pozitivno su utjecali na rast prodaje hrvatskih poduzeća. S druge strane, porast stope inflacije i nezaposlenosti negativno su utjecali na rast prodaje. Štoviše, potvrđeno je da inflacija i izvoz međusobno ojačavaju, svoj utjecaj na rast prodaje poduzeća.

Najznačajniji doprinos leži u korištenju velikog broja varijabli koje pokrivaju mnoge skupine. Oni se kreću od onih koji se pojavljuju u mnogim istraživanjima, kao što su inovacije i izvoz, do onih koje se rijetko uključuju, kao što su financijski omjeri. Posebno su zanimljivi rezultati o čimbenicima na makroekonomskoj razini koji utječu na rast, od kojih neki dosad nisu bili uključeni u kvantitativne modele rasta malih i srednjih poduzeća. Dodatna prednost u odnosu na druge studije je korištenje učinaka interakcije, koji daju uvid u to kako varijable međusobno jedna drugoj mijenjaju utjecaj na rast prodaje. Također, korištenje panela podataka omogućilo je analizu kvalitetnijih i pouzdanijih rezultata.

Disertacija se sastoji od šest poglavlja, uključujući uvod i zaključak. U uvodu je objašnjena motivacija za pisanje disertacije na ovu temu te koji joj je cilj. Također su navedene hipoteze. Četrnaest hipoteza je objedinjenom pod glavnom hipotezom da se rast malih i srednjih poduzeća može modelirati pomoću karakteristika poduzeća i njegove okoline. Te su navedeni očekivani znanstveni i praktični doprinosi. Nakon uvoda slijedi poglavlje koje razrađuje definicije malih i srednjih poduzeća, definicije njihovog rasta te metode koje su prethodna istraživanja koristila u promatranju njihovog rasta. Naredna dva poglavlja sistematiziraju istraživanja koja se bave rastom malih i srednjih poduzeća. U prvom su navedene teorije rasta, dok su u drugom suvremena istraživanja podijeljena u tri skupine prema glavnim karakteristikama koje utječu na rast – karakteristike poduzetnika, karakteristike poduzeća i karakteristike okoline. Slijedi empirijski dio disertacije, u njemu su obrađeni panel podaci, njihove deskriptivne statistike te statističke i dinamičke panel metode. Slijedi deskriptivna statistika Hrvatskih malih i srednjih poduzeća u periodu 2001-2015 i korelacijske tablice

varijabli zastupljenih u korištenim podacima. Potom su prezentirani dobiveni modeli, te poglavlje završava raspravom. Posljednje poglavlje disertacije je zaključak u kojem se otkrivaju doprinosi, tko ima koristi od dobivenih rezultata te preporuke za poduzetnike, državne vlasti, bankarski sektor i istraživače. Na samom kraju su navedene preporuke za daljnja istraživanja.

Ključne riječi: rast poduzeća, rast prodaje, karakteristike poduzeća, karakteristike okruženja, modeliranje panel podataka, učinak interakcije

I thank my mentors prof. dr. sc. Nataša Šarlija and prof. dr. sc. Mirta Benšić for every well-intentioned comment, guidance and understanding. I also thank my parents, my father for being proud of every success, and my mother for instilling in me the belief that I can do more and that I can do better. I would also like to thank all other close people, my children, my husband, my friends, and my colleagues who contributed in the slightest to bring this dissertation to completion.

To my children,

You are my strength, my happiness, and my love

Contents

1 Introduction

The building blocks of any economy are its enterprises. It is only natural that economists focus most of their research on these building blocks, i.e., on enterprises. For an economy to grow healthily, it is essential that its enterprises grow. This, in turn, leads to an increased interest in researching what enables enterprises to grow and what enterprises need to focus on in order to grow.

In most modern and capitalist countries, especially those in the OECD (Organization for Economic Cooperation and Development) area, two facts should be noted. The first is that most enterprises in the economies of these countries are small or medium-sized (OECD, 2017). The second is that it is beneficial for economies to grow and that one way to achieve this growth is through the growth of small and medium enterprises (SMEs).

The earliest research on enterprise growth focused on the owner and/or manager of the enterprise, which led to a few growth theories. Later, studies emerged that also focused on the characteristics of the enterprise and its environment. As Davidsson (1989) noted, most studies did not initially distinguish between large enterprises and SMEs, and few studies addressed the specific area of small enterprise growth, high-growth in particular. Only nine years later, Weinzimmer et al. (1998) acknowledge that considerable progress has been made in terms of the scope of research.

There is no single definition for small and medium enterprises. Most countries follow the OECD definition, with minor modifications, that SMEs have less than 250 employees. According to OECD (2017), SMEs account for about 99% of enterprises in the OECD area. They are also the main source of employment. On average, they employ about 70% of all employed people in the countries of the OECD area. In the case of Croatia, SMEs employ an even larger share of the total employed workforce, about 80 %. Since SMEs have such a large share of employees in the economy, it became of particular interest to policy makers and researchers to find out what influences the growth of SMEs and what can be done to support this growth. This indirectly opens the possibility of reducing the unemployment rate, which is beneficial for policy makers.

Furthermore, Keskġn et al (2010) stated that SMEs are not only important because of their number and employment power, but they also argued that SMEs have a number of advantages over their larger counterparts. According to them, SMEs are more efficient, more successful in increasing employment, more resilient to economic crises, it is easier for them to keep up with new demands and new technologies, and they are more adaptable. Beck et al. (2005) found that SMEs matter for the growth of the economy, especially when economic growth is measured by GDP per capita.

All these facts contribute to the motivation of investigating SMEs and their growth, specifically what influences their growth.

1.1 Purpose and subject of research

The subject of this study will be what influences growth in small and medium-sized enterprises and what the direction of that influence is. It will also explore what characteristics of the enterprise and characteristics of the environment can be used as determinants to predict enterprise growth.

In order to research growth, the first step must be to define growth. Existing research mainly focuses on two indicators of growth. These indicators are sales and employment. Other indicators that are present in research include total assets, turnover, revenues, return on sales, and return on assets. While some studies observe absolute change or percentage change in the chosen growth indicator, others define specific forms of growth, such as high-growth or even rapid growth.

Different results can be expected depending on how researchers define enterprise growth. Some researchers (Weinzimmer et al. 1998, Ipinnaiye, et al., 2017) found that more information on potential determinants of growth can be extracted by using multiple indicators. Other researchers prefer to use only one growth indicator so that the results are more focused. Since this study focuses on enterprises from only one market - Croatia, and most studies use sales as an indicator of growth, this research defines enterprise growth by increasing sales. Micro, small and medium-sized enterprises are included, some of which may have only a few employees or up to 250 employees. Therefore, the relative growth by adding an employee is large. By using sales, maximum comparability to other studies is maintained and possible misconceptions in comparing results are minimized.

After choosing the definition of growth, the issue becomes how to study that growth. There are many methods in research that look at possible influences on growth. First, there are studies that primarily use statistical tests to confirm a relationship between potential influencing factors and enterprise growth. The second group of studies uses various modelling techniques to create mathematical and statistical models. These models provide information on whether there is a relationship between a potential influencing factor and enterprise growth. In addition, the models provide insight into the direction of the relationship and even provide the ability to calculate current or future enterprise growth, depending on how the model was created. The last group of studies uses results from previous research and, by using methods such as meta-analysis, they can claim with more certainty and fewer limitations what the determinants of growth are.

Researchers have observed many potential variables in order to find out what enables enterprise growth. These can be categorized into three groups - characteristics of the entrepreneur, characteristics of the enterprise, and characteristics of the environment. Characteristics of the entrepreneur are the most popular in research. The first growth theories revolved mainly around the owner of the enterprise. In modern research, given that data processing is simplified by the use of computers, researchers added additional determinants. However, the characteristics of the entrepreneur remained the most popular. Second to entrepreneur characteristics are enterprise characteristics, which are more prone to change. Research that looks at the influence of enterprise characteristics on enterprise growth usually focuses on only one aspect of enterprises. The most popular aspect in research on growth is innovation. Innovation in itself is of interest to most researchers, especially in today's climate where consumerism is at an all-time high and everyone is looking for the next "new thing". Another enterprise characteristic that is present in research is the exporting of the enterprise. Exporting is closely related to innovation and is, therefore, often observed in conjunction with it. In recent years, research that primarily uses financial ratios to predict growth has gained popularity. Most studies include some basic characteristics of the enterprise, such as its age, size, or industry sector. The last group of studies, those that revolve around the characteristics of the environment as determinants of growth, are relatively rare. Those studies that include market characteristics, including level of competitiveness or entries/exits from markets, can be found to an extant even in growth theories. On the other hand, research on influences from the macroeconomic level are reduced to just a few. It is difficult to introduce these variables when the study includes enterprises from only one country, since in most cases the values will be the same for all units. The variables in these studies can range from the level of market competitiveness to policy incentives, as well as macroeconomic variables such as employment rate, inflation, and GDP.

Despite the large number of studies conducted, there are still gaps that provided the impetus for this topic. These gaps include:

1. most studies are limited to a fraction of the entire economy or to only one industry, leaving some industries underrepresented;
2. often only a small number of determinants are examined, leaving out the opportunity to look at a broader picture and gain a better understanding of the real influences;
3. rarely do studies follow enterprises over a number of years, leaving the possibility of drawing incorrect conclusions about whether a determinant is significant or not.

These gaps lead to the fact that the aim of this dissertation is to fill these gaps and explore the growth of SMEs, which determinants influence their growth, how they influence growth, and how this influence changes over time. The aim is to obtain models that can predict SME growth using enterprise-specific variables and macroeconomic level variables. This model will include individual effects of variables and interaction variables, i.e., the joint effect of some variables on growth.

1.2 Research hypotheses

To reflect the aim of the research, the umbrella hypothesis is defined as follows:

Hypothesis 0: SME growth is determined by enterprise characteristics and by macroeconomic variables.

In this research, a number of enterprise characteristics are included - innovation, export, financial ratios (liquidity, leverage, productivity, and profitability ratios), and the industry sector to which the enterprise belongs. In terms of macroeconomic variables, the usefulness of inflation, employment rates, and GDP in predicting enterprise growth is tested. It also examines how the global economic crisis and accession to the European Union affected the sales growth of Croatian enterprises. This is reflected in the more focused hypotheses.

Innovation is a complex problem in SME growth theory. While some researchers did not find it to be a significant driver of growth, others found significant, either negative or positive, relationships with growth. This diversity of findings prompted researchers to further focus on how certain types of innovations affect growth or how they affect growth in various types of enterprises. With new and innovative products, enterprises are more competitive, their products are more attractive to customers, which increases their sales and thus promotes enterprise growth. In line with previous studies on Croatian enterprises (Šarlija & Bilandžić, 2018), a positive relationship between innovation and growth is expected. This leads to the first hypothesis:

H1: Innovation is a positive determinant of growth.

By **exporting**, enterprises gain access to new markets, thus having the opportunity to attract new customers and increase sales. Therefore, growth is expected. However, exporting also opens the door to new information, new contacts, and new products and processes. With the opportunities to gain new knowledge, enterprises have the chance to further develop their products or even invent completely new ones. Export is closely linked to innovation and previous studies have confirmed that innovation and export influence each other in a cycle. The same is expected in this study in the case of Croatia.

H2a: Export is a positive determinant of growth.

H2b: The interaction of export and innovation is a significant determinant of growth.

There is no unanimous answer on **financial ratios** as determinants of growth. Studies divide them into four groups - profitability, liquidity, leverage, and turnover ratios. They do not agree on the importance of these variables nor on the direction of their effect. Research conducted on Croatian SMEs found models in which profitability and turnover ratios have a positive effect on growth and leverage has a negative effect on growth (Jeger et al., 2016). Leverage is expected to be negative due to increased uncertainty and risk from borrowing. With higher liquidity, SMEs have a constant source of funding when an opportunity arises. Therefore, it is expected to have a positive relationship with growth. Higher turnover ratios indicate that an SME can convert fixed assets and total assets into revenue faster. Therefore, it is expected that these ratios also have a positive relationship with growth. With higher profitability ratios, SMEs have more internal resources to finance their investments and take advantage of opportunities, which leads to growth. From this, the following hypotheses were made:

H3a: Liquidity ratios are positive determinants of growth.

H3b: Leverage ratios are negative determinants of growth.

H3c: Turnover ratios are positive determinants of growth.

H3d: Profitability ratios are positive determinants of growth.

Regarding the **industry sector**, most studies examining growth seem to focus on manufacturing industries. Some studies focus on differences between high-tech and low-tech industries, while others find that only the distributions of growth differ across industries and it would, therefore, be possible to simply include an industry variable in the modelling. In this study, all industries are examined and no industry is underrepresented. Since previous studies suggest that differences between industries are to be expected, the industry sector is expected to be a significant variable for growth and, therefore, the following hypothesis is made:

H4: Industrial sector is a significant determinant of growth.

Research on the effect of **macroeconomic variables** on growth is rare. Even fewer studies address the joint effect of these macroeconomic variables and enterprises-specific variables. With a higher **GDP**, a country is in better shape, so it is in a position where incentives and benefits can be expected by SMEs. As a result, a positive influence of GDP on growth rates is expected.

H5: Gross domestic product is a positive determinant of growth.

Theory suggests that when inflation and employment are higher, SME growth is burdened. **Inflation** means higher prices for products and services and, therefore, customers will buy less, reducing SME sales.

H6: Inflation is a negative determinant of growth.

With higher unemployment, i.e., lower employment rates, the labour market becomes crowded, which lowers the price of labour. This also means that there is a greater number of skilled workers available, which gives SMEs the opportunity to save on employee wages. On the other hand, more unemployed people in the total population means less purchasing power, i.e., fewer buyers, which would reduce sales growth and is the more immediate effect. This leads to a negative relationship between unemployment and growth.

H7: Unemployment is a negative determinant of growth.

Since Croatia **joined the European Union**, export restrictions to the EU have been eased, providing SMEs with a larger market and growth opportunities. On the other hand, it became easier for EU enterprises to export to Croatia, which increased competitiveness in the domestic market. Most changes require a period of adjustment and, therefore, an initial negative effect of joining the EU is expected, but export is expected to benefit from EU accession and its impact on growth will only be strengthened.

H8: Joining the European Union is a negative determinant of growth.

H9: Export has a greater impact on growth since Croatia joined the European Union.

Croatia, like the rest of the world, was hit by the global economic crisis in the late 2010s. As mentioned above, SMEs are more resilient to crises compared to large enterprises, but still this does not imply that the impact is not negative. As the whole economy shows a negative trend during a crisis, a negative effect can be expected.

H10: The economic crisis is a negative determinant of growth.

The aim of this study is to obtain a statistical model that can predict the growth of sales of small and medium enterprises. With this statistical model, the hypotheses defined above could be tested.

1.3 Dataset and methods

The dataset used in this research is a secondary dataset provided by the Croatian Financial agency (FINA). It consists of financial statements for the years 2001-2015. The dataset was cleaned of outliers and inconsistencies and only enterprises that had their financial statements for each year in the dataset were included. This resulted in a balanced panel dataset consisting of financial statements of 13808 micro, small, and medium enterprises. These financial statements are used to calculate financial ratios for nine groups:

Table 1 - Table of the groups that contain variables of the enterprise characteristics

Group name of variables	**Number of variables within group**
Innovation and R&D	5
Export	4
Investment	2
Liquidity ratios	4
Leverage ratios	7
Turnover ratios	8
Profitability ratios	4
Productivity ratio	1
Firmographic variables	3

The variables at the macroeconomic level also cover the period between 2001-2015. They are:

- Unemployment rates
- Gross domestic product
- Inflation
- Global crisis
- Membership in the European Union

The first step in data processing is to conduct standard methods of descriptive statistics.

In addition to descriptive statistics, graphical analysis is performed, with a particular emphasis on plotting means of continuous variables over time. Descriptive statistics and simple graphical analysis form the basis for quantitative analysis of the dataset.

Furthermore, correlation matrices are computed to test for multicollinearity among predictor variables.

Panel data modelling is done with panel data, i.e., data that have cross-sectional and time-invariant variables. Thus, each entity, in this particular research - each enterprise, is observed over time. Depending on whether the previous levels of the growth variable are included in the model, the static or dynamic approach is considered. In the static approach, there are three types of models - the pooled OLS (ordinary least squares) model, the fixed effects model, and the random effects model. The dynamic approach uses past levels of the growth variable to model its future levels. Here, the difference and system generalised method of moments are considered.

Pooled models use time-varying variables, but they do not recognise each enterprise as an entity over time. It is possible to add a year indicator variable to control for time influence. The method performs ordinary least squares. Often this method will be described as not being a "true panel method" because it does not require true panel datasets, such as fixed effects model and random effect models. The entities observed in different time periods may be completely different enterprises when pooled OLS is used. Nonetheless, the pooled method is a valuable way to see how a measure has affected the population on average (Wooldridge, 2012).

True panel modelling techniques include random panel models and fixed effect models. Random effect models assume that the time-invariant variables of the model are uncorrelated to all other explanatory variables. In this case, the random effects estimator is used. On the other hand, fixed effect models do not assume that the invariant variable is uncorrelated with other explanatory variables. Two estimators are used to estimate fixed effects models - the first difference estimator and the fixed effects estimator. Both use transformations of the equation being estimated.

To decide which of these estimators is more appropriate, three tests are performed - Lagrange's multiplier test (compares random and pooled models), F-test (compares pooled and fixed models), and Hausman test (compares fixed and random models) (Wooldridge, 2012).

Generalised method of moments (GMM) is the dynamic panel data method most popular in research. It is used on panel datasets that have a large number of entities and a comparatively small number of observations, which is the case here. There are two types of GMM, the difference GMM and the system GMM, which use different transformations of the model equation. The transformations mirror those of the fixed effects estimators.

The obtained model should predict future SME growth as measured by sales. Predictor variables whose regression coefficients are significantly different from zero are interpreted as significant determinants of growth. Moreover, depending on whether the regression coefficient is positive or not, a positive or negative relationship between growth and the associated determinant can be interpreted. This determines whether the hypotheses are rejected or not.

1.4 Expected scientific and practical contribution

The goal of this research is to develop models that predict SME growth by characteristics of the enterprise and the environment. Only a few studies have built such models for Croatian enterprises but with far fewer possible variables and smaller datasets. Beneficiaries of these models would be entrepreneurs themselves, but also policy makers, members of the banking sector, as well as the scientific community. The majority of the practical and scientific contributions are derived from these models.

Scientific contribution

1. The model uses a panel dataset, so it allows the use of variables that hold the same value for all enterprises but change over time. Otherwise, this type of variable can only be used in cross-country studies. In this study, these variables are specifically macroeconomic values and changes at the macroeconomic level. There are not many studies that quantitatively investigate (specifically, they do not create models) how some changes at the macroeconomic level have affected SMEs and specifically SME growth, and this research can be used as a guideline.
2. The joint, i.e., interaction and individual, effect of both characteristics of the enterprise and macroeconomic variables is also observed. While it is common to observe the influence of multiple variables on SME growth in models, rarely will researchers also observe if these variables strengthen each other's influence or weaken it. With the interaction effect of 2 or more variables, it is possible to see how the effect of one predictor variable on the dependent variable is influenced by another predictor variable. How such information can be extracted from datasets will be explained.
3. Specific standard deviations which are specific to panel datasets are explained and measured. Panel datasets are not very common in research of SME growth, and even fewer calculate these standard deviations. By calculating them, insight into the dispersion of the values across time of an entity and across entities in a moment can be observed.
4. The model obtained is expected to include enterprise characteristics that indicate which aspects of the enterprise affect the level of sales. In addition, the nature of the relationship will be clearer, i.e., whether a particular characteristic of the enterprise increases or decreases the level of sales.

5. It is expected that the model will include characteristics of the environment, mainly macroeconomic values and changes at the macroeconomic level. This will provide information on how these characteristics affect the specific group of small and medium enterprises.
6. The model is expected to include both groups of characteristics, enterprise, and environment, which can rarely be found in studies of enterprise growth. This will provide insight into how these characteristics jointly affect SME growth and if it is profitable to include both groups.
7. Two things can be calculated from the model. Firstly, by including the values of the current state of the enterprise and its environment, future levels of sales can be calculated. Second, by incorporating the change in the characteristics of the enterprise and its environment, the expected growth of enterprise sales can be calculated.
8. The model also allows the comparison of different enterprises and determine which enterprises have the potential to grow or which enterprises need assistance to achieve higher sales growth.

Practical contributions:

1. Entrepreneurs will be able to use the obtained model to get an understanding of their potential for growth and how much of an increase in growth they can expect if they alter some of their current enterprise values.
2. Banks can profit from the model by using it to get a better insight into the potential of the enterprise to grow, which would add valuable information on whether it is advisable to loan funds to enterprises.
3. Finally, policy makers can observe how their policies will affect enterprises, their growth, and in turn the entire economy.
4. Information on how the average characteristics of enterprises have changed over time and how they have been affected by the global crises.

1.5 A brief description of the structure of the doctoral dissertation

This dissertation consists of six parts, including the introduction and conclusion. The outline of the dissertation is shown below.

In the introduction, the reader is informed about the subject and the problem of the dissertation. The gaps of the previous studies are mentioned and how this research intends to fill them. Then, a total of fourteen hypotheses are defined, which unite under the main hypothesis that SME growth can be predicted based on enterprise and environment characteristics. A brief overview of the methods to be used in data processing follows. Expected scientific and practical contributions are mentioned. The chapter is concluded with a brief overview of the structure of the dissertation.

The second part of the dissertation gives an insight into the definitions of micro, small, and medium enterprises and which definitions are used in this research. It also provides insight into the different forms of growth used by researchers. Definitions and ways of measuring enterprise growth are also listed.

The theories of growth are the topic of the third chapter. These range from neoclassical theories, orthodox theory, behaviourist theories, stochastic theories, all the way up to evolutionary theory and concluding with population theory. Neoclassical theory is further divided into the static approach and the dynamic approach, which differ in whether the optimal size of the enterprise is a fixed value or whether it changes over time. Behaviourist theories focus on the manager of the enterprise rather than the owner and here again there are two theories - managerial theory and Penrose's theory. The stochastic theories are the first to observe the growth not only influenced by the characteristics of the entrepreneur, but also if and how enterprise size influences enterprise growth. The stochastic theories have their basis in Gibrat's law, which was further improved by the propositions of Kalecki and Champernowne.

The fourth part includes an overview of where recent research is. Here the studies are divided into three groups according to the area in which they look for influences on growth. These three groups are those that focus on the entrepreneur, on the enterprise and on the environment. Although most research has been conducted on the characteristics of the entrepreneur as potential influences on growth, this research will mainly focus on the characteristics of the enterprise and the environment, so these studies will be elaborated in more detail. Entrepreneurial characteristics are divided into innovation, export, financial ratios, firmographic characteristics of the enterprise (age, size, and industry), and intangible aspects of the enterprise. Few studies include environment characteristics in their examination of enterprise growth. Here the focus is on the global economic crisis, accession to the European Union, and macroeconomic values, including employment, inflation, and GDP.

The empirical part of the study is in the fifth chapter of the dissertation. It starts with the introduction of the dataset, its size, problems, and how these problems were addressed. As it continues, most of the variables are ratios, so their formulas and explanations are provided. Descriptive statistics are provided. In the second part of this chapter, the panel data modelling methods are described, as well as the tests used. The chapter follows with the obtained models and comments on them. Discussion on the obtained models concludes this chapter.

The conclusion is the sixth and final part of the dissertation. It consists of implications of the findings from the previous chapter, remaining gaps, and recommendations for further research.

2 Small and medium sized enterprises

Small and medium-sized enterprises, abbreviated as SMEs, make up the majority of enterprises in most countries. According to OECD (2017), SMEs account for up to 99% of all enterprise sizes in countries in the OECD area. Moreover, SMEs are responsible for the majority of employment, employing around 70% of all personnel employed in the economy on average. In relation to Croatia, the figures are similar. SMEs account for over 99% of the total number of enterprises and around 80% of all employees in Croatia's economy are employed in SMEs (OECD, 2017).

2.1 Defining SMEs

Definitions of SMEs in research papers and official sources vary. The OECD (2004) has established the definition of SMEs as enterprises with a maximum of 250 employees and up to 50 million euros in turnover. In Croatia, the official definition of SMEs is set by the Accounting Law, which was brought in line with EU directives[1] in 2015. According to this law, enterprises are divided into micro, small, medium, and large enterprises:

1. Micro enterprises - Enterprises with assets below HRK 2.6 million, net income below HRK 5.2 million, and an average number of employees below 10;
2. Small enterprises - Enterprises that meet at least 2 of the following three conditions: with assets below HRK 30 million, net income below HRK 60 million, and an average number of employees below 50.
3. Medium enterprises - enterprises that meet at least 2 of the following three conditions: with assets below HRK 150 million, net income below HRK 300 million, and an average number of employees below 250.
4. Large enterprises - Enterprises that meet at least two of the three conditions that cannot be violated by medium-sized enterprises and banks, building societies, leasing enterprises, insurance enterprises, and other financial institutions.

Besides the fact that SMEs are of great importance to any economy because they make up the largest part of the economy, Keskġn et al. (2010) list other reasons for their importance. According to them, SMEs have a great number of advantages over their larger counterparts -

[1] The accounting law NN 78/15, 134/15, 120/16, 116/18 can be found at https://www.zakon.hr/z/118/Zakon-o-ra%C4%8Dunovodstvu, and it is in line with EU directives that can be found at https://ec.europa.eu/competition/state_aid/studies_reports/sme_handbook.pdf

they are more efficient, more successful in increasing employment and shaping income, more resilient to the economic crisis, keep up with new demands and new technologies more easily, have the ability to make decisions faster, and they have even proved to contribute to the solution to employment problems in 1985.

Although a large SME sector is typically a feature of fast-growing economies, it is not the large number of SMEs that contributes to growth (Beck et al., 2005; Beck & Demirgüç-Kunt, 2006). What contributes to economic growth is the dynamism of the SME sector. They bring innovation, competition, and employment to the market (Beck, 2013). Ayyagari et al. (2007) confirmed that the contribution of SMEs to employment and GDP has a strong positive correlation with GDP per capita. Since SMEs account for the largest share of job creation and the highest growth in sales and employment, this impact should be reflected in the economy (Ayyagari et al., 2007).

Lindgren (2015) investigated how access to finance for SMEs affects economic growth in 28 EU member states. Her results confirmed that SMEs play an important role in economic growth. To be precise, a 10% increase in access to credit for SMEs leads to SME growth and hence 0.5% economic growth. Interestingly, this growth occurs only through growth in labour productivity and Total Factor productivity, but not through growth in GDP per capita. These findings are consistent with the research of Beck and Demirgüç-Kunt (2006) who suggest that SMEs lack contribution to economic growth because SMEs have less access to external finance, unlike large enterprises.

High-growth SMEs are a special group of SMEs. There are many approaches to defining these enterprises, but in all of them high-growth SMEs have an impact on job creation that is disproportionally large to their quantity. In the UK there are only 6% of them but they create up to 50% of new jobs (Mason et al., 2009). Similarly, in the US the top 5% of enterprises create 2/3 of new jobs (Stangler, 2010).

As a result, enterprise growth is becoming increasingly popular in research. Weinzimmer et al. (1998) acknowledge that significant progress has been made regarding the scope of research on small enterprise growth compared to 1989 when Davidsson (1989) criticized the lack of research on the same topic.

2.2 Defining growth of SMEs

Nowadays, there is a large number of studies on SMEs and their growth, which led to many different approaches to growth measurement. Among the two most common approaches is the measurement of growth through **sales** (North & Smallbone 2000; Wiklund & Shepherd 2003; Raymond et al., 2005; Honjo & Harada 2006; Lin & Chen 2007; Wiklund et al., 2009; Golovko & Valentini 2010; Subrahmanya et al., 2010; Uhlaner et al., 2013; Yeboah, 2015; Corner 2017; Ipinnaiye et al., 2017) and **employment** (North & Smallbone 2000; Wiklund & Shepherd 2003; Honjo & Harada 2006; Wiklund et al., 2009; Račić et al., 2008; Ipinnaiye et al., 2017). Sales measures are often preferred over employment measures, as enterprises usually have an established focus on increasing their sales. Račić et al. (2008) investigated what should be the preferred indicator of growth. According to them, the challenge of using sales as an indicator is that price levels vary across countries and, therefore, comparability between studies is lost. More so, when a study is conducted on enterprises from several countries, the different price levels have an impact on the sales figures of the enterprises. Another reason to avoid sales as an indicator is mentioned by Lavadera (2012), he highlights the culture of Italian enterprises that have a long tradition of not revealing real income to avoid tax payment in family ownership. On the other hand, using the number of employees as an indicator of enterprise growth presents a number of challenges. The relative change in employing an additional person is large between an enterprise with five employees and an enterprise with 200 employees. This may lead to the erroneous conclusion that some determinants are not significant in predicting employment growth. Also, the majority of the enterprises are not oriented towards increasing the number of employees but are more interested in increasing sales.

Alternative growth measures include total assets (Jeger et al. 2016); turnover (Loi & Khan, 2012), revenues (Corner, 2017), profitability measures, including return on assets, return on equity, net profit margin, and operating profit margin (Majocchi & Zucchella, 2003; García-Teruel & Martínez-Solano, 2007; Salman, 2019).

The use of different growth measures may lead to different conclusions about what influences SME growth and how. Therefore, Weinzimmer et al. (1998) suggest using more than one indicator. According to their findings, more information can be extracted by using multiple indicators, i.e., definitions of growth, and therefore this approach should be preferred over the usage of one indicator. An example of such research is Ipinnaiye et al. (2017) who used growth by employment, productivity, and turnover.

In addition to deciding on a particular indicator - sales, employment or a third option - research differs in how it further observes these indicators. Some observe absolute growth, growth as a percentage of the chosen indicator or defining specific types of growth, such as high-growth (O'Regan et al., 2006; Moreno & Casillas, 2007). As Ahmad and Gonnard (2007) observed, there are two main approaches to defining high-growth enterprises. The first defines a certain percentage of enterprises as high-growth, and the second attempts to define a threshold above which all enterprises are defined as high-growth. Coad et al. (2014) state that the second approach transitions into two further approaches - either cumulative growth over a threshold between a number of years or annualised growth over a period of time. The OECD (2017) suggests using the following definition (OECD, 2017; p. 61):

> *"All enterprises with average annualised growth greater than 20% per annum, over a three-year period should be considered as high-growth enterprises. Growth can be measured by the number of employees or by turnover."*

Sampagnaro (2013) defined high-growth enterprises as having annual sales growth in the first period between 0% and 10%, and in the second period annual sales growth of at least 15%. In another paper, Sampagnaro and Lavadera (2013) calculate the difference in the natural logarithm of sales between two years and select the top decile of enterprises in each industry as high-growth.

Côté and Rosa (2017) compared three definitions most commonly used in research - using the first approach of the top one percent of enterprises in employment growth, the OECD approach measured also by number of employees, and the approach proposed by BLS (Bureau of Labor Statistics) in the US. The BLS defined high-growth enterprises by the number of employees they had but observed how sales grew over the same period. The results in numbers of enterprises to be defined as high-growth varied massively. Furthermore, sales growth rates of high-growth enterprises for the definition of BLS were 25.2% higher than for non-high-growth enterprises, but for the top one percent approach they were only 12.4% higher.

Coad et al. (2014) stated that all approaches are valid and should be selected depending on the research question.

2.3 Research methods of SMEs growth

When enterprise growth is the subject of research, several approaches can be observed. The first division is that of quantitative and qualitative research. Qualitative research is usually concerned with the entrepreneur, i.e., how his/her characteristics and personality traits affect the growth of the enterprise he/she owns and/or manages. Quantitative research can be further divided into three groups of studies based on the type of analysis conducted to draw conclusions. These analyses include:

1.) Statistical testing
2.) Statistical modelling
3.) Meta-analysis

The first group of analyses are statistical tests. They are used to draw conclusions about whether there is a significant difference in some measures between different types of growth or whether there are different growth rates between enterprises divided based on some characteristics. For example, Yeboah (2015) observes sales growth in different industries. On the other hand, Šarlija and Bilandžić (2018) test whether there is a significant difference in innovation between high-growth and non-high-growth SMEs. Some studies rely only on results from statistical tests (Grundström et al. 2012), while others additionally incorporate some statistical modelling techniques (Šarlija & Bilandžić, 2018).

The second group of studies creates statistical models. Here, the range of methods is wide. The usage of a certain method in a study depends primarily on the type of dependent variable and the dataset. If the dataset is a cross-sectional dataset with a continuous dependent variable, the prevailing methods are linear regression methods, mainly ordinary least squares (OLS) regression. If the dependent variable is an indicator variable, such as whether the enterprise is high-growth, the preferred method is logistic regression. Few studies have a panel dataset available and therefore can use a panel method. Panel methods are more popular in research studies where the aim is to investigate how characteristics of the enterprise will affect growth. This is due to the fact that enterprise characteristics are prone to more change compared to the characteristics of the entrepreneur.

The last group of studies relies on conclusions drawn from meta-analyses. In these studies, the results of a group of previous studies are used. These findings are then carefully analysed and compared. It is not possible to draw definitive conclusions from studies that use different definitions of growth. This approach enables the authors to draw conclusions from the observed earlier studies that cover a wider geographical area, a longer time span, and more types of enterprises.

When deciding which approach to use in a study, the first consideration is the nature of the dataset. Then, the type of dependent variable further narrows the scope of available methods. Finally, the predictor variable must be included in the decision of which method is most appropriate.

3 Growth theories

Many scholars have approached the problem of how enterprises grow. Over time, theories have emerged describing enterprises, why they grow, how they grow, and to what extent. Different authors approached this problem from different angles, and their views often differ. Coad (2009) gave an overview of the 5 most commonly mentioned theories - neoclassical theory, Penrose's theory, managerialism, evolutionary theory, and population ecology. Teruel Carrizosa (2006) also gave an overview of growth theories in her dissertation. She divided the theories into four schools of thought, the classical economist, the behaviourist economist, stochastic theories, and models of learning and selection. The behaviourist economist included two mentioned by Coad (2009) - Penrose's theory and managerial theory. Nelson and Winter (1982) found that behavioural theory can solve some problems of orthodox theory. To cover all theories from these three sources, this chapter gives an overview of 6 groups of growth theories:

I Neoclassical theory
II Orthodox theory
III Behaviourist theory – Penrose’s theory and managerial theory
IV Stochastic theories – Gibrat’s law, Kalecki and Champernowne
V Evolutionary theory
VI Population ecology

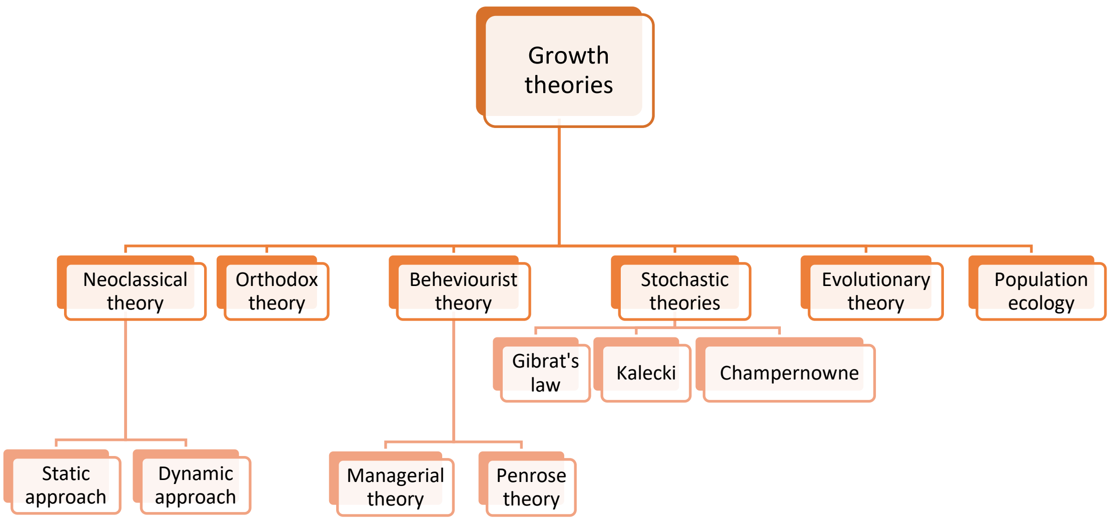

Figure 1 - Graphical representation of growth theories derived from Coad (2009), Teruel Carrizosa (2006) and Nelson and Winter (1982)

3.1 Neoclassical theory

Teruel Carrizosa (2006) calls it the "Classical Theory - Static Approach", while Coad (2009) calls it the "Neoclassical theory of growth". This theory hypothesizes that enterprises are attracted to an optimal size. As pointed out by Viner (1931), it does not directly examine enterprise growth as growth is merely the means/tool to achieve optimal size. The literature distinguishes between the static approach and the dynamic approach of neoclassical theory, the main difference being that the optimal size in the dynamic approach can change due to market changes.

3.1.1 Static approach

Coase (1937) observed the optimal size of the enterprise through transaction costs and vertical integration. In the study, he found that when transaction costs are higher, enterprises choose to integrate downstream or upstream so that transaction costs are reduced while coordination costs increase. When transaction costs are low, it is not profitable to integrate vertically, i.e., to grow and increase coordination through the authority; the better solution would be to use market mechanisms. Cho (2002) observe the optimal size using the number of employees, especially the benefits and costs of hiring more than one person. They find that employing more agents increases the productivity through specialized tasks, while peer supervision becomes more complicated and costly. The focus is on moral hazard, which they found can impose limits on enterprise size.

Lucas (1978) finds that enterprise size is associated with managerial talent. It is assumed that both enterprise size and managerial talent have a lognormal distribution. If managers have the talent to manage and lead a large organization, enterprise size will follow. On the other hand, if an enterprise is small, it is likely to remain small because managers do not have the skills needed to run a larger organization.

According to Teruel Carrizosa (2006), enterprise size and growth are negatively related, although growth is not of interest per se in this theory. The optimal size is determined by competition, intensity of competition, organizational factors, and sunk costs. In summary, optimal enterprise size is mainly formed by market forces.

Kumar et al. (2000) investigated a broader range of possible influences on enterprise size. They analysed enterprise sizes across industries and countries. The dataset included 15 European countries with enterprises from all industries. Looking at different industries, they found that larger enterprises tended to be found in capital-intensive industries, industries with high wages, industries with high investment in R&D, and in the utilities sector. In addition, they concluded that enterprises facing larger markets are also larger. In terms of countries, they point out that larger enterprises are found in countries with better institutional development. Institutional development in their study is measured by the efficiency of the country's judicial system. They found little evidence that richer countries have larger enterprises. The results are consistent with "Critical resource" theories, which suggest that differences in enterprise size are the result of differences between capital-intensive industries and industries that use little physical capital as judicial efficiency improves. Their final conclusions suggest that financial constraints limit the average size of enterprises.

In his research, Coad (2009) concluded that the concept of optimal size still receives much attention but lacks empirical support. Even when size is observed at the enterprise-specific level and examined through time series analysis, it does not appear to be consistent with optimal size theory.

3.1.2 Dynamic approach

The second approach of neoclassical theory is the dynamic approach. As pointed out by Teruel Carrizosa (2006), the difference between the static approach and the dynamic approach is the extent to which market forces determine the optimal size. While the static approach implies that enterprises observe the structure and state of the market, according to their findings, enterprises will then make changes to their production function to maximize their profits and optimize their performance. On the other hand, the dynamic approach does not stop there. Any change in the enterprises' production will also affect the market and in turn the enterprise will have to adapt again to the new situation. This in turn will affect the market, and so on. In summary, the dynamic approach views the optimal size as a fluid state that can change over time.

Nevertheless, the main implication of these theories remains that enterprises and their growth are limited by their optimal size. Therefore, the main criticism remains that neoclassical theory cannot justify the existence of enterprises larger than their optimal size, nor how the process of enterprise growth evolves over time.

3.2 Orthodox theory

The orthodox theory of the enterprise seeks to answer two questions, "what enterprises know how to do" and "how they choose what they will do." "Knowing how to do" consists of a clear set of choices, bounded by constraints, while choosing is done optimally, i.e., "how to choose" is answered with all available information and with the best possible outcome. The assumption of cost-free and perfect information is typical for models of equilibrium that emerged in the early days of orthodox theory. Over time, these assumptions have relaxed and only the costing processes of economic actors remain perfect (Nelson et al., 1975).

According to Nelson and Winter (1982), there are three building blocks of orthodox theory:

1. Objectives - In the simplest model, the goal of an enterprise is to make as much profit or market value as possible. Efforts have been made to describe the relationship between owners' interests and managers' actions. Managers' goals are typically viewed as a measure of the size of the enterprise or its growth. How objectives are chosen depends on two opposing sides of the orthodox theory. One sees the enterprise as an autonomous entity that carefully and painstakingly chooses its objectives by observing all the individuals involved, their roles, and their complex relationships. The other side sees the enterprise as an instrumentality of individuals and therefore the satisfaction of individuals plays a major role in the choice of objectives of the enterprise. This side underlies the neoclassical economic theory.
2. Set of things an enterprise knows how to do – This set of things is formally represented by a production set consisting of vectors of input and output quantities, that is, an enterprise can conduct a productive transformation if the vector of expected input and output lies in the production set. This idea of production set can be easily applied to all productive activities. Difficulties arise when it is applied to the service industry. According to the orthodox theory, the production set of an enterprise is characterized by the level of knowledge of the enterprise, not by physical laws or limitation of available inputs. This production set, i.e., knowledge is considered to be constant over time, with the exception of technological progress, which is considered to be the consequence of research and development or exogenous activities. Interestingly, this building block is far less studied than the objectives of the enterprise.
3. Optimizing choice given the objectives and capabilities of the enterprise - The third building block uses the first two to explain what enterprises do and why they do it.

Their choice is directed towards maximization, and so the orthodox theorist will seek to analyse the optimizing decision rule of the enterprise and its actors. This rule typically involves external variables, including market conditions, demand, etc., and internal variables, possible activities that rank first among the objectives of the enterprise. Typically, orthodox theory considers demand as a completely external variable, the enterprise can do nothing to influence it, while later theories acknowledge the possibility of influencing the demand for their products or services (Mahoney & Michael, 2005). The assumption of the orthodox theory is that the decisions made by economic actors are the result of processing unlimited and costless information.

Problems with the orthodox theory are (Nelson & Winter, 1982):

1. The orthodox theory assumes that every enterprise needs a clear set of objectives to function, which is not true for the real world.
2. The orthodox theory equates the production set with the enterprise's level of knowledge without answering why exactly it is in that state, how it changes, and whether all enterprises have the same state of knowledge at any given time.
3. The assumption of perfect information availability leads to conflicts, in particular, that in practice economic actors know everything that they need to know so they could make perfect decisions, while at the same time theorists struggle to explain exactly this behaviour.

3.3 Behaviourist theory

The main criticism of optimal size theory is taken up by the next two theories, Managerial theory and Penrose's theory. Both revolve around the role of managers. In the following theories, it is possible for an enterprise to grow larger than its optimal size, and the following theories explain the reasons why this is possible. Managers are more interested in growing enterprises than maximizing profits, and if the owner does not control the enterprise, managers have the freedom to do so (Teruel Carrizosa, 2006).

3.3.1 Managerial theory

Researchers have differing opinions about where managerial theory has its roots. While Tosi et al. (2000) refer to Berle and Means' 1932 book "The Modern Corporation and Private Property" as seminal, and Smith et al. (2019) even call it ground-breaking, Coad (2009) primarily credits the work of Marris in the 1960s as the beginning of managerialism. Berle and

Means (1932) in their book mention for the first time in literature that a new situation arises when the owner is separated from the enterprise i.e., from the control over his enterprise. Consequently, managers are in a new position of power and their interests will be different from those of the owner (Smith et al., 2019).

The basis of this theory is that managers control the direction that the enterprise takes and they are attaching utility to the size of the enterprise (Davis & Stout, 1992; Misangyi, 2002; Coad, 2009). Tosi et al. (2000) call them the "new managerialists" and acknowledge that they are the first to explicitly mention CEO pay and that managers want to increase the size of enterprises so that they themselves have higher wages, more power, and prestige.

Tosi et al. (2000) examined the empirical literature on CEO pay, enterprise size, and enterprise performance. They conducted a meta-analysis and concluded that enterprise size had the largest impact on CEO pay, more than 40% of the variance was due to enterprise size. In comparison, enterprise performance accounted for less than 5% of the variance in CEO compensation. Interestingly, the sensitivity to both changes in size, i.e., growth of enterprise, and changes in financial performance was similar, 5% and 4% of the explained variance, respectively. They find that this disparity is due to three things: 1) CEOs have a greater influence on the size of the enterprise so they care more about size than enterprise performance, especially when acquisitions are pending; 2) larger enterprises are more complex and therefore have more levels of management, which leads top managers and CEOs to have higher pay; 3) they can reduce and/or eliminate risk to their wages by tying their pay to a more stable component, such as enterprise size.

Davis and Stout (1992) and Coad (2009) found that managers have other motivations besides their income from the enterprise. These include power, social status, prestige, likelihood of promotion, and security. All of these factors are also associated with enterprise size. It seems only logical that managers tend to focus more on enterprise size. Owners and shareholders, on the other hand, are more oriented on enterprise performances. If the enterprise is small, the pursuit of maximizing growth may coincide with the pursuit of maximizing profits. Coad (2009) also points out that, according to managerial theory, managers will maximize the growth rate as much as possible as long as the profit rate is satisfactory to shareholders, and therefore they will not fire the manager.

Coad (2009) mostly follows models of Marris[2] in his work. These models assume that enterprises grow only through diversification. Above a certain growth rate, additional diversification has a lower expected profitability because managers have less time to worry about operational efficiency and developing new activities. This leads to a non-linear, hump-shaped relationship between growth rate and profit rate, which makes testing the "managerial hypothesis" difficult. The basic prediction that remains is that enterprises controlled by managers will have higher growth rates than enterprises controlled by owners, but profit rates will likely be lower. According to Coad's (2009) research, this prediction has not found unequivocal support.

Misangyi (2002) emphasized that the only constraints that prevent managers from mainly pursuing enterprise growth and instead make them pursue profit are the severe competition in the enterprise's product market and/or the presence of a dominant shareholder. According to Davis and Stout (1992), the primary constraint in the managerialists' model are takeovers, and more so for small and medium-sized enterprises than for large ones. Therefore, the threat of takeovers discourages the pursuit of growth at the expense of shareholder interests. Romano (1992) conducted her research after a decade of intense takeovers. She includes analysis of economic literature and law to examine regulatory regimes. In her research, she also addresses managerialism as the growth of enterprises is ensured through takeovers and performance usually suffers. The motivation for takeovers is found in the gravitation to maximize the manager's utility. She found that there are four non-value maximizing explanations for takeovers. Three of these have to do with managerialism: diversification, self-aggrandizement, and free cash flow excesses by the acquirer. The fourth is that managers may intend to maximize stock price through an acquisition but overvalue the gains of the transaction.

The orthodox theory already introduced the divergence of the manager's and stakeholder's objectives, and that the pursuit of growth as an objective can be detrimental to the objective of profitability. Also, the analytical tools introduced by orthodox theory are used for managerialist analysis, therefore Nelson and Winter (1982) found that managerialism is in some ways a mild heresy of orthodox theory.

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[2] Two studies are referenced:
Marris, R., (1963), 'A Model of the 'Managerial' enterprise', Quarterly Journal of Economics 77 (2), 185-209.
Marris, R. (1964) "The Economic Theory of Managerial Capitalism" Macmillan: London.

3.3.2 Penrose's theory

Penrose's theory rests on the book "The Theory of the Growth of the Firm" first published in 1959. In it, Edith Penrose acknowledges that the book itself deals with familiar concepts of that time, but in an unfamiliar way. As the title suggests, the growth of the enterprise is the focus of this theory, but it also deals with innovation, merger, diversification, etc.

According to Korl et al. (2016), Penrose's theory had a significant impact on strategic management, and the ripple effects it triggered still resonate today. They focus on five major contributions:

1. the concept of the enterprise – they are created by people to serve people. In contrast to neoclassical theory, which sees enterprises as a production function operating in equilibrium, Penrose describes enterprises as administrative organizations and models their growth through disequilibrium models. These disequilibrium models allow for the possible presence of underutilized and unused resources to drive growth. Moreover, the abilities of managers can act as both accelerators or retarders of enterprise growth. In this theory there are also limits to the rate of growth and it is constrained by the lack of administrative coordination and the time required to achieve it. Any desire for growth is driven purely by immediate or long-term profit goals. As Penrose explained it (1959, p. 31):

   > *"The productive activities of such an enterprise are governed by what we shall call its 'productive opportunity', which comprises all of the productive possibilities that its 'entrepreneurs' see and can take advantage of. A theory of the growth of enterprises is essentially an examination of the changing productive opportunity of enterprise; in order to find a limit to growth, or a restriction on the rate of growth."*

2. The enterprise as a bundle of resources and its managers - The enterprise is also seen in Penrose's theory as a collection of resources and the outputs that arise from them. Managers play a central role in the use of resources and in deciding how they are used and what opportunities they provide. Managers produce entrepreneurial and managerial outputs. Their knowledge of available resources and their entrepreneurial skills determine which opportunities will be exploited and how the enterprise will grow.

3. Unused and/or underutilized resources can be used as drivers for innovation, diversification, or even enterprise growth - If an enterprise has rare, inimitable, non-substitutable and valuable resources, they can provide a lasting competitive advantage. Examples of such resources are brand names, trade contracts, machinery, efficient procedures, skilled employees, in-house knowledge of technology (Wernerfelt, 1984). Montgomery (1994) suggests that Disney's cast of cartoon characters could be considered a resource, while Winter (2003) concludes that even "routines" can be considered resources. A somewhat extreme notion is Feldman's (2004) consideration of emotions, such as anger and frustration as resources.
4. Optimal growth rate and the Penrose Effect, theorem, or proposition - Managers divide their time between administrative/organizational tasks and managerial tasks. Over time, administrative tasks become more routinised and managerial talent is freed up. Managers can then focus on value-creating opportunities for the enterprise, including training new managers who, in turn, can take on administrative tasks and later train other managers. The Penrose effect occurs when managers focus too much on exploiting growth opportunities and allow operational efficiency to take a back seat, i.e., operating costs will increase. At this point, the enterprise is considered to have exceeded its optimal growth rate (Coad, 2009).
5. The Penrose Effect in Acquisitions and International Growth - As mentioned in point four, there is a limit to organic growth i.e., an optimal growth rate. The same is true for acquired growth. When an enterprise decides to acquire another enterprise, it also gains new management resources. Managers already know how to manage administrative tasks and maintain organizational efficiency, but policies and practices of the parent enterprise are still imposed on the acquired enterprise that may be incompatible with existing routines. This results in a great deal of adjustment and coordination between the enterprises. Penrose does not view international acquisitions as "materially" different from domestic acquisitions; both are considered part of the growth process of the parent enterprise. However, it allows for different treatment of international enterprises due to different economic, social, and political environments etc. She also considers them to be more independent of the parent enterprises, so it is possible that there is less administrative coordination. However, depending on the economic climate, it is

possible that international acquisitions are expected to grow faster than the parent enterprises.

Many research papers still criticize that the literature on corporate growth is scattered (Story, 1994; Weinzimmer et al., 1998; Davidsson et al., 2006). Penrose's growth theory remains the most comprehensive, albeit with little empirical verification (Lockett et al., 2013). She is often referred to as a seminal work (Coad, 2009; Lockett et al., 2013), although her earliest work on growth dates back to her article "Biological analogies in the theory of the firm".

Lockett et al. (2013) criticize the lack of empirical testing of Penrose's theory. In their research, they examine how past organic growth and acquisitive growth affect current growth through two key central aspects of Penrose's theory, adjustment costs and the productive opportunity set. They confirmed both hypotheses, first that greater past organic growth leads to lower current organic growth, i.e., a negative relationship was found, and second that greater past acquisitive growth leads to lower current organic growth. Although the hypotheses were consistent with Penrose's theory and the hypotheses were confirmed, the authors also found that some relaxation is needed in the aspect that enterprises can achieve higher growth rates by recombining their resources alone. Admittedly, this assertion may have been correct in the post-war environment, but today, with all the constraints a parent enterprise faces, it cannot be sustained.

3.4 Stochastic theories

Probably the most frequently mentioned law relating to size is "Gibrat's Law." Some scholars, such as Teruel Carrizosa (2006), put forward their own theory around Gibrat's law and its further improvements. Enterprise size is a dimension of the enterprise that is often explored solely in terms of the growth of the enterprise. Over the years, three propositions on enterprise size have developed: Gibrat's law, Kalecki's proposition, and Champernowne's proposition.

3.4.1 Gibrat' Law

As early as 1931, Gibrat published his ground-breaking research paper. In it, he concluded that the growth rate of enterprises is independent of their size (Relander, 2011). This became known as Gibrat's law or the law of Proportionate Effect (Teruel Carrizosa, 2006). With the intention of creating a model for enterprise size that is consistent with the log-normal distribution, Gibrat proposed the equation (Ribeiro, 2007):

$$Y_{it} = Y_{it-1} e^{v'_{it}}, \tag{1}$$

Where Y_{it} is the size of enterprise i in time period t, v'_{it} is a random term and $v'_{it} = v_{it} + a_i$ where a_i is its mean. By denoting $y_{it} = \ln Y_{it}$ the above equation becomes:

$$y_{it} = y_{it-1} + v_{it} + a_i, \qquad (2)$$

i.e.

$$\Delta y_{it} = v_{it} + a_i, \qquad (3)$$

According to Sutton (1997) the main consequences of this proposition are:

I There is no optimal size

II All enterprises have the same expected growth and its variability

III Past growth does not affect current growth

IV Dispersion of enterprise size increases over time, thereby market concentration increases as well, if the number of enterprises remains constant

V The variance of enterprise growth rates is equal for all sizes.

Since then, studies have shown that the law is no longer valid. Many studies followed to test this proposition. Some confirmed it (Gambini & Zazzaro, 2011) and others, like Mansfield (1962), concluded that Gibrat's law does not hold by testing the results several times. For example, Samuels (1965) showed that larger enterprises grow at a significantly higher proportional rate than small enterprises. Wagner (1992) tested Gibrat's law on 7000 manufacturing enterprises over the period between 1978-1989 (from Lower Saxony), which led to a few conclusions. Gibrat's law was only valid for a small number of groups of these enterprises and only in some periods. Overall, he did not find that larger enterprises systematically grow faster or slower than small enterprises, but he did confirm that enterprises grow faster relative to others if they have a history of faster growth. Most recent studies conclude that there is a negative relationship between high-growth and size of the enterprise, i.e., small enterprises grow faster than large enterprises (Bottazzi & Secchi, 2003; Yasuda, 2005).

3.4.2 Kalecki's proposition

Kalecki criticized Gibrat's law for implying that size dispersion grows unconstrained, which proved not to be true for some economies, and denied that it was a "law" (Ribeiro, 2007). Kalecki further built on Gibrat's equation:

$$y_{it} = \beta y_{it-1} + a_i + v_{it}, \qquad (4)$$

where the coefficient β is defined to be smaller than 1 in order to set limits on enterprise growth, which otherwise remains unconstrained. Like in Gibrat's law, the distribution of enterprise size remains lognormal, but the variance does not increase unconstrained over time, ultimately leading to the increase in market concentration.

3.4.3 Champernowne's proposition

As outlined by Teruel Carrizosa (2006), Champernowne's proposition assumes that enterprise size is a Markov process, it depends on previous enterprise sizes and a random element. The probability of enterprise growth is called a transition matrix. These probabilities are compiled into a transition matrix. The probabilities of reaching the target enterprise size decrease as the distance between the current size and the target size increases. The main consequence of Champernowne's thesis is that enterprise growth continues to be independent of size and market concentration actually decreases.

3.5 Evolutionary theory

As researchers recognized that the economy changes over time, theories developed to explain the economics of industrial organization in more dynamic terms (Coad, 2009). As Hölzl (2005) explained, evolutionary economics views the economy as a scientific domain full of disequilibrium processes that teach economic agents how to create and adapt to new situations. This theory emerged from Schumpeter's vision of capitalism, in which he found capitalism to be a process of "creative destruction", i.e., the creation of diversity and destruction leads to the dynamics of economic development. Evolutionary theory developed as an alternative to orthodox theory. Evolutionary theorists usually emphasize three problems with the orthodox theory (Santangelo, 2003). First, it relies on an equilibrium analysis that does not account for phenomena associated with historical change. Second, it assumes that all the information needed to make the best possible decisions is available. Complex situations are simplified in that it assumes that economic agents can foresee all possible outcomes and make their decisions on that basis. The final problem is the assumed economic rationality of agents, which implies that agents can make perfect decisions without taking into account their possible confusion by realistic complexity of situations, distractions, and potential mistakes.

Alchian (1950) proposes a modification of the approach commonly used until then. Economic analysis relied on and assumed predictable individual behaviour, with an emphasis on profit maximization. In his work, Alchian (1950) pursued the phenomenon of environmental adaptation. Specifically, enterprises that adapt and strive to adapt to the new situation will grow, while less viable enterprises will lose market share to them and exit. As a final result, evolutionary mechanisms of selection will steer the economy toward progress. Another influential book is Nelsons and Winters (1982) "An evolutionary theory of economic change". They first lay out the problems of orthodox theory, then shift their focus to evolutionary theory, which they consider the most important contribution of the book. They also build a micro-founded simulation model to illustrate the examples. Their model focuses on the competitive aspect of the path to growth. An advantage can be gained in two ways, either by discovering a cost-reducing innovation or by emulating industry best practice. It is assumed that more profitable enterprises will grow while less successful enterprises will shrink in size.

Hölzl (2005) highlights three aspects of evolutionary theory that provide an understanding of the enterprise. First, evolutionary theory explains how an enterprise can be defined - as a set of routines and competencies that comprise the enterprise. Second, because of these routines, which are different for each enterprise, enterprises will differ. Third, this theory explains the dynamics of enterprises, how enterprises combine different routines, and how they are able to transform secondary routines into the primary core activity.

Coad (2007b) acknowledges that the mechanism of "replicator dynamics" is the backbone of evolutionary theory. Growth, i.e., change in market share, is calculated by the level of fitness or profitability. He represents this mechanism with Fisher's "fundamental equation":

$$\delta M_i = \rho M_i(F_i - \overline{F}), \tag{5}$$

M_i stands for market share of enterprise i, F_i is the level of “fitness” of enterprise i (measured by productivity and/or profitability), $\overline{F}$ is the average fitness of the population, δ represents the variation in the infinitesimal interval $(t, t + \delta t)$, and ρ is the parameter. It is easy to see from the equation that enterprises that are "fitter" than the average enterprise will increase their market share, i.e., they will grow as long as the parameter ρ is estimated to be positive. Coad (2007b) criticizes this equation on four grounds:

1.) all enterprises cannot be assumed to have the same growth disposition;
2.) enterprises with sufficient market power could choose to increase the price of their goods by restricting production;
3.) highly profitable enterprises in niche markets may not have the opportunity to grow;
4.) downsizing and focusing on their core competence may lead enterprises towards higher profit rates.

In his study, Coad (2007b) reverses the equation and estimates profits using growth. Growth is calculated as the difference in the logarithms of size in a period of time, where size is measured by sales, number of employees, or value added. SYS-GMM (System Generalised Method of Moments) was conducted for 8405 French manufacturing enterprises over the period 1996-2004. The results showed that enterprise growth has a positive effect on future profits.

Empirical studies have generally found that the "growth of the fitter" principle of evolutionary theories may not apply to the real world. Coad (2007a) considers productivity and profitability as two measures of the fitness level of enterprises. In the overview of the literature, he noted that numerous empirical studies have found that growth is independent of these two measures. Hardwick and Adams (1999) examined Gibrat's law in life insurance parent enterprises in the UK over two periods, 1978-1992 and 1992-1996. They also tested whether profitable enterprises grow faster. For their dataset, profitability was found to be inversely related to growth, suggesting that less profitable enterprises will grow faster.

There are still three open questions that the evolutionary theory needs to answer (Coad, 2009):

I More empirical and theoretical work is needed to fully understand how routines change

II More needs to be said about conflicts within enterprises and how routines can be used to solve them

III Entrepreneurship hasn’t been explored by evolutionary theory.

3.6 Population theory

The first step in creating "population ecology" (or "organizational ecology") was Hannan and Freeman's 1977 study, The Population Ecology of Organizations. One of their major criticisms of the literature on enterprise growth was that all studies unreflectively look only at organizations, i.e., enterprises, as the entity under study. In their words, their goal was "to arrive at an application of modern population ecology theory to the study of organization-environment relationships." (Hannan & Freeman, 1977, p.956), and the central question of the theory should be, "Why are there so many kinds of organizations?" They derived their inspiration for population theory from sociology and human ecology, specifically from the principle of isomorphism. According to isomorphism, there is a one-to-one correspondence between elements of social organizations and units that regulate the flow of resources through the system. They argued that any observed isomorphism may occur because of the adaptation of organizations to environmental influences or because selection is made against those with less success in adaptation.

Further critique of existing theories was that they focus only on how the environment changes the structures of organizations, whereas population ecology also includes internal arrangements.

In their paper, they emphasized that not much can be said with certainty because there is little empirical research on the population of organizations, and they suggested researching small and medium-sized enterprises rather than large enterprises because:

1. Larger organizations usually exert dominance over their environment, including smaller organizations, but their power may not last (of the Fortune 500 in 1955, only 53.6% were still on the list in 1975).
2. Attention should be paid to time perspective. Even larger organizations often do not survive over long periods of time (during the revolution in the US, only 13 enterprises survived as stand-alone enterprises and seven as recognizable divisions)
3. There are far more small and medium-sized organizations so they are easier to use for modelling.
4. Possible actions of the state to rescue large organizations that have many interconnections, and thus they change the selection pattern.

According to Hannan (2005), there are four unique features in the empirical research strategy of population ecology: 1) it focuses on populations of organizations; 2) it examines the history of all organizations in the population, both large and small; 3) for each organization, their type of entry and exit into and out of the population is recorded; 4) it assesses what influences the characteristics of the organization, characteristics of the population, and characteristics of the environment have on the patterns of entry and exit.

Coad's (2009) paper specifically addresses how population ecology views the role of niches. Niches can refer to specific industries, niches within industries, or non-commercial ideological organizations. They play a special role in the growth of organizations. The discovery of a new niche with a rich resource pool would enable enterprises to grow unhindered. This opportunity will attract others that will reduce the available resources, thus limiting the growth rates of organizations in that niche. This relationship between enterprise growth rates and competition for resources is referred to as "density dependence".

According to Argote and Grave (2007), population ecology began as an opposing theory to behaviourist economists but was eventually influenced by them. Population ecology incorporated three concepts - satisficing, competence traps, and myopic search from Cyert and March's study "A Behavioral Theory of the Firm" (1963) into its theory. In modern population ecology, there has been a shift towards external relationships between organizations and their environment, and some have even moved to model organizations as a unitary actor.

In summary, according to Singh and Lumsden (1990), the main principle of population ecology is that organizations are under strong inertial pressure and changes in the population of organizations are largely caused by "entries" and "exits" of organizations into and out of the population. There are three different levels of analysis - the organization level, the population level, and the community level, with an emphasis on the population level. The most common criticisms of population ecology are its deterministic nature, its lack of attention to the adaptive learning of organizations, that the main unit of study is not the organization, and the divergence between theoretical constructs and their measures.

4 Determinants of enterprise growth

With advances in technology, especially in computer science, new possibilities opened up in data analysis. The growth theories mentioned in the previous chapter mostly revolve around the owner and/or manager. The conclusions are based on close observation of a smaller number of enterprises. However, with advances in computer power and how they made the processing of big data, and especially the modelling of that data, available to a wider audience, new possibilities opened up. Everything became the subject of observation as it potentially affected the growth of enterprises. According to Wiklund et al. (2009), one way to organise this research is to divide it into three categories that may overlap:

1. Entrepreneur characteristics affecting growth
2. Enterprise characteristics affecting growth
3. Environment characteristics affecting growth

Most studies fall into just one of these three groups. Far more uncommon is research which includes possible determinants from two or three groups.

4.1 Entrepreneur characteristics affecting growth

The share of studies incorporating entrepreneur characteristics into quantitative research of enterprise growth is large, especially compared to enterprise and environment characteristics. This is probably a consequence of the fact the established growth theories mostly revolve around the owner and/or manager. Also contributing to the larger share of entrepreneur characteristics is that entrepreneurs are more willing to answer questionnaires about their demographic characteristics, skill, and personality traits than reveal specificities on how their enterprise is operating. Widely used entrepreneur characteristics include age, gender, education, experience, skills, and personality of the owner and/or manager of the enterprise. The results of studies often vary, sometimes even contradicting each other.

Usually, studies include at least one demographic characteristic such as gender, age, or education. Most studies agree on the influence of gender on enterprise growth. It has been confirmed that enterprises owned by male entrepreneurs have a higher probability to grow faster compared to enterprises owned by female entrepreneurs (Cooper et al., 1994). Walsh et al. (1996) confirmed that industry experience of the founder had a positive impact on high-growth. Welter (2001), on the other hand, found that age of the entrepreneur negatively affects high-growth. This is contradictory in a way because it is not possible to have much experience at a younger age. Barringer et al. (2005) also found experience to positively affect high-growth, the positive influence is found in both industry experience and entrepreneurial experience. Higher education showed a positive relationship with growth (they used this as a proxy for entrepreneurial skills and abilities, such as search skills, foresight, imagination, and computational and communication skills). Moreover, most studies agree that high-growth is positively related to educational attainment (Kolvereid & Bullvag, 1996; Peńa, 2002).

Personality traits and skills commonly included in studies are - motivation for growth, need for achievement, risk-taking propensity, social skills, and self-efficacy. Studies of Kolvereid and Bullvag (1996), Delmar (1996), and Peńa (2002) all confirmed that the entrepreneur's motivation for growth will increase the probability that his or her enterprise is (i.e., will become) a high-growth enterprise, as expected.

With regard to need for achievement, it has also been shown in the context of motivation theory that higher levels of need for achievement will increase the likelihood of achieving high-growth (Lau & Busenitz, 2001; Levie & Autio, 2013). Results on the influence of risk taking on the probability of high-growth are diverse in research. While Palich and Bagby (1995) found no significant relationship between risk-taking and high-growth, others (Cassia et al., 2009; Levie & Autio, 2013) have found a positive relationship. It should be noted that Palich and Bagby (1995) studied hyper-growth enterprises, as opposed to enterprises included in the studies of Cassia et al. (2009) and Levie and Autio (2013). Hyper-growth enterprises have even greater growth rate, assuming that enterprises go from small enterprises to large enterprises within 4 years with a structural growth process. Another positive relationship was found between self-efficacy and growth (Baum, 1994). More developed social skills will increase financial success of new ventures (Baron & Tang, 2009).

Entrepreneur characteristics remain the most popular and most represented characteristics in modern research of enterprise growth.

4.2 Enterprise characteristics affecting growth

In the previous chapter, only one growth theory covered a characteristic of the enterprise. This, of course, is the stochastic theory that observed if and how size affects enterprise growth. But many studies include a variety of other enterprise characteristics besides size, such as:

1. Innovation and investment in R&D
2. Export
3. Financial ratios
4. Intangible characteristics – visions, strategies, and human capital
5. Firmographic characteristics – age, size, and industry sector

Innovation and export are particularly popular subjects of observation. However, studies disagree on whether there is a relationship between either of them and enterprise growth. They also disagree on the direction of the relationship. It is not uncommon for studies to include both innovation and exports in their growth research to see how they will affect each other's influence on enterprise growth. Financial ratios are far less common in research on enterprise growth; they are more popular in studies that observe solvency. Although, they are gaining popularity as determinants of growth in recent research. Enterprise visions and strategies are difficult to incorporate into research for a number of reasons. Information about them is usually obtained through questionnaires and enterprises either do not like to answer these types of questions or they are not honest. Moreover, the answers are highly subjective. The last group of determinants of enterprise growth includes age, size, and industry sector. At least one of these three determinants is found in most studies and usually in the role of a control variable.

4.2.1 Innovation and its role in affecting enterprise growth

Since the 1880s, there has been a trend to use the term "innovation" to describe something unusual. The first influential statements on innovation were made by Joseph A. Schumpeter, a political economist who developed two entrepreneurship theories in which he attached great importance to innovation and entrepreneurship (Śledzik, 2013). According to Schumpeter (1911), development is a historical process that is substantially driven by innovation and that any enterprise that seeks profit must innovate, adding that innovation is a key driver of competitiveness and economic dynamics. Innovation also remains a popular area of interest to this day. Researchers and industries use different approaches in defining innovation, most commonly these definitions include advances in products, processes, and markets (Popa et al., 2010). There is no universally accepted definition of innovation. One possibility is to use the OECD (2005) definition of innovation:

> *An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.*

Boer (2001) simplifies the definition of innovation in his study. He considers innovation as the creation of a new product-market-technology-organization (PMTO-combination). From this definition he derives three key elements of innovation:

I Innovation is a process, and it needs to be managed as a process;

II The result of innovation is at least one new element in the PMTO-combinations of the enterprise;

III To which degree an innovation is new can be viewed from two standpoints. How different the innovation is to previous products and processes, and to whom the innovation is new.

Schumpeter's (1947) work stresses the need to distinguish 'invention' from 'innovation'. An 'invention' in itself is useful only for science but has no significance for organizations or for the economy. Entrepreneurs are needed to exploit these inventions and incorporate the process of innovation into the production function.

According to Popa et al. (2010), it is believed that how an enterprise defines innovation has a great impact on how it operates, namely which activities take place within the enterprise and which activities are outsourced. They found that innovation is the source of competitive advantage, especially due to intense global competition and technological development. As a result, innovation and the ability to develop new ideas have become priorities for many organizations. Edison et al. (2013) study is in line with those findings. They confirmed that enterprises that can be considered innovators occupy leading positions in their market sector. They also noted that many enterprises are losing their leading positions to new, emerging enterprises, which signifies that it is not enough to achieve innovation, but to innovate continuously.

It is not only important how innovation is defined but also what kind of innovation is observed. Crossan and Apaydin (2010) differentiate between innovation as a process and innovation as an outcome. According to them, innovation should include the aspect of exploitation, and thus "innovation as an outcome" is both necessary and sufficient, while "innovation as a process" is only necessary. They found that "innovation as an outcome" is an important dependent variable in empirical studies on innovation. Leovaridis and Popescu (2015) emphasized the importance of organizational innovation in achieving higher organizational performance. They showed that organizational innovation is also important for employees' well-being and health and, thus, for their motivation and loyalty.

The best-known types of innovation are - product and service innovation, process and organizational innovation, and radical and incremental innovation. All these types have their ground in Schumpeter (1911).

Product innovation is the creation (O'Sullivan & Dooley, 2009; Popa et al., 2010; Edison et al., 2013) and introduction (Tiwari, 2008; Edison et al., 2013) of technologically new or significantly improved (Tiwari, 2008; Edison et al., 2013) products with advances that are beneficial to customers (O'Sullivan & Dooley, 2009; Popa et al., 2010). These changes include advances in architecture structure, technical specifications, features, components and materials, user friendliness, and performance (Tiwari, 2008; Edison et al., 2013).

Many authors have stated that product innovation is critical to the survival of enterprises as it provides competitive advantage in new and existing markets (Mentz, 1999, Popa et al., 2010). O'Sullivan and Dooley (2009) emphasize that, while most established enterprises have a product portfolio that needs to evolve and adapt to new market demands, it is important that they also invest in expansions of their product families. Product innovation can lead to large increases in revenues and growth or even create the potential for a temporary monopoly position.

Service innovation refers to changes in intangible products and as such can be considered a form of product innovation (Mentz, 1999; Tiwari 2008; Popa et al., 2010).

Process innovation is the implementation of a new or significantly improved analysis or development method for the production or delivery of products that improves current procedures and adds value to the enterprise (Mentz, 1999; O'Sullivan & Dooley, 2009; Popa et al., 2010; Edison et al., 2013). The term 'process' indicates that this type of innovation is about a set of activities aimed at creating products rather than the product itself. Therefore, this type of innovation focuses on how the enterprise operates rather than what it does, i.e., what it markets (O'Sullivan & Dooley, 2009). Through it, enterprises intend to either reduce the unit cost of production and/or delivery or increase quality.

It is recognized by many authors that product innovation requires changes in the process of product manufacturing, i.e., process innovation is required for product innovation to be carried out (Crossan & Apaydin, 2010). Nevertheless, process innovation is underrepresented in research studies (Crossan & Apaydin 2010).

Organizational innovation is one aspect of process innovation (Mentz, 1999). Organizational innovations, also called procedure innovations, are innovations that do not directly affect the product, i.e., its shape, size, or other characteristics. Examples include beneficial changes in organizational method within the enterprise's business practices, workplace organization, or external relations. It would be innovative, for instance, to improve management procedures, corporate governance, financial systems, or employee's remuneration systems (Edison et al., 2013).

Product and process innovations are collectively referred to as technological innovations (Lhuillery et al., 2016).

Radical (revolutionary, disruptive) **innovations** are products, services, processes, or combinations thereof (Popa et al., 2010) that are introduced for the first time or have significantly better performances. They use substantially different technology and deliver true novelty to the customer (O'Sullivan & Dooley, 2009; Edison et al., 2013). These innovations typically occur in smaller enterprises, in niche markets where they "survive" until an opportunity arises in a larger market and the innovation disrupts it (Mentz, 1999), or they create an entirely new market (Popa et al., 2010; Edison et al., 2013).

Incremental (evolutionary) **innovations** are based on previous radical innovations (Mentz, 1999). They typically use minor technological advances to slightly increase customer value (Edison et al., 2013). They are based on improving existing products and processes rather than creating significantly new ones (Popa et al., 2010). Most enterprises, whether small, medium or large, prefer to invest in incremental innovations because they involve less risk (Mentz, 1999; O'Sullivan & Dooley, 2009), but they offer lower potential returns (O'Sullivan & Dooley, 2009).

Edison et al. (2013) distinguish 5 types of innovation according to their degree of novelty, which is useful to distinguish market leaders from their successors. These types are:

1. New to the enterprise: This is the lowest level of novelty that a new product, process, or service must meet. To be considered an innovation it must be new or substantially new to the enterprise creating or adapting it. This includes systems.
2. New to the market: The second level of innovativeness is that the new product is new to all enterprises in the same market.
3. New to the industry: Innovations on this level are new to all enterprises in the same industry sector as the enterprise that has created the innovation.
4. New to the world: these innovations are new or significantly new to all markets and industries, domestic and international.
5. Knowledge view: this level includes not only the final product and its application and marketing, but the entire process by which an organization's creative and knowledgeable people define and formulate problems and then create new knowledge to understand and solve those problems.

Research clearly needs to be able to measure innovation. However, the same is true for enterprises. Both real sector actors and academics agree on the importance of measuring innovation (Andrew et al., 2008; Morris, 2008; Ali & Edison, 2010). Gupta (2009) claimed that enterprises manage what they measure and therefore enterprises would make better, more responsible, and conscious decisions if they measured innovation.

Lhuillery et al. (2015) examined measures of innovation output, starting with the basic question, "Has there been an innovation (product, process, organizational, or marketing) in the past period (usually 3 years)?" They introduce innovation counting, innovation novelty identification, and innovation impact. These metrics had the problem that minor innovations were not distinguished from major innovations. Moreover, most respondents could not determine the degree of novelty or impact of the innovation. Lhuillery et al. (2015) concluded that 'the percentage of turnover related to product innovations' is a dominant indicator of innovation output, especially as it relates to the impact of innovation on the economic performance of enterprises.

In 2007, BCG had published another study (Andrew et al., 2007) which found that industry practitioners use predominantly four groups of innovation metrics:

I Revenues realized from offerings launched in last 3 years
II Projected versus actual performance
III Total funds invested in growth projects
IV Allocation of investments across projects

Burnett (2011) offered a list of 6 key performance indicators to track innovation and enable enterprises to make business decisions on how to improve. However, they emphasized that these are only indicators and they need to be used with specific facts (Table 2).

Table 2 - Six key performance indicators to track innovation, according to Burnett (2011)

Key performance indicators (KPIs) of innovation	**Measures of innovation KPIs**
Financial & market measures	*Revenue from new products or services;* *Profit from new products or services;* *New customers from new products or services;* *New segments and sector entry from new products and services;*
Conversion Ratios for each step in the Innovation process / value stream	*Ideas / Ideation campaigns;* *Ideas that reach concept design / Ideas;* *Implemented designs / Concept designs;* *Ideas that sell / Implemented ideas;* *Ideas that make a profit / Ideas that sell;* *Sales leads / Target customer base;* *Sales / Sales leads;*
Holistic ratios for the rate of renewal of the organization	*Sales from new products & services / sales from existing products & services;* *Profit from new products & services / profit from existing products & services;* *Customers on the new products / customers on the old products;* *Rate of transfer of capital investment to new capabilities*

Balancing the desire to innovate with risk management	*Verified knowledge / Unverified assumptions*; *Effort spent on implementations / Effort spent on concept development*;
Innovation Competency / Effectiveness / Discipline / Repeatability	*Use of formal creativity tools & techniques;* *Use of formal idea management tools & techniques;* *Use of formal problem − solving tools & techniques*;
Growth and sustainability measures	*Revenue from new products & services*; *Profit from new products & services*; *How much have your customers increased their succes or reduced their cost due to use of your products;* *Rate of return on Innovation Investment (how sustainable is your Innovation)*; *Market share growth from new products & services*; *Brand awareness and Stickiness (those who stay on new product / those who leave);* *Patents created per year*; *Market share protected by patents*; *Revenue protected by patents*; *Revenue generated from licencing patents*

Malinski and Perry (2000) proposed Return on Product Development Expense (RoPDE) to use as the primary innovation metric.

$$RoPDE = \frac{GM - PDE}{PDE} \tag{6}$$

Where GM stands for “Gross Margin” or “Gross Profit” and $GM = Revenue - CoGS$. $CoGS$ stands for “Cost of Goods Sold” and typically includes the material, labour, and overhead costs associated with delivering a unit of output. PDE is the acronym of “Product Development Expense” and typically includes engineering, technician, product marketing, and related management costs that are fully charged. The authors particularly recommend this metric when the intended strategic outcomes of an innovation goal are an increased number and improved quality of new ideas, better implementation of ideas, and increased success from these new ideas.

Innovativeness is an important factor that contributes to the success of enterprises and makes those enterprises that invest resources in innovation and create a stimulating climate fast and successful innovators and, therefore, successful enterprises (Popa et al, 2010).

Alongside innovation, two central themes of entrepreneurship are enterprise growth and venture creation (Delmar, 2006). Many researchers believe that there is a relationship between innovation and enterprise growth (Tohidi & Jabbari, 2012). Mason et al. (2009) claimed that innovation is one of the most important means by which enterprises compete and grow, which they believe has its causality in the knowledge-based era in which enterprises exist.

Of course, since the first researchers became interested in innovation and saw it as linked to the growth of enterprises, many studies have tried to use innovation as a variable in their attempt to predict the growth of an enterprise. Even today, innovation is one of the most frequently reported determinants of growth. Among the studies that have been conducted, a variety of contradictory results can be found. Most studies confirm that there is a relationship between innovation and enterprise growth, but there is no unanimous opinion on whether this relationship is positive or negative. Among the studies that confirmed the expected positive relationship are Fischer et al. (1997), Wang and Chang (2005), Barringer et al. (2005), Mason et al. (2009), European Commission (2010), Subrahmanya et al. (2010), Love and Roper (2015), and Coad et al. (2015). For example, Maldonado- Gonzalo et al. (2018) observed 206 family-owned SMEs in Mexico. They demonstrated that an increase in innovation activities significantly increases the growth opportunities of SMEs.

Rosenbusch et al. (2011) examined the available literature on the role of innovation in SME performance. They used meta-analysis which enabled them to obtain conclusive results from the observed literature. Both innovation orientation and innovation activities were found to have a positive impact on SME performance, with innovation orientation being more beneficial. Further results suggested that internal innovation projects lead to higher performance, but innovations from projects with other enterprises do not. Finally, SMEs in cultures with increased individualism benefit significantly less from innovation than enterprises in more collective cultures.

Demirel and Mazzucato (2013), on the other hand, found that there can be a negative relationship between innovation and enterprise growth.

Interestingly, there are also studies that found that innovation has no significant impact on enterprise growth (Almus & Nerlinger, 1999; Bottazzi et al., 2001; Grundström et al., 2012).

According to Boer (2001), two conditions must be met for an innovation to be successful:

1.) balanced attention to each of the constituent processes;
2.) the "characteristics of the innovation process" and "the people, roles, and organizational arrangements needed to implement, support, and manage the process" must match.

These conditions do not promise success, but they are essential for success.

To clarify the impact of innovation on enterprise performance or growth, researchers have begun to observe more specific problems. Studies have emerged that differentiate the impact of innovation depending on various types of innovation or reasons by which they have differentiated enterprises. Some reasons for differentiation are:

1. different types of innovation as determinants
   1.1. Product, process, and other types of innovation
   1.2. Various degrees of innovation
2. the role of enterprise type in the effect of innovation on enterprise growth.
   2.1. Slow growing versus fast growing enterprises
   2.2. Young versus old enterprises
   2.3. Different enterprise sizes
   2.4. Low-tech vs. high-tech enterprises (Stam & Wennberg, 2009).

4.2.1.1 Types of innovation and enterprise growth

Some researchers examined how the impact of innovations differed depending on the degree of novelty of the innovation, while others observed what the innovation improved - a product, a process, management, or some other aspect of the enterprise.

How product, process and other types of innovation affect growth

Garza-Reyes et al. (2018) observed 308 SMEs in Mexico and examined how four types of innovation would affect their growth. These four types of innovation include product, process, marketing, and management innovation. Their models did not find enough evidence to reject any of their four hypotheses. All four considered their respective types of innovation to have a positive impact on growth in their dataset.

Uhlaner et al. (2013) confirmed that process innovation has a positive effect on growth rates but failed to demonstrate a significant relationship between product innovation and growth rates.

Fernandes et al (2013) found that many studies confirmed that there is a relationship between product innovation and economic growth, as well as productivity growth and enterprise size growth. They concluded that innovation performance of enterprises, capacity, and innovation strategies differ between regions and, therefore, government policies should be installed to support disadvantaged regions.

Another study that establishes a link between innovation and growth is that of Badrinas Ardèvol (2015), which found that product innovation is present in two of three possible ways to achieve growth. According to the study, growth is generated mainly through Product Leadership, Market Exploration, or the combination of both. Product Leadership is achieved through successful product innovation and Market Exploration focuses on adapting existing enterprise products to other related and new markets.

Demirel and Danisman (2019) observed how the increasingly popular circular eco-innovation affects SME growth in European countries. They came to the conclusion that at least 10% of revenues should be invested in eco-innovation for SMEs to benefit.

How the novelty of innovation affects growth

The study by Avlonitis and Salavou (2007) was conducted on small and medium-sized manufacturing enterprises that had developed a new product in the three years preceding the study. Innovation was measured in three dimensions created with factor analysis: Uniqueness to the customer, Novelty to the customer, and Novelty to the enterprise. Two clusters of enterprises were formed - enterprises managed by passive vs. active entrepreneurs. The results showed that for active entrepreneurs, i.e., those more inclined to be first, take action, and accept a higher level of risk, there was a positive relationship between product uniqueness and performance.

Another approach was to differentiate what type of innovation enterprises achieved and how this affected their performance. Lin and Chen (2007) layered innovation. The first layer was incremental and radical innovation. Both were further divided into four types of innovation - technological, marketing (new brand, new market, and new sales approach), administrative (changes in organizational structure or administrative processes), and strategic (actions taken to create a sustainable competitive advantage and reinvent the rules of competition). From their dataset sample of 877 manufacturing and service enterprises, 80% carried out some type of innovation, and most of them were involved in technological and marketing innovations. The results showed that innovation has a weak relationship with enterprise turnover. Administrative innovation was found to be the most influential type of innovation. When concerning enterprise sales, the reported relationships were positive.

O'Sullivan and Dooley (2009) see the purpose of innovation primarily as enabling enterprises to grow. While growth is most often measured in terms of sales or profit, according to them it can also occur in knowledge, human experience, efficiency and quality of products, processes, and services. They emphasized that new core products could enable enterprises to increase revenues and growth to the extent that enterprises could create a temporary monopoly. In the debate between radical and incremental innovation, O'Sullivan and Dooley (2009) found that radical innovations can enable enterprises to achieve higher growth rates. Incremental innovations, on the other hand, consume fewer resources and take lower risks, but if the enterprise successfully implements enough of them, the growth rates achieved by incremental innovations could be similar to those of radical innovations.

4.2.1.2 Innovation and growth in slow-growing and fast-growing enterprises

Hölzl (2009) studied a specific type of high-growth enterprises, gazelles. Gazelles were defined as the top 10% and top 5% of high-growth enterprises, and high-growth enterprises were defined by the Birch index, which combines absolute growth and proportional growth indices. It is defined as:

$$\mathrm{m} = (x_{it} - x_{it-1})\left(\frac{x_{it}}{x_{it-1}}\right) \tag{7}$$

Where x_{it} and x_{it-1} denote the size of the enterprise at time t and $t-1$, respectively. Innovation was observed through six indicators: 1.) fractions of turnover from new products, 2.) if they are new only to the enterprise and if they are new to both the enterprise and the market, 3.) number of employees in R&D over total number of employees, 4.) R&D over turnover, 5.) acquisitioned R&D over turnover and 5.) investment in machinery and equipment over turnover. The dataset covered 16 European Union countries divided into three country groups - Continental Europe, South Europe, and new member countries. Continental Europe and South Europe were considered to be at the technological frontier. Gazelles were compared between country groups and with non-gazelles within the same country group. They showed that innovation is an essential part of enterprise strategies for gazelles in technological frontier countries. The level of innovativeness was also significantly higher for high-growth SMEs than other SMEs only in technological frontier countries.

Mason et al. (2009) observed high-growth enterprises, which were defined as enterprises with 20% growth per year over a three-year period, while there were three indicators of innovation - new products, new processes, and innovations in enterprise structures and practices. Two equations were estimated. In the first equation, innovation success was predicted by innovation investment over the past three years and other enterprise-specific variables (employment size, age, industry, region, and geographic market focus). In the second equation, the identified innovation success was used as an independent variable to predict enterprise growth. The research showed that enterprises that invest more in innovation also grow faster, and that innovation success leads to growth but is more pronounced in high-growth enterprises than in non-high-growth enterprises.

Stam and Wennberg (2009) focused on new enterprises. They observed enterprises younger than 6 years, from the Netherlands. Growth was measured by employment and the top 10% were considered as fast-growing enterprises. The innovation tendencies of the enterprises were measured by three variables - was the enterprise involved in new product development, was there investment in R&D, and an ordinary variable was formed from time spent on R&D. The results were consistent with Hölzl (2009) and Mason et al. (2009), all of which confirmed that innovation facilitates faster enterprise growth.

Another study that observed the difference in the effect of innovation between high-growth and other enterprises is Grundström et al. (2012). They observed 409 Swedish SMEs, 71 of which were gazelles. By their definition, those enterprises grew by more than 100% from 2006 to 2009. Gazelles proved to have high profitability, and a higher number of employees and market shares. They confirmed that this was because gazelles had a higher proportion of new products as part of turnover as opposed to slower-growing enterprises. In addition, gazelles perceived themselves as enterprises that: 1.) offered better products, 2.) better understood their customer needs, 3.) were more adaptable, and were more successful at keeping costs down. Compared to other enterprises in the dataset, gazelles also prioritized taking risks, reinvesting, and focusing on growth more.

Mazzucato and Parris (2014) controlled for the competitive environment when observing enterprise growth in high-growth enterprises compared to those that are not high-growth. Differences in the relationships between R&D and growth were significant across quantiles of competitive intensity. When the level of competition was relatively high, increasing R&D intensity benefited enterprises that grew at the median level and above. This proved to be particularly pronounced for enterprises with high-growth. Interestingly, the data suggested that high-growth enterprises at low levels of competition do not gain any growth advantage from increasing R&D intensity. Product diversity proved to be more important during periods of high innovation intensity. In summary, enterprises must grow in a competitive environment, or they will die, and innovation is the tool which enables them to grow.

4.2.1.3 Innovation and growth in young and old enterprises

Mason et al. (2009), in addition to differentiating the effect of innovation between high-growth and non-high-growth enterprises, also examined the differences between younger and older enterprises, finding that younger enterprises benefited more from innovation.

Coad et al. (2015) observed Spanish enterprises for the period between 2004-2012 and found that innovation affected the growth rates of younger enterprises differently than those of more mature enterprises. Growth was measured by sales, productivity, and employment, while innovation was represented by the logarithm of the level of R&D investment per employee. Enterprises were defined as young if they had been in existence for less than 10 years. They concluded that younger enterprises benefited more from successful innovation, but also lost more when investment in innovation was unsuccessful.

Using meta-analysis, Rosenbusch et al. (2011) reviewed the available literature. They confirmed that younger enterprises benefited more from innovation than older enterprises.

4.2.1.4 Innovation and growth in different enterprise sizes

Demirel and Mazzucato (2013) observed all publicly traded pharmaceutical enterprises in the US, their annual sales, employment, and R&D expenditures between 1950 and 2008. Growth was observed by sales, and innovation was represented by three variables - effect of R&D, depending on whether they had patents, and whether they had persistent patents. Enterprises were considered patent holders if they had at least one patent and persistent patent holders if they had obtained patents for at least five consecutive years. They concluded that, regardless of size, there was no significant relationship found between R&D and sales growth if the enterprise was not a patent holder. The relationship was significantly positive only for small enterprises that are permanent patent holders, and significantly negative for all other groups.

Uhlaner et al. (2013) also observed how enterprise size changed the impact of innovation on sales growth in 229 Dutch enterprises in 1999, 2000, and 2002. Enterprises under observation were micro (4-9 employees), small (10-49 employees), and medium-sized (50-99 employees) enterprises. They found that both product and process innovation increased sales growth more in micro and small enterprises than in medium enterprises.

4.2.1.5 Innovation and growth in high-tech and low-tech enterprises.

Stam and Wennberg (2009) also examined how the effect of innovation differs between high-tech and low-tech enterprises. High-tech enterprises included those whose products were based on new materials, biotechnology, medical technology, or environmental/energy technology. R&D was found to have a relationship with growth in new high-tech enterprises, but the same could not be confirmed for low-tech enterprises.

Laforet (2010) comments on the complexity of innovation: by understanding the ever-changing customer needs, enterprises should meet them through innovation. Innovation is seen as the core capability of enterprises. It includes not only new products, but also business processes and the entering and development and creation of new markets to meet customers' needs.

Schumpeter (1947) was the first to emphasize the importance of innovation for economic growth, and this idea persists to this day. Even the official agenda of the European Commission for 2020 advocates that enterprises should spend more on R&D. If possible, it should be up to 3 percent of GDP in aggregate figures.

4.2.2 Export and its role in affecting enterprise growth

Export is usually described as the products and services produced and offered in one country and sold to consumers in another (Amadeo, 2020; Segal, 2020). It is a form of international trade, along with import and trade (Grozdanovska et al., 2017).

The economic crisis of 2008 also affected trade. Trade had been on an upward trajectory since 1982, but 2008 saw the first decline in decades (Love & Lattimore, 2009). As trade binds economies, it promotes development, both positive and negative. As consumption and investment fell, so did the demand for exports, which was felt most by countries that rely heavily on export-led growth.

Enterprises export when they have competitive or comparative advantages (Amadeo, 2020). Competitive advantage means that the enterprise is better than others in producing or offering the product or service. Enterprises find their comparative advantage in the specific characteristics of their country, for example Croatia is a country with access to quality wood, so natural export products include wood as raw material and wood products.

The largest exporting countries in 2019 were China, the United States of America, Germany, Japan, and the Netherlands (Szmigiera, 2021). China has been the leading country in export for some time. Their export in 2018 was 2.5 trillion, 12.8 percent of global goods export and 4.6 percent of service export. Their largest export product category was machinery and transportation equipment. The same 5 countries were also the top 5 exporters in 2018 (Duffin, 2020) and 2017 (Desjardins, 2018). These countries are also among the largest and most stable economies in the world.

In Croatia, only 15% of all enterprises export. But these 15% of enterprises employ 51% of the employed workforce, they are responsible for 62% of all investments, they account for 66% of total revenues, and they are responsible for 73% of investments in development (https://izvoz.gov.hr/o-hrvatskom-izvozu/9).

For some time, researchers have claimed that there is a significant relationship between a country's GDP and international trade, especially exports (Kovač, 2012). The natural consequence is that governments will try to encourage enterprises to enter foreign markets. According to Kovač (2012), Croatia is a small country, but it is a medium rich country in terms of resources and, therefore, export is of extreme importance for Croatia's economic growth and development.

Exporting also has a number of benefits for enterprises (Hill, 2015; HBOR, 2020; Segal, 2020):

- Profit and sales growth - by entering foreign markets, enterprises gain a larger market to operate in, opening up the possibility of profit and sales growth;
- Lower unit costs - by increasing production, economies of scale occur and therefore the cost per unit decreases;
- Dispersion of risk - enterprises that export are not dependent on just one market, i.e., a decline in demand for their products or services in the domestic market does not affect them as much;
- Using excess production capacity - if an enterprise has the opportunity to offer more products or services and the domestic market is not big enough for them, foreign markets could be a solution;
- Gaining knowledge from competition - entering foreign markets could bring new knowledge about competitors' practices that can also be used in the domestic market;
- Opportunity cost - Enterprises that do not export usually lose opportunities to grow;
- Potential gain of new knowledge, experience, and understanding of other business practices - learning about practices that are not common in the domestic market can lead enterprises to higher performance. There is also a greater chance of learning about new technologies and products and forming valuable partnerships.

What hinders most enterprises in exploiting these benefits are the barriers they encounter. An internal barrier to exporting is size. In the US, 5% of enterprises with less than 500 employees export (Hill, 2015) and in Croatia, although SMEs make up 99% of all enterprises, they only account for 53% of exports (Alpeza et al., 2018). Large enterprises tend to be more proactive than their small and medium-sized counterparts, so large enterprises are more likely to enter foreign markets. SMEs are generally reactive, most of them will only try to export when the domestic market is saturated. Some SMEs will forego the opportunity to export even if the foreign market contacts them first (Hill, 2015).

The most common barrier when it comes to exporting is tariffs. Tariffs are imposed by governments to make it difficult for others to enter their country's market. Although tariffs begin as a way to protect domestic producers, it often backfires (Moffatt, 2020). With higher tariffs, importers may pull out of the market, demand for domestic products increases, and their prices rise. With higher prices, customers buy less of that product or some other products. The result is a decrease in demand for a particular product, and ultimately the economy suffers a loss. The disadvantages usually outweigh the benefits of tariffs. In addition, other countries may impose their own tariffs in response, which can lead to a trade war.

According to Hill (2015), other barriers that may prevent enterprises from exporting are unfamiliarity with the opportunities that entering new markets may bring, fear of not being able to handle the complexity and mechanics of business practices, possible barriers that may arise from unfamiliar language, culture, legal systems, and currency. Therefore, enterprises will choose to be more or less involved in the process of exporting (Hollensen, 2007).

4.2.2.1 Export as a standalone determinant of growth

Since exporting has numerous benefits, it is expected to have a positive impact on enterprises (Knight, 2000). SMEs also believe that export drives growth and they expect that the volume of export will increase (31% expect increase vs 8% that expect decrease in export) (UPS, 2017).

As a result, not many researchers attempt to study the relationship between exporting and growth. Of the few papers, some observe the differences between groups of exporters and non-exporters, while others use exporting as a possible variable in models to predict enterprise growth. Jamali and Nor (2012) in their model of manufacturing enterprises in Iran, SMEs and large enterprises, came to the conclusion that export has a positive effect in both groups of enterprises.

Wiboonchutikula (2001) observed all enterprises in Thailand during the period between 1987-1996 and growth through employment was observed by calculating factor productivity indices. They concluded that export-oriented enterprises are labour-intensive and that there is no difference in the growth of SMEs and large enterprises, i.e., SMEs can achieve the same growth rates as large enterprises when they turn to foreign markets.

Burger et al. (2013) used export as a control variable. They examined the determinants of enterprise performance and growth in two datasets, one at the micro level consisting of enterprise-level data, the other at the macro level, data on respective domestic markets, from Central and Eastern Europe during the global recession. Growth was measured with two indicators - growth through employment and growth through investment. The results showed that, controlling for exports, the decline in demand has a stronger negative effect on growth through employment for non-exporters compared to exporters. The decline in cash flow also has a negative effect on investment growth, but exporters are more successful in adjusting investment to the new cash flow compared to non-exporters.

Šarlija and Bilandžić (2018) observed exporting in SMEs using two variables - share of foreign customers and share of export in total sales. Both variables showed no significant differences between SMEs that achieved high-growth and those that did not.

Dujak et al. (2016) observed logistic industries compared to all other SMEs in Croatia in the period between 2010-2014, and export was a significant variable only in the model that predicted high-growth of all SMEs. Specifically, the higher the share of exports in turnover, the more likely an enterprise is to achieve high-growth in the near future. Šarlija et al. (2017) created models to predict whether an SME will achieve high-growth. Their model showed that SMEs that are export-oriented, smaller, younger, and use high technology also have a greater prospect of achieving high-growth.

Corner (2017) observed 700 SMEs in Canada over the period between 2010-2014. The dependent variable growth was measured by sales, profits, and number of employees. It was found that exporting had a significant positive effect on growth when measured by sales and profit, but not on growth measured by increase in number of employees. Their dataset, obtained by interviewing entrepreneurs, shows that creating business contacts in target markets is essential for success as 83% of exporters claimed just that.

Love and Lattimore (2009) explain that trade affects growth in a number of ways - enterprises gain a larger customer base which enables them to increase production, while customers have a wider choice of goods at lower prices. In addition, knowledge circulates. Trade in itself is not enough. For trade to have the greatest impact on growth, additional conditions must be met, some of which are quality infrastructure and skilled labour. They conclude that it is difficult to determine whether trade influences growth, if trade is influenced by growth, or both, but it is certain that when a new idea, product, or way of working emerges, trade spreads it.

4.2.2.2 Joined influence of export and innovation on enterprise growth

A number of studies have examined the relationship between innovation and exporting. Orser and Carrington (2006) report that, in the case of Canada, innovative SMEs are three times more likely to export and in turn 41% of all sales in innovative SMEs come from export revenues. In the case of European SMEs, about half of them that engage in export have introduced new, innovative products, but only one fifth of non-exporting enterprises have done the same. Also, innovative European SMEs have a higher probability of exporting (European Commission, 2010).

Šarlija and Bilandžić (2018) came to the conclusion that innovative SMEs export more than non-innovative SMEs. Other research involved model building. Binary logistic multiple regression analysis was used by Pickernell et al. (2016) to search for determinants of SME exporting among 4388 enterprises in the UK. Innovation was identified as a determinant, in addition to age, industry, owner/manager characteristics, available resources, use of technology, and intellectual property.

Studies were also conducted on how different types of innovation affect exports. Saridakisa et al. (2018) first confirmed that innovative SMEs are more likely to export than non-innovative SMEs. Furthermore, their data showed that product innovations promote exporting more than service or process innovations. In the case of radical vs. incremental innovation, the probability of exporting benefits more from radical innovation, but the largest increase in exporting is expected when radical and incremental innovation are combined. On the other hand, Bodlaj et al. (2018) assume that exporting and innovation have a positive impact on enterprise performance and directly observe which type of innovation affects exporting while controlling for financial constraints and geographic diversification. Their results imply that technological, organisational, product, and marketing innovations all have a positive impact on SME exporting.

Chang and Webster (2019) also examined the relationship between innovativeness and exporting, but they controlled for environmental competitiveness and for government, industry, and professional networks. A logistic regression on 2263 Australian SMEs found that innovativeness and professional networks increase the probability of exporting by 17.5% when all other variables are fixed. The results further suggest that SMEs interested in growth through exporting and/or innovation should focus on building professional networks as a resource opportunity.

In essence, innovation and exporting influence each other and function in a cycle (Love & Lattimore, 2009; Golovko & Valentini, 2011). Innovation opens up opportunities to enter new markets at home and abroad, which leads enterprises to export. By entering new markets, enterprises gain knowledge, and in order to face competition, enterprises will innovate, which then leads to new markets. Enterprises are able to produce and sell more through exporting, which increases sales. Consumers enjoy a wider range of products. In their attempt to prove the cyclical nature of innovation and exporting and their effect on enterprise growth, Golovko and Valentini (2011) used a number of methods (fixed effects panel analysis, fixed effects modelling with an AR (1) process, and multinomial probit regression) on a panel dataset of manufacturing enterprises in Spain during 1990-1999. They confirmed that exporting and innovation are mutually beneficial, that innovativeness magnifies the positive effect of exporting on sales growth, and that exporting increases the positive effect of innovation on growth. Moreover, they showed that adopting growth strategy through export positively affects the adjustment strategy of growth through innovation and vice versa.

The relationship between R&D and export was also explored. Liem et al. (2019) observed proactive vs. reactive innovation and its effect on enterprise performance. Pooled ordinary least squares with robust errors showed that proactive innovation had a significant and positive effect, but reactive innovation had a significant negative effect on performance. They also observed the combined effect of reactive innovation and low constraints. The authors defined enterprises with low constraints to be enterprises that exported, were large in size (as opposed to an SME), and/or to have more than one owner. All combined effects (reactive innovation in exporting enterprises, reactive innovation by large enterprises, and reactive innovation by enterprises with more than one owner) were significant and negative. Therefore, their recommendation for SMEs with low constraints (SMEs that export or have more than one owner) was either to innovate proactively or not at all. Huang (2019) observed 6500 Canadian SMEs and investigated the relationship between high-growth enterprises, investment in R&D and exporting. The results showed positive relationships between high-growth, R&D, and exporting, but the direction of the relationship was unclear. They found that high-growth does not significantly affect either investment in R&D or export, leading to the conclusion that the positive relationship is in the other direction, i.e., that both investment in R&D and export affect growth. Interestingly, the models confirmed that R&D positively influences export and vice versa.

Not all studies concluded that there is a positive relationship between innovation, export, and growth. As Booltink and Saka-Helmhout (2017) noted, they examined the effect of R&D investment in non-high-tech SMEs as there is a clear positive relationship between R&D investment and enterprise performance in high-tech SMEs. Interestingly, they found an inverse U-shaped relationship between R&D investment and enterprise performance. They also emphasize the importance of the extent to which enterprises export. Indeed, marginally internationalized enterprises achieve the highest performance boost when R&D investment is increased to 5.8%, and fully internationalized SMEs reach their optimal level of R&D investment at 18.1%. Investment in R&D above these thresholds is not favourable. The gap between fully internationalized and marginally internationalized SMEs is due to the fact that fully internationalized SMEs are more directly exposed to market pressures and, therefore, innovation is most important for them to remain competitive.

Battaglia et al. (2018) observed how investment in R&D affects sales growth at different levels of exports. Investment in R&D has a positive effect on sales growth when the export share of sales is below 10%. This effect becomes negative when the export share is above 50%. This is true for SMEs that are less than 10 years old. Enterprises older than 10 years have a positive effect of R&D on sales growth, probably because the management of an older enterprise has more experience and is able to better combine different activities, technological vs market.

Love and Roper (2015) examined the available literature on enterprise exporting, innovation, and growth and reported three key findings. First, across countries and time periods, researchers consistently report a strong positive relationship between innovation, exporting, and performance, regardless of whether performance was measured by growth or productivity. Second, innovation and exports are mutually reinforcing in their effect on growth. Third, productive, growing enterprises tend to innovate and export and, in turn, performance benefits from that accrued innovation and exporting.

4.2.3 Financial ratios and their role in affecting enterprise growth

A good starting point for comparing enterprises is their financial statements. There are two possibilities of avoiding problems in the comparison process because the enterprises under consideration belong to very different industries and/or there is a difference in size. One way of comparing financial statements is to express items in financial statements as percentages of total assets and total sales. By expressing all items as percentages of total assets or total sales, they are standardized.

The other approach in using financial statements to compare enterprises is to calculate financial ratios. These ratios were introduced to avoid problems in comparing absolute values of enterprises of different sizes that may have different currencies (Ross et al., 2010). They basically put the relationship between two items on a financial statement into proportion.

The problem with different enterprise sizes has been eliminated and what remains are percentages, multiples, and time periods.

Financial ratios essentially focus on the relationship between two items from a financial report. Depending on what information can be extracted from a ratio and to whom it is important, financial ratios are usually divided into 4 groups:

1. Liquidity ratios
2. Leverage ratios
3. Turnover ratios
4. Profitability ratios.

Nadar and Wadhwa (2019) stated that financial ratios are mainly used in financial evaluation Azaro et al., 2020), insolvency prediction (Ciampi & Gordini, 2008), valuation, inter-linkage studies, benchmarking, decision making, and technical analysis.

There is not a lot of research on how financial ratios affect the future growth of enterprises. The growth studies that do use ratios usually cover only a few groups of financial ratios, in addition to other possible influences, including entrepreneurs' characteristics, environment characteristics, and other enterprise characteristics. The need to expand the use of more financial ratios was highlighted by Kotane and Kuzmina-Merlino (2019). They investigated which financial ratios were used in evaluating enterprise performance in the Latvian transport sector. Usually, only three financial ratios were used - current ratio, total debt to equity ratio, and return on assets. However, the authors found that more ratios should be included, at least accounts receivable turnover (in days), return on sales, return on equity, payables turnover (in days), inventory turnover (in days), and gross profitability.

Prawirodipoero et al. (2019) confirmed the importance of financial ratios in monitoring enterprise performance of micro, small, and medium-sized enterprises. They observed the available literature and established a research framework. According to them, influential financial ratios include liquidity ratios, debt ratios, operating performance ratios, profitability indicator ratios, and cash flow ratios.

4.2.3.1 Liquidity ratios as determinants of growth

Results on how liquidity measures affect the dependent variable may vary depending on which liquidity measure was used, but also depending on how the dependent variable was measured.

Moreira (2016) observed how liquidity affects growth as measured by the number of employees. According to the study, most studies explain that creditworthiness is considered a key factor in enterprise growth and that liquidity and solvency ratios are used in modelling credit risk. The results show that the liquidity ratio was significant only at a 10% level but not at a 5% level. The conclusion is that there is no relationship between growth by number of employees and liquidity, but the possibility that there might be a relationship if growth had been measured by revenue, sales, or turnover is left open.

Researchers also disagree on how liquidity affects sales growth. Voulgaris et al. (2003) observed a negative effect of current ratio on sales growth. Others confirmed a positive effect. Simbaña-Taipe et al. (2019) also observed the current ratio but found that it positively affects future sales growth. Jeger et al. (2016) also confirmed a positive effect of the current ratio on growth, but here the observed growth was high-growth by assets. Another study that found a positive effect of liquidity on growth is Silva and Santos (2012). Here, turnover was the dependent variable.

Some researchers defined growth through various profitability measures. Other researchers defined that by using profitability ratios they observe performance. Ishak et al. (2017) observed enterprise performance measured by net profit margin and the results showed that net profit margin is positively affected by current ratio and quick ratio. Widyastuti (2019) observed all enterprises in the food and beverage sector in Indonesia. Performance was measured by three ratios - return on assets, return on equity, and net profit margin. Liquidity ratios were measured by current ratio, quick ratio, and cash ratio. Significant positive impact of liquidity on performance was confirmed.

Borhan et al. (2014) had a slightly different approach. Instead of observing a number of enterprises they focused on one chemical enterprise and examined how changes in financial ratios affected net income growth. Liquidity was represented by current ratio and quick ratio. A significant and positive impact was confirmed only for current ratio.

Pandey and Diaz (2019) use only current ratio to observe how it affects net income. While the current ratio was significant for both the technology industry sector and for finance corporations, the direction of influence was opposite. When the impact of liquidity was modelled for financial corporations, the impact was positive, and in the model for technology enterprises it was negative. This meant that when one model was used for the entire dataset, the current ratio was not significant.

4.2.3.2 Leverage ratios as determinants of growth

In studying the relationship between leverage and growth, contradictory results can be found depending on how an enterprise finances its venture, externally or internally (Segarra & Teruel, 2009). Storey (1994), Cooper et al. (1994), Becchetti and Trovato (2002) all reported a positive influence of availability or use of external finances, while Sampagnaro (2013) found a negative influence of external financing on growth. In addition, he confirmed that internal cash flow is the most relevant factor of growth.

When researchers choose to use leverage ratios when studying growth, they rarely use only one leverage ratio, as Voulgaris et al. (2003) did. They modelled growth by sales and proved that leverage has a negative effect on growth. Most, like Salman (2019), use more ratios. In this study they used four leverage ratios - debt ratio, total debt to equity ratio, long-term debt to equity ratio, and time interest earned. They also had several dependent variables, all related to growth. When growth was measured by market value, the results derived from the multiple regression indicated a positive relationship between leverage ratios and growth, but the relationship was not significant. On the other hand, when growth was measured by profitability ratios, a strong, significant positive relationship was found between leverage and growth.

In their study of high-growth enterprises, Simbaña-Taipe et al. (2019) measured growth using sales and covered three groups of financial ratios, but only leverage ratios were represented by two ratios - total debt to equity ratio and total equity to total assets ratio. Interestingly, the total debt to total equity ratio used a lag, i.e., the values from the previous time period were used, while the total equity to total assets ratios was not lagged. Both were found to have a positive impact on sales growth. The study by Jeger et al. (2016) used three leverage ratios in modelling asset growth. Current liabilities over equity had a positive effect, but it was not significant. A significant positive effect was confirmed for the retained earnings over total assets ratio and total debt over total assets ratios.

In addition to growth, Silva and Santos (2012) also observed how ratios affect profitability. Leverage proved to have a non-significant (positive) impact on growth by turnover, but a significant and negative impact on profitability.

Ishak et al. (2017) measured leverage using total debt ratio. The study reported an insignificant impact on net profit margin, but it is worth noting that the authors used a significance level of

5%. At a 10% significance level, the impact would have been significant. Widyastuti (2019) also reported a non-significant relationship between profitability and leverage ratio.

Borhan et al. (2014) chose two ratios for each group in their study of the influence of financial ratios on performance, but only one made it into the final model. For the leverage ratios, the representatives were total debt ratio and debt to equity ratio. A significant positive effect of debt ratio on net income was confirmed.

Pandey and Diaz (2019) used two ratios out of the leverage ratios group, the total debt ratio and the long-term debt ratio (long-term debt over total assets). For both the financial corporations and the technology enterprises, return on assets was found to be significantly affected by leverage ratio. In both sectors, the effect of long-term debt ratio was negative and that of total debt ratio was positive. This was also reflected in the models constructed for both industries.

4.2.3.3 Turnover ratios as determinants of growth

Turnover ratios are often overlooked by researchers when modelling growth. For example, Voulgaris et al. (2003) used a stepwise approach and created up to 8 models when modelling sales growth, using the turnover ratio only in the last step. The ratio used was sales to fixed assets and the effect was significantly negative. A significant positive effect of turnover ratios on growth was confirmed by Jeger et al. (2016), but growth was measured in assets and turnover was represented by the ratio of sales to total assets.

Warrad and Al Omari (2015) observed how the performance of enterprises measured by return on assets was influenced by the turnover ratios - total asset turnover and fixed asset turnover. A significant positive relationship was demonstrated between the two ratios used. Widyastuti (2019) found no significant relationship between turnover ratios and net profit margin, return on assets or return on equity.

Pandey and Diaz (2019) used the ratio of fixed assets to total assets as a proxy for the turnover ratios to observe their impact on return on assets. The ratios were significant for both models, for the technology sector models and for the financial sector models. As with the liquidity ratio, the effect of turnover ratio was opposite between enterprise groups, with a negative effect found in the financial sector and a positive effect in the technology sector. Unlike the liquidity ratio, in the case of the turnover ratio the effect was significant when an overall model was created for both sectors, the effect was negative.

4.2.3.4 Profitability ratios as determinants of growth

Researchers mostly agree on the significance and the direction of profitability ratios when modelling growth. Usually, a significant positive relationship is confirmed. When Voulgaris et al. (2003) observed sales growth, profitability was measured by return on sales and return on assets. Both showed a significant positive effect on sales growth. Diaz Hermelo and Vassolo (2007) used return on sales among other independent variables in modelling sales growth. The results reflected a significant positive relationship. Simbaña-Taipe et al. (2019) observed how return on equity affects sales growth in high-growth enterprises. A positive relationship was found. According to the authors, the positive relationship can be explained by the fact enterprises that manage their resources effectively are able to create an environment that encourages investment, which in turn leads to growth. Return on equity was also used by Jeger et al (2016) to predict high-growth SMEs and the relationship was significantly positive.

Operating profit margin and net profit margin were selected by Borhan et al. (2014) as the profitability ratios that would influence performance. The multiple regression model used only the net profit margin ratio. Its effect was significantly positive. Pandey and Diaz (2019) also observed how other profitability ratios, namely return on equity and return on sales, affected their dependent variable, return on assets. Both ratios were significant in all models. Return on sales had a positive effect for both observed industries, technology industry and financial industry. Return on equity had a negative effect on return on assets, which does not normally occur in studies.

4.2.4 Visions, strategies, and other intangible aspects of the enterprise and their role in affecting enterprise growth

The extensive research by Barringer et al. (2005) showed that pursuing corporate strategies that also include dealing with the creation of product superiority and uniqueness improve growth potential. They also emphasize the positive effect of having a growth-oriented vision written down (in their dataset this was the case for 60% of high-growth enterprises, and only 15% of the rest). Both studies, by Barringer et al. (2005) and by Janczak and Bares (2010), emphasize the importance of human capital, especially the presence of skilled employees. According to Diaz Hermelo and Vassolo (2007), growth prospects will not be influenced by strategies which involve product diversification. On the other hand, geographic market diversification and the use of new technologies will positively affect growth prospect. Davidsson et al. (2002) found that Entrepreneurial Orientation, which in their study includes innovativeness, proactiveness, and risk-taking, positively affects growth, although they advise caution because different sub-dimensions of entrepreneurial orientation may have different effects on enterprise performance.

4.2.5 Firmographic characteristics of the enterprise as determinants of growth

Firmographic characteristics are to enterprises what demographic characteristics are to the population. They include industry, size, age, annual revenue, sales cycle stage, location, ownership status, and performance - these are some of the most commonly used firmographic characteristics in research (Fairlie, 2020). They can be incorporated into research in three ways:

1. the firmographic characteristic is integrated into the model as a variable;
2. specific models are built for each category of the firmographic characteristic;
3. only a subset of the population is observed.

In this study, size and industry are observed more closely.

4.2.5.1 Size of the enterprise as a determinant of growth

If size is one of the interests in modelling enterprise growth, the mention of Gibrat's law is inevitable. Gibrat's law states that there is no significant relationship between size and enterprise growth. Nevertheless, there is no unanimous answer on the dependence of size and growth. Some researchers, such as Wagner (1992), Diaz Hermelo and Vassolo (2007), and Gambini and Zazzaro (2011), agree with Gibrat's law and confirm it in their studies. Others have found a significant relationship between size and growth and, therefore, reject Gibrat's law. Although many researchers agree that a significant relationship exists, they disagree on whether the relationship is positive or negative. For example, the studies of Samuels (1965) and Perić, et al. (2020) found that larger enterprises grow proportionally faster than small enterprises. Such a positive relationship is associated with economies of scale. However, there seem to be more studies that have found that smaller enterprises grow faster as opposed to larger enterprises, including Mansfield (1962), Bottazzi and Secchi (2003), Voulgaris et al. (2003), Yasuda (2005), Krasniqi (2007), and Simbaña-Taipe et al. (2019). Another research that found a significant relationship between enterprise size and enterprise growth is Yang and Li (2020). Interestingly, they confirmed a positive relationship in non-state-owned enterprises while a negative relationship was found in state-owned enterprises.

4.2.5.2 Industry sector as a determinant of growth

Industry sector in itself is a popular topic to research, i.e. how enterprises divert from another depending on sector (Campa & Goldberg, 1997; Chatman & Jehn, 1994).

Regarding the industry sector as a predictor of growth, it is noticeable that most of the studies on enterprise growth focus on only one or two industries. Numerous papers focused only on how enterprises of the manufacturing sector achieve growth (Voulgaris et al. 2003; Avlonitis & Salavou 2007; Warrad & Al Omari, 2015; Simbaña-Taipe et al. 2019). Others chose only one or two industries, e.g., Ipinnaiye et al. (2017) build separate models for high-tech and low-tech industries, and Pandey and Diaz (2019) conducted their research on enterprises of the technology industry and the financial industry. Henrekson and Johansson (2010) compare high-tech industries with service industries and found that high-growth enterprises are not overrepresented in high-tech industries, as expected by the authors, but are very common in service industries. Others used more subsectors, such as Voulgaris et al. (2003) and Batrancea et al. (2018), who both used 5 subsectors. Batrancea et al. (2018) observed the pharmaceutical, furniture, leather garment, software, and textile sectors, and Voulgaris et al. (2003) observed the chemical, food, garments, machinery, and textile sectors. Both studies also constructed models of enterprise growth for each subsector. Warrad and Al Omari (2015) used 11 sub-sectors (chemical sector, glass and ceramic sector, paper and cardboard sector, pharmaceutical and medical sector, tobacco and cigarette sector, engineering and construction sector, printing and packaging sector, electrical sector, food and beverage sector, mining and extraction sector, textile, leather, and clothing sector) and observed values of financial ratios for each sub-sector, but only one overall model was constructed.

Some studies used the industry sector as a control variable in modelling growth (Becchetti & Trovato 2002; Carpenter & Petersen, 2002). Although they assumed the influence of industry using this approach, they failed to comment on whether the industry sector is significant or not and how it affects growth.

The most useful information on the impact of industry affiliation on enterprise growth can be obtained from those studies that used industry as an independent variable in the modelling process. Virtanen (2019) used industry as a categorical variable with 20 categories in machine learning models. When examining the importance of the variables, industry was not in the top positions. Predominant in the results is that industry is not a significant variable (Mateev &

Anastasov 2010; Hashi & Krasniqi, 2011; Yeboah, 2015). However, there are studies that find a significant impact of industry on growth (Wiklund et al. 2009; Stjepanović & Cita, 2017).

The most rarely used firmograhic characteristic is age, it has been reported to have a negative relationship with growth (Geroski & Gugler, 2004; Yasuda, 2005).

4.3 Environment characteristics affecting growth

The most commonly studied variables related to the environment are studies of various barriers, namely financial barriers, institutional barriers, and organizational barriers. Institutional barriers include taxation, government policy, and administration (Davidsson & Henreksson, 2002). Financial barriers include lack of external financing and equity capital (Becchetti & Trovato, 2002; Sampagnaro, 2013). Organizational and social barriers relate to market position, access to networks and skilled human capital and can also reduce the growth of enterprises (Bartlett & Bukvic, 2001). Wiklund et al. (2009) studied three aspects of growth: the enterprise, the entrepreneur, and the environment. In relation to the environment, they refer to three types:

1. The dynamic environment that provides the opportunity for growth;
2. The hostile environment that hinders growth;
3. The heterogeneity of the environment that promotes growth.

Further, they report in their research that changes in society, politics, market, and technology open more opportunities for growth.

Apart from the different types of environments and the obstacles they present, the characteristics and state of the market as a whole can be considered as characteristics of the environment. It is typical of economic occurrences that they affect each other in a cyclical nature. SMEs are an important component of most economies and their influence on the state of the economy is observed by many. In the case of Canada, in 2013 SMEs make up 99.8 percent of all enterprises and they employ about 89.9 percent of the work force. As a consequence, they account for 52 percent of gross domestic product and in the prior 10 years SMEs were responsible for 90.2 percent of employment (Seens, 2015). According to Ubi and Mba (2019) it is projected that SMEs in the USA and EU countries contribute 40-60 percent of gross domestic product and over 60 percent in employment. SMEs in Asian Tigers (Malaysia, India, Indonesia, South Korea, China and Japan) contribute 40 percent of GDP and 70-90 percent in employment, and in Africa's most developed countries (South Africa, Egypt, Nigeria and Kenya) it is estimated that SMEs contribute 30-40 percent in GDP and over 70 percent in employment. There is not much resaerce found on how these measures affect SME growth.

In order to study how macroeconomic policies affect the growth of SMEs, the dataset must meet some conditions. Macroeconomic measures have a fixed value for all enterprises in an economy at a fixed point in time. For this reason, the dataset must contain either enterprises from different economies, values for enterprises at different points in time, i.e., longitudinal data, or both. Such datasets are not common and, consequently, such studies are not either.

Studies on how EU membership affects SMEs are even rarer, although the benefits are numerous, especially in terms of trade with other EU members.

Some studies also observed taxes and policies. Taxes were found to be significant and negatively affect growth. Studies by Krasniqi (2007) and Honjo and Harada (2006) observed the effect of specific policies.

Here, special attention is paid to macroeconomic variables and specific states of the economy – the economic crisis and membership in the European Union.

4.3.1 Gross domestic product as a determinant of growth

When economic activity is of interest, the first indicator everyone turns to is gross domestic product (Bureau of Economic Analysis, 2015; Seens, 2015).

Seens (2015) observed revenue growth of SMEs and large enterprises in Canada and how current and lagged GDP affected it. The results showed that current GDP had a stronger impact on revenue growth of large enterprises, while lagged GDP growth had a stronger and positive effect on SME growth.

Ishak et al. (2015), on the other hand, concluded that GDP growth alone had no effect on SME growth. However, when the model included financial ratios in addition to GDP growth, the results showed a significant effect of GDP.

4.3.2 Inflation and employment as determinants of growth

Probably the most commonly considered macroeconomic variable in modelling SME growth is inflation. Inflation is the increase in the average price level of a basket of selected goods and services in an economy over a period of time (Chen, 2020). When inflation is present, the same amount of money can buy less than before inflation. Therefore, inflation is also described as the decrease in the purchasing power of a nation's currency (Blanchard & Johnson, 2013). The rate of inflation is the rate at which these prices increase. Deflation is the opposite of inflation, which is the decrease in the average price level or the increase in the purchasing power of the currency.

Studies mostly agree that the effect of inflation is significant and negative.

Hashi (2001) observed obstacles to SME growth by assets in Kosovo. First, the barriers were grouped into "indicators" and then these were used in the process of modelling. Inflation was a part of the environmental barrier which was a significant negative variable in the model.

Ochanda (2014) examined possible influences on SME growth in Kenya. A regression on 100 SMEs showed a significant negative effect of inflation on growth. Halim et al. (2017) observed growth of SME GDP rates. They confirmed a significant negative effect of inflation on their dependent variable.

One of the few studies that did not confirm the significance of inflation in researching enterprise growth was that of Udoh et al. (2018). However, their dependent variable was the overall, summarized growth of SMEs in Nigeria and not the individual growth of SMEs. The dependent variable "real output of Nigeria" was measured as the contribution of SMEs to GDP. Through modelling, they observed how monetary policy which affected interest rates, exchange rates, and inflation affected the growth of SMEs. The results indicate that only interest rates had a significant impact on SMEs growth while exchange rates and inflation remained insignificant.

Another vital indicator of the economy is the unemployment rate. The unemployment rate is the percentage of unemployed in the total work force. The work force equals the sum of all employed and unemployed people. It is negatively related to growth of GDP rates, which is stated by Okun’s law (Owyang & Sekhposyan, 2012).

Employment rate is rarely used in research on enterprise growth. One of the few studies that included employment as well is Ipinnaiye et al. (2017). They found that unemployment and inflation had a significant, negative relationship with growth in both high-tech and low-tech industries.

4.3.3 Global economic crisis and EU membership as determinants of growth

There are three official stages of economic crisis used to describe and classify the negative change in the economy (Kutnjak et al., 2015):

1. Stagnation - a period in which the economy is static, i.e., output does not grow and remains at the same level.
2. Recession - at the national level, it refers to a period extending over two quarterly periods in which output decreases. At the global level, there is no definition, but most economists accept the IMF description - slowdown in the growth rate of the world economy to less than 3%.
3. Depression - decline in output that lasts for three or more consecutive quarterly periods.

In addition to the financial consequences there are also social consequences. Mukunda (2018) argues that the social and political consequences are even greater than the economic, he states that consequences of the global crisis in America include election of Trump as president and in Europe one of the bigger consequences is Brexit, which in turn affect the economy even more.

Opinions differ on how recessions affect small and medium-sized enterprises compared to their large counterparts. Hodorogel (2009) considered SMEs as a particularly vulnerable group and therefore investigated what policies should be introduced to mitigate the impact of the crisis.

Common sense would suggest that the survival rate of new enterprises is lower in times of crisis. However, Simón-Moya et al. (2019) confirmed that it is indeed higher during crisis. They hypothesize that this is due to the fact that the opportunity cost of working in larger enterprises and avoiding self-employment is lower during crisis.

Studies emerged that examined how the recession affected specific industries. Hsieh (2011) studied four Asian dragoons and found that, as exports collapsed, many turned to service industries, namely new service development (NSD). NSD involves high-tech or more sophisticated manufacturing products with information technology, telecommunications, and consulting functions to provide value-added services. Rozentale (2014) found that creative industries are more responsive to economic shocks than the average economy but stresses the need to consider differences between creative industries sectors. Horváth and Paap (2011) examined the gambling industry in the US and how it was affected by the crises. They divide it into three sub-sectors - casino gambling, lottery, and pari-mutuel betting. The conclusion is that only lottery was not affected by the crisis. Casino gambling maintained its growth during the recession (albeit at a lower intensity) and pari-mutuel betting had no significant growth rates before the recession and had a decline during the recession.

Wolf and Terrell (2016) emphasize the importance of high-tech industries to the US economy; they account for about 12 percent of all jobs but produce nearly 23 percent of output. They found that the 2000-01 recession hit high-tech industries but also that the industry was almost unaffected by the 2007-09 recession, although there was a shift of jobs from manufacturing to services.

Although recession is a popular research topic in general (Barnichon et al., 2018), and in how it affected practices in enterprises (Bryson & Forth, 2016). Nonetheless, not many studies can be found on how it specifically affects SME growth. Cowling and Liu (2011) also examined the impact of the recession on SMEs. They found that most SMEs managed to maintain both turnover and employment at pre-recession levels, although each SME lost 1.5-2.0 jobs. Some SMEs even managed to achieve employment growth during the recession. This growth was usually achieved by SMEs that were seeking capital for the first time. Turnover growth was achieved by SMEs with sustainable growth aspirations. According to the findings, SMEs were the most resilient to the recession. They conclude that the majority of SMEs are realistic about the potential for growth in the economy and have adjusted their expectations accordingly.

The European Union (EU) evolved from the European Economic Community, which was established in 1958 to promote economic cooperation. Today, the EU has 27 members, with Croatia being the latest to join in 2013 (retrieved from https://europa.eu/european-union/about-eu/countries_en#the-27-member-countries-of-the-eu). Two main features of the EU that most directly affect enterprises are the common currency and the Schengen area. The Schengen area abolishes internal borders, making it easier to trade with other European countries. The elimination of internal borders simplifies exports and increases the potential demand for enterprise products. Similarly, the common currency also simplifies cross-border trade, stabilises the economy, and provides consumers with a greater choice of products, services, and opportunities. All of this makes membership in the EU a great potential influence on the operations and growth of enterprises. Nevertheless, studies using it in modelling growth are very rare as it is a difficult variable to include. Only enterprises from 28 countries have membership and, moreover, not all countries joined the EU at the same time. Voulgaris et al. (2003) observed how manufacturing SMEs in Greece changed when their overprotective economy turned into a competitive environment after joining the EU. SMEs mainly reduced their labour costs instead of reducing production costs and introducing new technologies and innovations in their production processes and products.

For an overview off all the above studies on growth determinants, see APPENDIX A. Previous research to date shows how scattered the studies are. The studies differ in how the dependent variable growth was defined, what growth indicator was used, what possible influences were considered, and finally how the relationship was examined.

The definitions of growth vary widely. They range from defining growth in absolute terms, to percentages, as well as defining specific types of growth, including high-growth. In addition, the indicator used for growth varies. The most popular are sales, employment, and total assets, but there are many other indicators which can be found in usage by researchers. Some studies have even confirmed that ideas about what influences and defines growth vary depending on the indicators chosen.

Moreover, the significance of determinants also changes depending on what other influences are included in the models. The most popular potential determinants observed overall are entrepreneurial characteristics, but among enterprise characteristics, innovation and export are favoured. On the other hand, environment characteristics are observed in only a few studies, with inflation being the predominant potential determinant of enterprise growth.

The observed studies also differ in terms of the methods chosen. Different regression methods predominate, with linear, logistic, and ordinary least squares (OLS) regression being the most commonly used. Of the 57 studies cited, only seven used some type of panel data method. In the studies that used panel models, innovation and exports were most frequently observed as determinants of growth. This is not surprising given that innovation and export are the most popular enterprise-specific characteristics considered by researchers as determinants of enterprise growth. Also, the use of multiple environment variables, especially macroeconomic variables, was found only in studies that examined their datasets with panel models.

Particular attention has been paid in this chapter to enterprise and environment characteristics, especially for Croatia. Previous studies have shown that innovation, export, and financial ratios are significant determinants of growth for Croatian enterprises, but a lack of studies on the environment level is evident.

5 Empirical research of the influence of enterprise and environment characteristics on the growth of Croatian SMEs

In order to investigate how Croatian SMEs grow and what influences their growth, a dataset of Croatian enterprises is examined. This chapter first provides a brief overview of the entire dataset. The presentation of the dataset is followed by an explanation of the methods used in descriptive statistics and modelling. Finally, the dataset is examined in detail through the aforementioned descriptive statistics methods and the modelling techniques are used to create models. The chapter ends with explanations of the chosen models and the results are compared with previous research.

5.1 Dataset of Croatian SMEs in the period between 2001-2015

The dataset used in this research is a panel dataset. It is a secondary dataset consisting of financial reports provided by the Croatian Financial Agency (FINA) and covering the period from 2001 to 2015. This dataset includes all privately owned enterprises that existed in 2001 and each year in the subsequent 15-year period, and they also had to be considered micro, small or medium-sized at the beginning of the observed period, i.e., in 2001. The dataset was cleaned of outliers and inconsistencies.

Inconsistencies that emerged upon careful examination of the dataset included:

- Negative values or values equal to zero in total assets, fixed assets, current assets, current liabilities, commitments towards suppliers, sales revenue, cost of materials, total income, total expenditures, bank and cash balances, investment in new fixed assets, and imports.
- Missing values, or the exact value "1", for the variables from the previous item.
- Enterprises whose sales revenues from exports or domestic sales were higher than their total sales revenues.

Outliers that were excluded from the dataset were enterprises that had investments in new fixed assets and imports that were up to one thousand times higher than total assets and total expenditures.

Another problem with the dataset was that some enterprises did not file their financial statements for one or more years. Although it is mandatory, they rather chose to pay a fine. These enterprises were also excluded from the dataset. This type of dataset, where every enterprise is present at every point in time, is called a balanced panel dataset. There remained 13808 SMEs in the dataset that were either micro, small, or medium-sized at the beginning of the observation period but could grew into large enterprises over the course of the observation period. The next graph shows the proportion of small, medium, and large enterprises

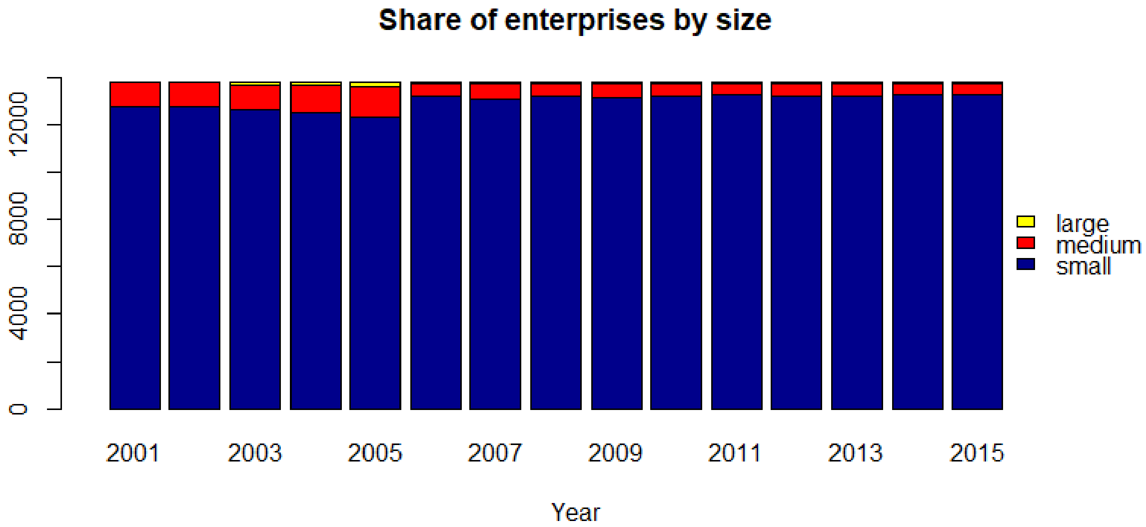


Figure 2 - Share of enterprises depending on size in Croatia in the time period 2001-2015. Source: Author's calculation.

As can be seen from the Figure 2, there are no large enterprises in 2001 and 2002. By 2006, the number of large enterprises increases. The same is true for medium-sized enterprises. The number of large enterprises remains constant in the range of 20-35 large enterprises per year. This could also have been a possible warning sign for the upcoming recession in 2008, i.e., 2009 for Croatia.

The dataset is composed of two parts. The first part contains enterprise characteristics and builds on the enterprises' financial statements. The second part of the dataset contains environment data, which includes macroeconomic variables and indicators of the state of the economy.

The dependent variable for which the model will be created is growth of the enterprise measured by total sales and is extracted from the financial statements. As already stated, the two most common indicators to be used to measure growth are sales and employment. Both have their advantages and disadvantages. Since this study includes enterprises from only one economy (i.e., from Croatia) and because of the disproportional relative change for one additional employee among small, medium, and large enterprises, the measure of sales is favoured compared to the indicator of employment.

The financial statements were used to compute ratios that belong to the group of enterprise characteristics. The ratios for groups of innovation, export, investment, and productivity were taken over from Šarlija and Bilandžić (2018.), while liquidity ratios, leverage ratios, turnover ratios, and profitability ratios were mostly taken from Ross et al. (2010). Also, firmographic characteristics (size and industry sector) were subtracted from the financial statements.

1. Innovation ratios

Four of the five innovation variables used are shares of total assets. They provide information on how much of the enterprise's assets is associated with the enterprise's innovativeness. The four ratios are:

$$\text{IATA} = \frac{Intangible\ assets}{Total\ assets}, \tag{8}$$

$$\text{EXTA} = \frac{Expenditures\ in\ development}{Total\ assets}, \tag{9}$$

$$\text{CPLTA} = \frac{Concessions, patents, licenses, trademarks, service\ marks, software\ etc.}{Total\ assets}, \tag{10}$$

$$\text{GWTA} = \frac{Goodwill}{Total\ assets}. \tag{11}$$

The last innovation variable is an indicator variable named "innovative". The value of the variable is defined to be "1" if the enterprise has spent above average on concessions, patents, licenses, trademarks and service marks, software, and other rights, otherwise it is equal to "0".

2. Export ratios

Export ratios are set as shares of sales. Two ratios are defined:

$$\text{ExSal} = \frac{Export}{Sales}. \tag{12}$$

$$\text{InCSal} = \frac{Income\ on\ the\ domestic\ market}{Sales}. \tag{13}$$

Because enterprises sell their products either on the domestic market or on foreign markets, i.e., through export, the sum of the ratios (12) and (13) will equal "1".

3. Liquidity ratios

Liquidity ratios are also known as short-term solvency ratios. As the name suggests, they are designed to indicate whether an enterprise is able to pay its bills over short periods of time without stress. Current assets and current liabilities are both short-lived measures because they change so quickly that there is no time to distinguish their book value too much from their market value. On the other hand, today's values can change and be misleading by tomorrow because of the rapid changes.

Current ratio (Cr)

Current ratio is one of the most popular ratios. This ratio is calculated in the following way:

$$\text{Cr} = Current\ ratio = \frac{Current\ assets}{Current\ liabilities} \tag{14}$$

For a value of *x*, it indicates that the enterprise either "has *x* units of currency in current assets for each unit of currency in current liabilities" or that "current liabilities are coveted *x* times over". Intuitively, it seems that the higher the current ratio, the better shape the enterprise is in, but too high a value may indicate that the enterprise is using cash and other short-term assets inefficiently.

An acceptable value usually needs to be above 1. It is preferable to observe previous values and the industry average before commenting on the value and drawing conclusions. As a rule of thumb, financial analysts would suggest a value of 2.0, which can be misleading depending on the industry.

Quick ratio (Qr)

This ratio is also called the acid ratio. It is fairly similar to the current ratio, except its numerator is reduced by the value of the inventory, i.e.:

$$\text{Qr} = Quick\ ratio = \frac{Current\ assets - Inventory}{Current\ liabilities} \tag{15}$$

It is worth noting that buying inventory with cash does not change the value of the Current Ratio, but it does change the Quick Ratio. Inventory is the least liquid asset and can vary greatly from market value because the condition of the state of the inventory is not considered. Also, a large inventory can be a sign that the enterprise is overproducing or that it overbought and has a larger inventory than necessary.

As with the Current Ratio, an acceptable value for the Quick Ratio is any that does not deviate too much from the industry average. If the average is not known, a decent value would be 1, and a minimum sufficient value is 0.9.

Cash ratio (Cshr)

Cash is the most liquid asset an enterprise owns, so it is of interest to financial analysts and especially to very short-term creditors. It is calculated as:

$$\text{Cshr} = Cash\ ratio = \frac{Cash}{Current\ liabilities} \qquad (16)$$

A very small value might not be a problem if the enterprise can borrow on short notice.

Current assets to total assets ratio (CATA)

CATA ratio is a very popular choice of ratio in research of growth (Mandal & Goswami 2010). It expresses the share of current assets in total assets.

$$\text{CATA} = \frac{Current\ assets}{Total\ assets} \qquad (17)$$

This ratio provides information on the amount of total funds invested for the purpose of working capital. It offers understanding of the share of current assets to total assets, which is important because current assets are significantly involved in the formation of working capital.

4. Leverage ratios

Leverage ratios are also known as long term solvency ratios. They address how the enterprise is meeting its long-term obligations, thus giving an indication of how much risk is involved in investing in the enterprise. Although financial leverage has a negative connotation, it can have a positive impact if the resources received are well managed and well invested.

Total debt ratio (TD)

The total debt ratio gets its name because it observes all debt, of all maturities to all creditors, relative to total assets. Since total assets are equal to the sum of all debts and total equity, the ratio can be calculated as follows:

$$\text{TD} = Total\ debt\ ratio = \frac{Total\ assets - Total\ equity}{Total\ assets} = \frac{liabilities + Currentl\ iabilities}{Total\ assets} \qquad (18)$$

It expresses how much debt is used by the enterprise. To estimate whether the value of the total debt ratio is acceptable, it is advisable to observe how it has changed over time and compare it with other enterprises in the same industry.

Debt to equity ratio (TDTE)

The debt to equity ratio is just a variation of the total debt ratio, its formula is:

$$\text{TDTE} = Debt\ equity\ ratio = \frac{Total\ debt}{Total\ equity} \tag{19}$$

If only current liabilities of all debt are of interest, then the debt to equity ratio turns to:

$$\text{CLTE} = \frac{Current\ liabilities}{Total\ equity} \tag{20}$$

Bank loan to total assets ratio

Probably the most interesting part of total debt are the liabilities to banks. Another leverage ratio, therefore, is bank loan to total assets ratio:

$$\text{BLTA} = \frac{long\text{-}term\ liabilities + short\text{-}term\ liabilities\ banks \wedge other\ financ.inst.}{Total\ assets} \tag{21}$$

Other leverage ratios include

RETA

$$\text{RETA} = \frac{Retained\ earnings}{Total\ assets} \tag{22}$$

A low value suggests that the enterprise is financing expenditures from borrowings, rather than from their own earnings. On the other hand, a high value is often linked to a history of profitability, which can indicate the competence of the enterprise to overcome a bad period.

Long-term debt to current assets ratio (LDCA)

The formula of LDCA is:

$$\text{LDCA} = \frac{Long\text{-}term\ debt}{Current\ assets} \tag{23}$$

The LDCA ratio is used to measure financial stability and can signal potential problems within the enterprise. An acceptable value is 1 or less, meaning that for the current period the financial stability is not tenanted (Morehouse, 2011).

Total equity to total assets ratio (TETA)

The TETA ratio is calculated as:

$$\text{TETA} = \frac{Total\ equity}{Total\ assets} \tag{24}$$

It expresses what percentage of total assets is financed by the enterprise's equity. This ratio holds the same information as the Total debt ratio because the sum of total equity and total debt equals total assets, i.e., TETA=1- TD. Assets must be financed by one of the two (Robison & Barry, 1998).

5. Turnover ratios

Turnover ratios are also called asset utilization ratios, activity ratios, or efficiency ratios. They are intended to describe how efficiently the enterprise exploits its assets to generate sales.

Receivables turnover and Days' sales in receivables (DaysR)

These ratios provide information on how long it takes an enterprise to go from manufacturing a product to selling it.

$$Receivables\ turnover = \frac{Sales}{Accounts\ receivables} \tag{25}$$

The Receivables turnover ratio can be loosely interpreted as the number of times the enterprise has collected on its outstanding credit accounts and recharged the money that year.

For a more intuitive interpretation, the number of days in that year (365 days by default) is divided by the Receivables turnover ratio.

$$\text{DaysR} = Days'\ sales\ in\ receivables = \frac{365}{Receivables\ turnover} \tag{26}$$

This ratio can be interpreted as the number of days it takes the enterprise to collect its credit.

Accounts payable turnover and Days' outstanding in accounts payable (DaysA)

One variation of Receivables turnover is the Accounts payable turnover, and Days' sales in receivables has its variation in Days' outstanding of accounts payable. The formulas are:

$$Accounts\ payable\ turnover = \frac{Cost\ of\ goods\ sold}{Accounts\ payable} \tag{27}$$

and

$$\text{DaysA} = Days'outstanding\ in\ accounts\ payable = \frac{365}{Accounts\ payable\ turnover} \tag{28}$$

Days' outstanding in accounts payable can be interpreted as the number of days it takes the enterprise to pay its creditors. A logical assumption would be that it is favourable for Days' outstanding in accounts payable ratio to be as low as possible, i.e., accounts payable turnover ratio to be as high as possible. However, if the accounts payable turnover ratio is considerably higher than the industry average, this could indicate that the enterprise is not investing its cash properly or using it intelligently.

Other turnover ratios

Net working capital (NWC) turnover ratio indicates how much “work” is derived from the working capital. A high value is preferable. It is calculated as follows:

$$\text{NWCt} = \frac{Sales}{NWC} \tag{29}$$

Another popular ratio is the **total assets turnover ratio (Tat)**. It presents how much sale is generated for every unit of currency of total assets.

$$\text{TAt} = \frac{Sales}{Total\ assets} \tag{30}$$

If this ratio drops or deviates from the industry average, it may indicate problems.

Instead of Sales, researchers will often use Total Income.

$$\text{TITA} = \frac{Total\ income}{Total\ assets} \tag{31}$$

Total assets equal the sum of fixed assets and current assets, so other possible ratios include

$$\text{TIFA} = \frac{Total\ income}{Fixed\ assets} \tag{32}$$

$$\text{TICA} = \frac{Total\ income}{Current\ assets} \tag{33}$$

Following a similar logic to the one with quick ratio, in this case again the least liquid share of current assets, i.e., the inventory, is subtracted from current assets and then divided by sales.

$$\text{CAIS} = \frac{Current\ assets - Inventory}{Sales} \tag{34}$$

6. Profitability ratios

Profitability ratios are the best known and also the most commonly used ratios. They provide information about how efficiently the enterprise is operating, that is, how efficiently it is conducting its business.

Profit margin (ROS)

Profit margin is often called ROS, as an acronym for return on sales. It is popular with managers because it indicates how much profit is generated by sales.

$$\text{ROS} = \frac{Net\ income}{Sales} \tag{35}$$

If all other things are constant, a higher value of profit margin is desirable. But it is rare that all other things are constant. For example, if an enterprise lowers its prices, the volume of products sold is expected to increase. Total profit may increase or decrease, but the profit margin ratio will usually decrease, meaning a lower value of PM can be positive in some cases.

Net profit margin (NPM)

For some enterprises, it may be of interest to observe net income as a percentage of total income, rather than just as a percentage of income from sales. This ratio is called "net profit margin" and is calculated as follows:

$$\text{NPM} = 100 * \frac{Net\ income}{Total\ income} \tag{36}$$

It can be considered as a measure of how well management is doing its job, as the ratio of net income to total income can be interpreted as the ratio of costs to prices in running the enterprise.

Return on assets (ROA)

Return on assets is a ratio that indicates how much profit is generated for each currency unit of total assets, that is, it expresses how successfully the enterprise uses its assets to generate profits.

$$\text{ROA} = 100 * \frac{Net\ income}{Total\ assets} \tag{37}$$

What is an acceptable or desirable value of return on assets depends largely on the industry to which the enterprise belongs. Capital intensive industries will by default have a higher value of ROA as opposed to industries that are non-capital intensive.

Return in equity (ROE)

Return on equity shows how much profit is generated for each currency unit of equity. It is often referred to as the most important profitability ratio because it shows how shareholders have fared during the year.

$$\text{ROE} = 100 * \frac{Net\ income}{Total\ equity} \tag{38}$$

It is the ratio most commonly used as a measure of performance. Return on equity can be used in combination with return on assets and the interest rate of another exterior equity can be used to examine whether it is better for the enterprise to use its own capital or other sources.

7. Investment ratios

The dataset also includes investment variables. These are defined as shares of total expenditures or of total assets:

$$\text{ImpTA} = \frac{Import}{Total\ Assets} \tag{39}$$

$$\text{ImpTE} = \frac{Import}{Total\ Expenditures} \tag{40}$$

$$\text{InvLATA} = \frac{Investment\ in\ Long - term\ Assets}{Total\ Assets} \tag{41}$$

$$\text{InvLATE} = \frac{Investment\ in\ Long - term\ Assets}{Total\ Expenditures} \tag{42}$$

8. Productivity ratio

Only one productivity ratio was included in the modelling process. It indicates productivity based on the number of employees:

$$\text{InrE} = \frac{Income}{Number\ of\ employees} \tag{43}$$

9. Firmographic variables

Two firmographic variables were included in the dataset - the size of the enterprise and the industry sector to which the enterprise belongs. Both variables are categorical.

The size variable has up to three categories - small, medium, and large. The dataset includes only small and medium sized enterprises in the first observed period, i.e. year 2001. To not exclude enterprises that grew to large enterprises, in later periods the enterprise can be also labelled as large. Therefore, the variable 'size' has two categories in 20012, and for the period between 2002-2015 it has three categories.

The industry variable has been categorized into 10 groups. Those are agriculture, industry, construction, trade, transport and storage, accommodation and food, information and communication, finance and real estate, professional, scientific and technical activities and education, services, and arts.

10. Environment characteristics

Environment characteristics are included in the second part of the dataset. They cover the same period as the financial statements, i.e., 2001 to 2015. Four macroeconomic measures are included in the dataset:

- GDP – in millions of kunas
- GDP growth rate
- Inflation rates - Average annual consumer price inflation rate
- Employment rates.

They are retrieved from the Croatian National Bank (https://www.hnb.hr/statistika/glavni-makroekonomski-indikatori).

Three indicator variables are included to describe the state of the economy. The first two indicator variables are related to the global financial crisis of 2008. Croatia was in a state of economic crisis in the years 2008-2015, with the peak in the period between 2008-2010. Croatia became a member of the European Union in 2013 and remained a member in the observed period.

The three indicator variables are equal for all enterprises in the same year:

- GL - Global Crisis - all enterprises have a value of "1" in this variable in the years 2008-2015;
- ES - Economic Shock - all enterprises have a value of "1" in this variable in the years 2008-2010;
- EU - EU membership - all enterprises have a value of "1" in this variable in the years 2013-2015;

The total number of all variables in the dataset is 43. Enterprise characteristics cover 36 of them and 7 are environment characteristics.

5.2 Panel datasets and panel data modelling techniques

Datasets are mostly 2-dimensional. They either span over time for an entity, or they contain a number of entities at a given time. They can easily be represented in a two-dimensional table. Panel data, on the other hand, contains information about a number of entities for several characteristics over time. Therefore, some researchers consider panel datasets as three-dimensional: entities i=1,...,n; measurements, i.e., panel waves, t=1,...T; variables v=1,...,V (Chamberlain, 1984; Wooldridge, 2001). As a result, panel datasets may contain three types of variables:

1. Time-invariant variables - these variables are constant over time for each entity, but they differ between individuals. A typical example would be gender or industry sector.
2. Individual invariant variables - unlike the first type, these variables change over time but have the same values for all entities at a given time. An example is the inflation rate for enterprises in an economy.
3. Time and individual variant variables - this group of variables is usually most prevalent in panel data. The variables vary across entities and over time. A typical example is working experience.

Andreß (2008) distinguishes types of panel datasets according to the representation of entities in measurements, depending on whether there are more entities or measurements and how the data are organised. Depending on the representation, there are balanced and unbalanced panel datasets. If all entities have measurements at every observed moment, then the dataset is a balanced panel dataset. Otherwise, the dataset is unbalanced, and the number of entities varies over time.

The second criterion was whether there are more entities or more measurements. Depending on this, there are micro and macro panel datasets. Micro datasets are those that have a large number of entities, which is also much larger than the number of measurements, i.e., n>>T, while macro datasets have a small number of entities, sometimes even smaller than the number of measurements (n<T). Typical example for a micro dataset is the population of a country and for a macro dataset it is a set of countries. This is also where the names of the dataset types come from - while micro datasets comprise smaller units, such as individuals, macro datasets usually consist of larger units, such as countries.

Depending on how the dataset is organised, two types of formats are defined - wide format and long format. The wide format organises the data so that the rows consist of entities and the columns consist of variables for each year. These tables have n rows and T*V columns. This format was traditionally used more often, especially when the number of time measurements was small (T< 4). With the passage of time and the wider use of computers, the long format has been used more frequently. In the long format, each entity has T rows, for each measurement in time, and the columns contain each variable only once. Tables in the long format have n*T rows and V variables.

The long format highlights two properties of panel datasets. They are hierarchical datasets and they are also called pooled datasets. First, panel datasets are also hierarchical datasets, which means that measurements are nested within entities. The data can be observed so that each entity has a small time series. Examples of hierarchical cross-sectional datasets are students in a school nested within classes, or respondents in different countries. The only difference between hierarchical cross-sectional data and panel data is that measurements within entities in panel data have a natural order (in terms of time), whereas in cross-sectional data there is no order. What they have in common is that measurements within entities are more similar to each other than measurements from other entities. In the case of panel datasets, these similarities will be even more pronounced at smaller temporal intervals. For this reason, the assumption of independence cannot be made for hierarchical datasets.

Second, panel datasets are also referred to as pooled datasets because they can be viewed as a number of individual time series data combined into one file. It is not uncommon for economists and political scientists to also call panel datasets pooled time series cross-section datasets (TSCS). Given these two features, some researchers will even argue that pooling cross-sectional data over time increases the number of cases from n to n*T, and hence the statistical power. However, this is difficult to uphold because the assumption of independence is not provided. With the broad format, it is clear that the dataset does not have n*T cases, and misinterpretations are more easily avoided.

Because of their unique characteristics, panel data have a number of advantages over traditional time series data and cross-sectional data. Hsiao (2014) lists 7 of them:

1. Panel data increase the accuracy of inference of model parameters - panel data usually have more data points, which leads to higher degrees of freedom, collinearity between independent variables is reduced, and the efficiency of econometric estimations is thus improved.
2. Panel data allow researchers to construct more realistic behavioural hypotheses - compared to cross-sectional data, panel data include the ability to observe how the probability for the subject to act or react in a certain way changes over time or as a result of an influence. As an example, Hsiao (2014) cites how likely women are to work. A cross-sectional dataset constructed from women who are 50% in and 50% out of the labour force could lead to the conclusion that women spend only half their lives in the labour force. However, it is much more common that those who are included in the labour force are included throughout their lives. This could be demonstrated with a panel dataset and panel data analysis.
3. Panel data are more successful at uncovering dynamic relationships - while cross-sectional datasets cannot estimate micro and macro dynamic effects, a single time series dataset does not usually provide good estimates either. On the other hand, panel data can exploit individual differences in the independent variables, reducing the problem of collinearity.
4. Panel data provide some tools to potentially better deal with omitted variables. Omitted variables are often a problem in models derived from cross-sectional datasets, as they can lead to biased regression coefficients. If the dataset provided is a panel dataset and the omitted variables are constant over time for individuals or constant over individuals at a given time, the problem can be solved by simple transformations. In the case of variables constant over time, it is sufficient to model the first differenced equation of the individual observations over time instead of the initial equation. Also, if the variables are constant over individuals, it is sufficient to model the deviation from the mean over individuals at a given time.

5. Panel data obtain more accurate predictions of individual outcomes. Especially when time series data on individuals are limited, it is possible to obtain more information when the observed individual is compared to others.
6. Panel data provide micro-foundations for aggregate data analysis. They are ideal for studying heterogeneity versus homogeneity issues but can lead to misleading conclusions when used to evaluate or recommend policies.
7. Panel data can simplify model computation and statistical inference. This is only true in certain cases, namely in the analysis of non-stationary time series data, measurement errors, and dynamic Tobit models.

There are also several disadvantages regarding panel data, most of them obvious. Baltagi (2005) lists them as limitations of panel data:

1. Problems with design and data collection - often researchers have difficulty obtaining a representative and sufficiently large sample of cross-sectional data or a complete time series dataset. With panel data these problems are even greater, in addition to the usual problems of collecting a dataset - coverage (i.e., representation of the population in the dataset), nonresponse (missing data), and recall (difficulty remembering correctly) - panel datasets also encounter difficulties with frequency of interview, interview spacing, reference periods, use of bounding, and time-in-sample bias.
2. Measurement error bias - although measurement error is often present in datasets, the problem is even greater with panel data. With the increase in time lag, Baltagi (2005) refers to research that has shown that discrepancies between different sources are also increasing.
3. Selectivity problems - this includes self-selectivity, nonresponse, and attrition
4. Short time series dimension - this is the case with micro-panel datasets, which means that the asymptotic arguments depend heavily on the number of individuals tending towards infinity. However, as the time dimension increases, problems of attrition and increasing computational difficulties in modelling panel models arise.
5. Cross-sectional dependence - accounting for cross-sectional dependence is essential to avoid inference and erroneous conclusions.

5.2.1 Descriptive statistics of panel data

Panel data include multiple entities over a period of time. Therefore, they contain more information compared to the usual cross-sectional data or compared to time series data for only one entity. This is also reflected in their descriptive statistics, more specifically in the specific measures that are calculated when panel data are observed. The most commonly used measures of descriptive statistics when analysing datasets are mean and standard deviation. Researchers take different paths to presenting descriptive statistics of panel data. Let us denote that T is the number of time periods covered by the panel dataset and N is the number of entities recurring in those time periods.

One possibility is to observe how these measures have changed over time, that is, they will observe how the means and standard deviations of all entities have changed over the observed time period. In this case, the time period *t* is fixed and the mean and standard deviation are measured for that particular *t* (Katchova, 2013):

- Annual mean:

$$\bar{x_t} = \frac{1}{N} \sum_i x_{it} \tag{44}$$

- Annual standard deviation:

$$s_t = \sqrt{\frac{1}{N-1} \sum_i (x_{it} - \bar{x_t})^2} \tag{45}$$

As a result, a number of T means and T standard deviations are computed.

Another way of using mean and standard deviation while reporting about panel data is to calculate them for all records in a panel dataset. Such measures are referred to as the overall mean and overall standard deviation:

- Overall mean:

$$\bar{x} = \frac{1}{NT} \sum_i \sum_t x_{it} \tag{46}$$

- Overall standard deviation:

$$s_O = \sqrt{\frac{1}{N(T-1)} \sum_i \sum_t (x_{it} - \bar{x})^2} \tag{47}$$

To reflect the special traits of panel data, the values for within and between standard deviations are also computed (Andreß, 2008):

- Between standard deviation:

$$s_B = \sqrt{\frac{1}{N-1}\sum_i (\bar{x}_i - \bar{x})^2} \tag{48}$$

- Within standard deviation:

$$s_W = \sqrt{\frac{1}{N(T-1)}\sum_i (x_{it} - \bar{x}_i)^2} \tag{49}$$

where $\bar{x}_i = \frac{1}{T}\sum_t x_{it}$.

Within standard deviation and between standard deviation are typically not considered individually but together and weighted against each other. They provide information about how heterogeneity differs between entities and over time. Typically, the variance between entities is higher than the variance of an entity over time, and the distance between them can also provide insight into the nature of the dataset (Andreß, 2008).

Interestingly, overall standard deviation is related to within and between standard deviation through the following equation (Katchova, 2013):

$$s_O \approx s_B + s_W \tag{50}$$

5.2.2 Panel data methods

Models built using panel data also have their specificities. Depending on the combination of explanatory variables, especially whether the lagged dependent variable was used as an explanatory variable also, two types of panel models can be distinguished - static models and dynamic models. As the name suggests, static models do not use the dependent variable from previous time periods as a predictor variable, while dynamic models use previous values of the dependent variable as a predictor.

5.2.2.1 Static panel models

The most general form of a static panel data model is (Wooldridge, 2012):

$$y_{it} = \alpha_{it} + x_{it}^T\beta_{it} + u_{it} \tag{51}$$

where $i = 1, \dots, N$ denotes the individuals, and $t = 1, \dots T$ moments in time. Furthermore:

- y_{it}- is the dependent variable, of the entity *i* at time *t*
- $x_{it} = (x_{it1}, \dots, x_{itK})$- vector of K predictor variables, of the entity *i* at time *t*
- α_{it}- unobserved effect of the entity *i* at time *t*
- β_{it}- vector of parameters to be estimated for the k predictor variables
- u_{it}- error-term of the *i*-th entity at time *t*, with mean 0 and variance σ_u^2

In its most general form, the panel model cannot be determined. The number of unknown parameters, i.e., number of parameters that need to be calculated, is larger than the number of observations. Therefore, restrictions are imposed on the unknown parameters. Depending on these restrictions, three types of models are observed - pooled OLS models, fixed effects models, and random effects models.

Pooled model

By introducing restrictions to the equation (51), the form of the pooled OLS model is revealed in the form:

$$y_{it} = \alpha + x_{it}^T\beta + u_{it} \tag{52}$$

where everything corresponds to the equation (51), except the intercept α and the vector of parameters β. As can be seen, they no longer have indexes, which means that they are constant over time and equal for all entities. This inevitably means that the influence of the predictor variables on the dependent variable is fixed. With such strong restrictions, some of the advantages of panel datasets are lost. As Brooks (2008) notes, one option is to build separate time series models for each entity or cross-sectional models for each time period. However, this could be very burdensome if the models contain a large number of entities or time periods and common variations over time or common structures across entities may be missed. To avoid these problems, the usual two approaches when dealing with panel data are fixed effect models and random effect models.

Fixed effects model

The fixed effect model has the structure (Wooldridge, 2012):

$$y_{it} = \alpha_i + \gamma_t + x_{it}^T\beta + u_{it} \tag{53}$$

where $i = 1, \ldots, N$, $t = 1, \ldots T$. Compared to equation (51), again the intercept α_i and the vector of parameters β, differ in their indices. Once more β is fixed over time and for all entities. But the intercept α_i retains the i in its index, which means that it still varies across entities but is fixed over time and is, therefore, also referred to as the fixed effect, unobserved effect, and unobserved heterogeneity. Moreover, an additional parameter is included - γ_t, this is an additional intercept that varies over time. In practice, it can be included with dummy variables that refer to the time period, i.e., (53) becomes:

$$y_{it} = \alpha_i + \gamma_1 + \gamma_2 * I2_t + \cdots + \gamma_T * IT_t + x_{it}^T\beta + u_{it} \tag{54}$$

where the unobserved error of the first, base period is γ_1, the one of the second period $\gamma_1 + \gamma_2$, the third period $\gamma_1 + \gamma_3$, and so on. In research γ_t can be dropped from the equation, and therefore it becomes part of the error-term u_{it}.

The key assumption of the fixed effects model is that the error-terms are uncorrelated with each of the predictor variables from vector $x_{it} = (x_{it1}, \ldots, x_{itK})$ over time:

$$Cov(x_{itk}, u_{ij}) = 0, \text{ for all } t = 1, \ldots, T, k = 1, \ldots, K \text{ and } j = 1, \ldots, T$$

This assumption ensures that all predictor variables will be exogenous after the unobserved effect is removed. Effectively, future predictor variables will not be affected by current changes in the idiosyncratic error. This assumption is especially important if a lagged dependent variable is included as a predictor variable.

Random effects model

The general form of the random effects models is (Wooldridge, 2012):

$$y_{it} = \alpha_i + \beta_0 + x_{it}^T\beta + u_{it} \tag{55}$$

everything corresponds to the adjusted form of the fixed effects model (54) where the variable corresponding to the unobserved effect that changes over time is dropped. Also β_0 is introduced, so it can be assumed that α_i has zero mean, without losing generality. This form of the fixed model becomes a random effects model only if an important assumption is fulfilled – the unobserved effect α_i is uncorrelated with the explanatory variables:

$$Cov(x_{itk}, \alpha_i) = 0, \text{ for all } t = 1, \dots T \text{and } k = 1, \dots, K.$$

With this assumption there is no need to eliminate the unobserved effect from the model so it could be possible to estimate the regression coefficients in the vector β.

Estimators for panel data models

In order to estimate the model parameters, a decision must first be made as to which estimator to use. When a panel dataset is available, some of the most common estimators are the pooled OLS estimator, the within estimator, the first difference estimator, and the random effects estimator (Wooldridge, 2012).

Pooled OLS estimator - as the name suggests, this estimator is used for pooled models. In this approach, the data are simply "pooled" together, meaning that all entries for all entities are simply stacked in a matrix. The equation (51) can be written in its matrix notation:

$$y = W\gamma + u \tag{56}$$

where y and u are $NT \times 1$ vectors derived from the values y_{it} and u_{it} respecitively, for $i = 1, \dots, N$ and $t = 1, \dots T$. The γ is a vector of the form $[\alpha \;\; \beta^T]^T$, i.e., a $(K + 1) \times 1$ vector of parameters. Lastly, W is a matrix of dimension $NT \times (K + 1)$. The pooled models meet the assumption that the error-terms are uncorrelated with the predictor variables i.e., $E[u|W] = 0$, which leads to the form of the estimator being:

$$\hat{\gamma} = (W^T W)^{-1} W^T y \tag{57}$$

First difference estimator (FD estimator) – the first step in obtaining this estimator is to get rid of the unobserved effect α_i. As already mentioned in the fixed effects model the parameter α_i is constant over time, so for the entity *i* there will be *T* equations:

$$\begin{gathered} y_{i1} = \alpha_i + x_{i1}^T\beta + u_{i1} \\ y_{i2} = \alpha_i + x_{i2}^T\beta + u_{i2} \\ \vdots \\ y_{iT} = \alpha_i + x_{iT}^T\beta + u_{iT} \end{gathered} \tag{58}$$

By subtracting the first equation from the second, the second from the third and so on, a set of $T-1$ equations remain without the unobserved effect α_i:

$$\begin{aligned} y_{i2}-y_{i1} &= (x_{i2}^T - x_{i1}^T)\beta + (u_{i2}-u_{i1}) \\ y_{i3}-y_{i2} &= (x_{i3}^T - x_{i2}^T)\beta + (u_{i3}-u_{i2}) \\ &\vdots \\ y_{iT}-y_{iT-1} &= (x_{iT}^T - x_{iT-1}^T)\beta + (u_{iT}-u_{iT-1}). \end{aligned} \tag{59}$$

The general recognized form is $y_{it}-y_{it-1} = (x_{it}-x_{it-1})^T\beta + (u_{it}-u_{it-1})$. Again, the error terms are uncorrelated with the predictor variables, but here the error term needs to be uncorrelated with the predictor variables from the same period and the previous period, which in mathematical terms can be written as $E[u_{it}-u_{it-1}|x_{it}-x_{it-1}] = 0$. Therefore, the estimator for β is:

$$\hat{\beta} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it}-x_{it-1})\,(x_{it}-x_{it-1})^T\right]^{-1}\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it}-x_{it-1})\,(y_{it}-y_{it-1}) \tag{60}$$

Unlike with the pooled OLS estimator, one period is lost for every entity, because there is no entry that can be subtracted from the first period entry.

Within estimator – is also called the fixed effects estimator. Like in the first difference estimator, the unobserved effect α_i is lost, but unlike in the FD estimator the goal is to preserve all entries, i.e., all periods for all entities. The first step is to average every entity over time:

$$\bar{y}_i = \bar{\alpha}_i + \bar{x}_i{}^T\beta + \bar{u}_i \tag{61}$$

where $\bar{y}_i = \frac{1}{T}\sum_{t=1}^{T} y_{it}$, $\bar{x}_i = \frac{1}{T}\sum_{t=1}^{T} x_{it}$, and $\bar{u}_i = \frac{1}{T}\sum_{t=1}^{T} u_{it}$. Because the unobserved term is constant over time for every entity it is $\bar{\alpha}_i = \frac{1}{T}\sum_{t=1}^{T}\alpha_i = \alpha_i$. By subtracting the averaged equation from equations of every period, the following is obtained:

$$y_{it}-\bar{y}_i = (x_{it}-\bar{x}_i)^T\beta + (u_{it}-\bar{u}_i) \tag{62}$$

Therefore, the estimator is:

$$\hat{\beta} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it}-\bar{x}_i)\,(x_{it}-\bar{x}_i)^T\right]^{-1}\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it}-\bar{x}_i)\,(y_{it}-\bar{y}_i) \tag{63}$$

But here, the error term needs to be uncorrelated to every predictor variable at every period.

The unobserved effect can than easily be estimated by $\hat{\alpha}_i = \bar{y}_i - \bar{x}_i{}^T \hat{\beta}$

Random effects estimator – as the name suggests, this estimator is used for random effects models. Although random effects models can be estimated by the pooled OLS estimator as well, there is a more efficient estimator obtained by using GLS, a weighted least squares regression. By denoting $x'_{it} = [1 \quad x_{it}^T]^T$ and $\beta' = [\beta_0 \quad \beta^T]^T$, the equation (55) becomes:

$$y_{it} = x'^T_{it}\beta' + \alpha_i + u_{it} \tag{64}$$

Transforming this for GLS by:

$$y_{it} - \hat{\lambda}\bar{y}_i = (1-\hat{\lambda})\beta_0 + (x_{it} - \hat{\lambda}\bar{x}_i)^T\beta + (1-\hat{\lambda})\alpha_i + (u_{it} - \hat{\lambda}\bar{u}_i) \tag{65}$$

where:

$$\hat{\lambda} = 1 - \frac{\sigma_u}{\sqrt{\sigma_u^2 + T\sigma_\alpha^2}} \tag{66}$$

The estimator is therefore:

$$\widehat{\beta'} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x'_{it} - \hat{\lambda}\bar{x}'_i)(x'_{it} - \hat{\lambda}\bar{x}'_i)^T\right]^{-1} \sum_{i=1}^{N}\sum_{t=1}^{T}(x'_{it} - \hat{\lambda}\bar{x}'_i)(y_{it} - \hat{\lambda}\bar{y}_i) \tag{67}$$

As stated by Wooldridge (2012), virtually all economists agree that it is a minimal requirement for used estimators to be consistent. Generally, all estimators attempt to assess the true value of θ as close as possible, but consistent estimators get closer to the true value with the increase of *n*. As for the mentioned models and estimators, the following rules apply (Katchova, 2013):

Table 3 - Consistency of panel models estimators

	Pooled model	Random effects model	Fixed effects model
Pooled OLS estimator	Consistent	Consistent	Inconsistent
Within estimator	Consistent	Consistent	Consistent
First difference estimator	Consistent	Consistent	Consistent
Random effects estimator	Consistent	Consistent	Inconsistent

5.2.2.2 Dynamic panel models

As mentioned earlier, dynamic panel models use prior levels of the dependent variable in addition to other explanatory variables for modelling. There are several estimators, but the most popular estimators among researchers are the Generalised Method of Moments (GMM) estimators, which are an instrumental variable method. Methods that use instrumental variables are trying to solve the problem of omitted variables, that cause many methods to have biased estimators. As stated by Hansen (2020) given a simple equation with two regressors:

$$y_2 = \alpha y_1 + \beta x + u \tag{68}$$

Both y_1 and x are regressor variables in equation (68), but x is an exogenous regressor, while y_1 is an endogenous predictor, i.e. $\text{Cov}(y_1, u) \neq 0$. If there are any omitted variables from the equation, they will become part of the error term u. To deal with the omitted variable, additional equations are introduced which model the endogenous regressor through instrumental variables, that is:

$$y_1 = \pi z + e \tag{69}$$

Where z, a $l \times 1$ random vector, is called an instrumental variable, which needs to meet three assumptions:

$$\begin{gathered} E[zy_1] \neq 0 \\ E[zz'] > 0 \\ \text{rank}(E[zy_1{}']) = k, \text{ where } l \geq k. \end{gathered} \tag{70}$$

According to Roodman (2009a), GMM is designed for situations where:

1. "T is small, N is large" – i.e., the observed panel datasets consist of a great number of entities observed through a short period of time;
2. The relationship between dependent and predictor variables is linear;
3. The predictor variable is dependent on its previous realisations;
4. Predictor variables are not strictly exogenous, i.e., they can be correlated to the error term;
5. Fixed individual effects;
6. Heteroscedasticity and autocorrelation can be observed within entities, but not across them.

The goal in GMM is to fit the following model (Roodman, 2009a):

$$y_{it} = x_{it}^T\beta + u_{it} \tag{71}$$

$$\mathrm{E}(u_{\mathrm{it}}|\mathrm{z_{it}}) = 0 \tag{72}$$

where y_{it} is the dependent variable, $x_{it} = (x_{it1}, \dots, x_{itK})$ is a K-vector of predictor variables. The vector of coefficients is denoted by β, and u_{it} is the error term, also a random variable. The term $\mathrm{z_{it}} = (z_{\mathrm{it1}}, \dots, z_{\mathrm{itJ}})$ represents the vector of instruments, where $J \geq K$, and x_{it} and $\mathrm{z_{it}}$ can share elements.

By denoting Y, X and Z to be matrices of n observations for the corresponding y_{it} and vectors x_{it} and z_{it}. Also, lets denote U to be the matrix of error terms. From (71) follows that $U = Y - X\beta$, i.e., for an estimate $\hat{\beta}$ the empirical residuals are $\widehat{U} = Y - X\hat{\beta}$. Let us assume that $\mathrm{E}(UU'|Z) = \Omega$ exists. By condition all the instruments are orthogonal to the error term, so the goal is to minimize the magnitude of the corresponding vector of empirical moments $\mathrm{E_N}(\mathbf{z_{it}}\boldsymbol{u_{it}}) \equiv \frac{1}{N}Z'\widehat{U}$, which is overidentified in the case $J > K$ i.e., in that case the system has more equations than variables.

To minimize the magnitude of $\mathrm{E_N}(\mathbf{z_{it}}\boldsymbol{u_{it}})$ in the GMM, that magnitude is defined through a generalized metric base on a positive-semidefinite quadratic form. Let A be a positive-semidefinite matrix, then the weighted norm by A is:

$$||\mathrm{E_N}(z_{it}u_{it})||_A = \left\|\frac{1}{N}Z'\widehat{U}\right\|_A = \frac{1}{N}\widehat{U}'ZAZ'\widehat{U} \tag{73}$$

To obtain an estimate of β the above term is then minimized, i.e., the minimization problem $\hat{\beta}_A = argmin_{\hat{\beta}}\left\|Z'\widehat{U}\right\|_A$, that is:

$$\hat{\beta}_A = (X'ZAZ'X)^{-1}(X'ZAZ'Y) \tag{74}$$

Similar to the GMM model, the difference and system GMM are used to fit the model (Roodman, 2009b):

$$y_{it} = \alpha y_{i,t-1} + x_{it}'\beta + u_{it} \tag{75}$$

$$u_{it} = \mu_i + v_{it} \tag{76}$$

$$E(\mu_i) = E(v_{it}) = E(\mu_{it}v_{it}) = 0 \tag{77}$$

As can be seen from (76) the error term is comprised of two orthogonal components, the fixed effect μ_i and the idiosyncratic shock v_{it}.

Clearly, $y_{i,t-1}$ is an endogenous regressor in equation (75), therefore the instrumental variables are chosen to be correlated to $y_{i,t-1}$, but not to the error term.

Two approaches are common to get rid of the fixed effects. These approaches correspond to the first difference and within estimator for static panel models, in particular the fixed effects models. The first approach is the difference generalized method of moments, where transformed equations are introduced by differentiating the t-th and $(t-1)$-th equations, thus losing the fixed effects μ_i. The second approach is the system generalized method of moments, where a system of equations is formed containing the original equation and the transformed equation. The fixed effect μ_i is lost in the transformed equations by subtracting the average of all variables from the equation, similar to the within estimator. For the applicability of this approach, it is assumed that the first difference of the instrumental variables is uncorrelated with the fixed effects. Due to this assumption, more instrumental variables can be used and the efficiency is improved. As a result, the difference GMM model cannot have time-invariant predictor variables, while the system GMM can.

Although the system GMM offers more possibilities by including time-invariant variables, it is also more difficult to compute and additional assumptions must be met. When choosing between these approaches, two criteria are proposed in the literature to be reviewed. The first criterion is suggested by Arellano and Bover (1995). If the model corresponds to a random walk, the system GMM should be used. The second criterion, often referred to as a rule of thumb, requires the calculation of two additional models. According to Bond et al. (2001), the regression coefficients of $y_{i,t-1}$ (i.e., α in)) from the difference GMM should be compared with those obtained by OLS and the within estimator of panel models. If the α from the system GMM is close to or below the within estimate of α, the difference GMM should be used to fit the model.

5.2.2.3 Statistical test for panel models

When building static panel models, researchers have to decide between the three approaches mentioned above, i.e., how to calculate the parameters β_i. In order to statistically confirm which is the most appropriate effect for estimating the panel model, three tests are used in this dissertation - Hausman test, F-test, and Wooldridge test.

Hausman test

Hausman test is used to decide between using random and fixed effects (Wooldridge, 2012). It reveals statistically significant differences in the coefficients of the time-varying variables from previously constructed models. As mentioned earlier, random effects have the same form as fixed effects with the additional assumption that the unobserved effect α_i is uncorrelated with any explanatory variable, so the Hausman test questions just that. Therefore, the hypotheses are:

H0: The unobserved effect α_i is uncorrelated with the explanatory variables x_{itj}.

H1: The unobserved effect α_i is correlated with the explanatory variables x_{itj}.

This means that rejecting the null hypothesis leads to the use of the fixed effects model. In practice, failure to reject the null hypothesis may be due to two reasons - the random effects and fixed effects estimates are so close that either effect can be used, or the estimates in the fixed effects model have such large sample variation that it cannot be concluded that practically significant differences are also statistically significant.

Wooldridge Multiplier Test

Wooldridge Multiplier test (also called The Breusch-Pagan Lagrange multiplier test) is used to justify the use of random effects vs. pooled OLS with statistically significant confidence. It is a test statistic with a large sample justification that is commonly used to test for heteroscedasticity, serial correlation, and omitted variables (Wooldridge, 2012). The test is based on the OLS estimator and asks if there are individual effects. The hypotheses are:

H0: There are no individual effects

H1: There are individual effects

According to Greene (2003) reformulating the panel equation to:

$$y_{it} = \alpha_i + \beta_0 + x_{it}^T\beta + \varepsilon_i + u_{it} \tag{78}$$

And the definition of $\eta_{it} = \varepsilon_i + u_{it}$, where ε_i is the error term specific to the individual but constant over time. In this case, the null hypothesis can be also written as $H0: corr(\eta_{it}, \eta_{is}) = 0$. If the null hypothesis is not rejected, there is no need to introduce individual effects into the model and a pooled OLS model is sufficient.

F test

The F-test is used to test which model, the pooled OLS model or the fixed effects model, is appropriate. The main difference between these models, i.e., equations (52) and (53), is the intercept term. For the pooled model, it remains constant across time and individuals, but for the fixed effects model, it is constant across time but specific to each individual. Therefore, the F-test uses this difference to ask which model to use. The null hypothesis is:

H0: $\alpha_1 = \alpha_2 = \cdots = \alpha_{N-1} = 0$

If the null hypothesis is rejected, a pooled OLS model is not appropriate. Instead, a fixed effects model should be chosen.

When building a dynamic model, an appropriate set of instrumental variables needs to be chosen. This is tested with the Sargan test (it is also often referred to as the Sargan-Hansen test).

Sargan test

The Sargan test is a test of specification, more specifically a test of overidentification restrictions (Arellano & Bond, 1995). It is used to test whether the instrumental variables are appropriate. A main assumption of GMM is that the instrumental variables are exogenous. Therefore, the hypotheses are:

H0: *Overidentifying restrictions are valid*

H1: *Overidentifying restrictions are not valid*

As a result, a p-value above 0.05 is preferred as this indicates that the set of instrumental variables is adequate.

The most obvious weakness of the Sargan test is that it tests whether the $(1/N)Z'\hat{E}$ is close to zero after being driven to zero by applying the GMM. On the other hand, as the number of instrumental variables increases, the number of moment conditions also increases and it becomes more difficult to satisfy them all, hence the Sargan test becomes weaker.

5.3 Modelling the growth of Croatian SMEs

The first step in modelling is to consider the dataset and its variables. First, descriptive statistics are compiled for all variables, continuous and categorical. Second, the means of the continuous variables are observed over time. The final step in observing the dataset will be how the variables react to each other, i.e., correlations will be observed. Finally, the models created will be presented and a review of them will be given. The chapter will conclude with a discussion on how the results compare to previous research.

5.3.1 Descriptive statistics of Croatian SMEs

As noted earlier, panel data vary across individuals and over time, so descriptive statistics should reflect this. The following tables include measures of central tendency (overall mean and overall median), measures of dispersion (overall, between, and within standard deviation and corresponding minimums and maximums to reflect range), and measures of position (the overall 1st and 3rd quartile).

1. Innovation

Table 4 - Descriptive statistics of innovation variables of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	Type	Mean	St. dev.	Min	1st Qu	Median	3rd Qu.	Max
***IATA* (intangible assets/ total assets)**	overall	0.0115	0.0575	0	0	0	0	0.9968
	between		0.0403	0				0.9106
	within		0.0396	0.0106				0.0128
***EXTA* (expanses/ total assets)**	overall	0.0004	0.0156	0	0	0	0	0.9840
	between		0.0059	0				0.3201
	within		0.0086	0.0003				0.0005
***CPLTA* (Concessions , patents etc./ total assets)**	overall	0.0054	0.0565	0	0	0	0	0.9883
	between		0.0250	0				0.5815
	within		0.0280	0.0041				0.0066
***GWTA* (Goodwill/ total assets)**	overall	0.0002	0.0090	0	0	0	0	0.4975
	between		0.0039	0				0.2563
	within		0.0046	0.0002				0.0003

There are four variables for innovation. All have a range of almost 1 (minimum 0, maximum 1), except GWTA, i.e., goodwill over total assets, which has a range of 0.5. All innovation variables have a mean value very close to 0, reflecting that their first quartile, median, and third quartile have a value of 0. This shows that, in the observed period, at least 75% of cases in Croatia have no innovation activities when innovation is measured by these 4 metrics. Further examination of the dataset revealed that 95.9% (13242 enterprises) reported no expenditure on development during the observed period, i.e., the variable EXTA was zero in every year of the observed period 2001-2015. On the other hand, only 57.57% (7949 enterprises) had no expenditure on concessions, patents, licenses, trademarks, service marks, software, and other rights i.e., CPLTA was zero in each year of the observed period 2001-2015. The standard deviations are larger than the distance between the minimum and the mean. The standard deviations between and within are close in value, i.e., there is not much difference in variation among individuals and across years.

2. Export

Table 5 - Descriptive statistics of export variables of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	**Type**	**Mean**	**St. dev.**	**Min**	**1st Qu**	**Median**	**3rd Qu.**	**Max**
InCSal (income on the domestic market /sales	overall	0.9292	0.3214	0	0.99	1	1	1
	between		0.1684	0				1
	within		0.1293	0.9176				0.9397
ExpSal (export/ sales)	overall	0.0695	0.3176	0	0	0	0	1
	between		0.1682	0				1
	within		0.1254	0.0603				0.0824

Export is represented by the variables ExpSal and InCSal, which are the share of export in sales and share of sales in the domestic market in sales, respectively. The sum of these two shares equals 1 since total sales consist of sales in the domestic market and in the foreign market. This is reflected in their mean values. The two ratios have similar standard deviations, and for both the dispersion of the data between individuals is slightly higher than between years (0.17 vs. 0.13). However, both ratios have a minimum of 0 and a maximum of 1. The quartiles show that most of the observed enterprises are mainly focused on the domestic market. The 3rd quartile of the share of domestic sales in total sales equals 1, which indicates that at least 75% of all cases in Croatia during the years 2001 through 2015 do not export at all.

3. Liquidity ratios

Table 6 - Descriptive statistics of liquidity ratios of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	Type	Mean	St. dev.	Min	1st Qu	Median	3rd Qu	Max
Cr (Current assets/ total liabilities)	overall	3.702	59.472	0	0.895	1.379	2.4795	12038.63
	between		22.272	0.03				1651.66
	within		54.822	2.527				6.386
Qr (Current assets-inventory)/Current liabilities	overall	2.981	56.431	0	0.514	1.011	1.9768	7682
	between		18.336	0				1247.46
	within		42.787	1.943				5.421
CATA (Current assets/Total assets)	overall	0.673	0.343	0	0.474	0.735	0.9167	1
	between		0.228	0.007				1
	within		0.159	0.657				0.693
Cshr (Cash/ total liabilities)	overall	1.019	45.481	0	0.026	0.121	0.4644	6741
	between		13.387	0				1179.06
	within		27.413	0.615				2.477

Liquidity of enterprises is calculated by four ratios: Current Ratio, Quick Ratio, Cash Ratio, and CATA Ratio. All of them have a minimum value of 0, and only the share of current assets in total assets (CATA) is limited to a maximum value of 1. Also, CATA is the only liquidity ratio that varies more between individuals than across years. For the other three liquidity ratios, the within standard deviation is more than twice the between standard deviation, i.e., the variation of liquidity measures across years is twice as high as variation among individuals.

4. Leverage ratios

Table 7 - Descriptive statistics of leverage ratios of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	Type	Mean	St. dev.	Min	1st Qu	Median	3rd Qu	Max
TD (Total assets- Total equity)/Total assets	overall	0.799	8.525	0.0001	0.363	0.622	0.837	1675.32
	between		3.213	0.001				289.351
	within		6.294	0.673				1.25
TDTE (Total debt/Total equity)	overall	4.077	229.598	-35109.25	0.341	1.18	3.273	38537.5
	between		49.329	-2305.768				2552.16
	within		184.553	1.414				7.187
BLTA (Bank loans/Total assets)	overall	0.159	0.755	0	0	0.026	0.234	195.193
	between		0.238	0				13.463
	within		0.578	0.09				0.238
TETA (Total equity/ Total assets)	overall	0.184	8.553	-1674.322	0.152	0.357	0.612	0.999
	between		3.212	-288.372				0.999
	within		6.294	-0.272				0.315
CLTE (Current liabilities/Total equity)	overall	2.999	175.89	-35109.25	0.262	0.89	2.531	21272.4
	between		38.475	-2305.826				1423.99
	within		140.68	0.668				6.001
LDCA (Long-term debt/Current assets)	overall	0.697	31.614	0	0	0	0.255	7563.24
	between		8.287	0				581.509
	within		24.78	0.361				1.354
RETA (Retained earnings/ Total assets)	overall	-0.012	9.326	-1626.72	0.006	0.121	0.305	268.845
	between		2.393	-166.551				18.172
	within		5.791	-0.631				0.176

The dataset contains 7 leverage ratios, they do not have a lower bound of 0 except BLTA. They also do not have an upper bound that they cannot exceed. Their overall standard deviations are not large considering the range of each ratio. Again, the variation within an enterprise is 2 to 3 times larger than the variation between individuals on average over the years. In other words, the heterogeneity in leverage ratios across years is 2 to 3 times larger than between individuals (taking into account the average level of the respective leverage ratio for each enterprise). Looking at the mean relative to quartiles, we find that at least 75% of cases have LDCA (long-term debt over current assets), TDTE (total debt over total equity), and CLTE (current liabilities over total equity) leverage levels that are lower than the average, i.e., the mean, and at least 75% have RETA (retained earnings over total assets) levels that are higher than the average mean for all enterprises across all years.

5. Turnover ratios

Table 8 - Descriptive statistics of turnover ratios of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	**Type**	**Mean**	**St. dev.**	**Min**	**1st Qu**	**Median**	**3rd Qu**	**Max**
TITA (Total Income/Total assets)	overall	1.965	6.913	0	0.865	1.469	2.3144	1135.513
	between		3.081	0.005				283.639
	within		4.765	1.734				2.364
TIFA (Total Income/Fixed assets)	overall	74.419	2647.89	0	2.222	6.06	19.967	577156.9
	between		702.935	0.008				42494.57
	within		1946.89	43.50				141.849
TICA (Total Income/Current assets)	overall	4.567	205.909	0.0001	1.448	2.336	3.8056	43303.38
	between		37.722	0.11				3038.808
	within		134.215	3.446				7.0002
Tat (Sales/Total assets)	overall	1.852	5.989	0	0.797	1.394	2.2286	535.965
	between		2.118	0.002				140.619
	within		3.424	1.622				2.272
NWCt (Sales/NWC)	overall	3.219	788.267	-5760.3	-1.126	2.646	7.1952	121579.4
	between		133.19	-3915.5				8089.666
	within		516.994	-7.564				10.884
CAIS (Current assets-Inventory/ Sales)	overall	1.149	57.341	0	0.181	0.325	0.5556	9021.997
	between		13.79	0				1247.413
	within		36.207	0.517				2.926
DaysR (Days' sales in receivables)	overall	169.38	4603.65	0	26.027	62.474	117.42	594476.3
	between		971.135	0				49772.06
	within		2958.54	99.419				497.084
DaysA (Days' outstanding in accounts payable)	overall	463.76	22028.4	0	30.082	85.005	224.11	3979351.
	between		4389.09	0				267961.3
	within		14244.4	170.47				1058.99

Seven of eight turnover ratios have a bottom limit of 0 and no upper limit. Problems with outliers are most apparent in the variables of "Days' outstanding in accounts payable" (DaysA) and "Days' sales in receivables" (DaysR), that is, the number of days it takes the enterprise to pay its suppliers and the number of days it takes to collect from its customers. The mean value of the DaysA metric indicates that, on average, enterprises take more than a year (nearly 16 months) to pay their suppliers and nearly half a year to collect from their customers, according to DaysR. Just how misleading the averages are is shown by the 3rd quartile values, which indicate that 75% of cases during the observed period in Croatia take less than 224 days (≈7 months) to pay their suppliers and less than 117 days (≈3 months) to collect from their customers. As with most liquidity ratios and leverage ratios, the variation in turnover ratios within one enterprise over the years is greater than over enterprises in a year, as indicated by the greater within standard deviation than between standard deviation.

6. Profitability ratios

Table 9 - Descriptive statistics of profitability ratios of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	**Type**	**Mean**	**St. dev.**	**Min**	**1st Qu**	**Median**	**3rd Qu**	**Max**
NPM (Net profit margin)	overall	5.358	13.136	-217.65	0.35	2.13	6.53	222.93
	between		5.663	-7.45				64.547
	within		6.718	4.398				6.292
ROA (Return on assets)	overall	8.754	49.51	-52.56	0.41	3.11	10.25	6101.06
	between		12.255	-0.671				431.287
	within		31.118	7.116				9.876
ROE (Return on equity)	overall	20.877	988.163	-88997.5	0.73	9.01	27.23	128462.5
	between		167.938	-5913.64				8547.223
	within		645.836	4.536				33.815
ROS (Return on Sales)	overall	0.089	3.52	-2.845	0.004	0.023	0.07	796.252
	between		1.277	-0.006				120.064
	within		2.615	0.058				0.151

There are 4 profitability ratios in the dataset. As with all groups before, there is more variation within enterprises than between them in a year, given the averages of profitability ratios within an enterprise. There are no lower or upper limits for the values of the profitability ratios. Variables Net profit margin, Return on assets, and Return on equity have an overall mean value in the range between the median and the third quartile.

7. Investment and productivity ratios

Table 10 - Descriptive statistics of investment variables of Croatian SMEs 2001-2015. Source: Author's calculation.

Variable name	**Type**	**Mean**	**St. dev.**	**Min**	**1st Qu**	**Median**	**3rd Qu**	**Max**
ImpTA (Import/Total assets)	overall	0.133	0.854	0	0	0	0.012	82.132
	between		0.343	0				11.178
	within		0.455	0.089				0.183
ImpTE (Import/ Total Expenditures)	overall	0.082	0.411	0	0	0	0.011	53.583
	between		0.169	0				3.909
	within		0.216	0.062				0.101
InvLATA (Investment in long term assets/ Total assets)	overall	0.052	0.329	0	0	0	0.038	71.507
	between		0.076	0				5.049
	within		0.208	0.025				0.089
InvLATE (Investment in Long-term-assets/ Total Expenditures)	overall	0.055	0.612	0	0	0	0.027	64.121
	between		0.137	0				4.985
	within		0.388	0.029				0.08
InrE (Income/ number of employees)	overall	$57 * 10^4$	$99 * 10^4$	46.205	$16 * 10^4$	$31 * 10^4$	$63 * 10^4$	$6276 * 10^4$
	between		$77 * 10^4$	4155				$1997 * 10^4$
	within		$57 * 10^4$	$52 * 10^4$				$66 * 10^4$

Table 10 provides an insight into the investment practices of Croatian SMEs in the period 2001-2015. All four investment variables (share of import in total assets and share of import in equity, share of investment of long-term assets in total assets and total equity) have a lower limit of 0, but no upper limit, and therefore the values of the mean, ranging from 0.052 to 0.133, are rather disappointing. In more than half of the cases there was no investing over the observed period, as evidenced by the fact that the median is 0 in all variables. The only productivity ratio is income per employee (InrE), as expected the variation in the dataset is high and it is higher between enterprises than across years.

8. Macroeconomic variables

Table 11 - Descriptive statistics of macroeconomic variables for the time period 2001-2015. Source: Author's calculation.

Variable name	mean	sd	Min.	1st Qu.	Median	3rd Qu.	Max.
GDP	296565	51691.5	192312	260455	329432	331656	346610
GDP growth rate	1.6867	3.6617	-7.3	-0.35	2.4	4.65	5.7
inflation rate	2.3733	1.6078	-0.5	1.75	2.3	3.25	6.1
unemployment rate	13.48	2.8743	8.5	11.4	13.8	15.85	17.3

Three macroeconomic variables were included in the dataset, GDP, inflation rate, and unemployment rate. There is no need to compute descriptive statistics tailored to panel data because the macro-level variables do not change across enterprises, so their between-standard deviation is zero and their within-standard deviation is equal to the overall standard deviation. The standard deviations are relatively large for the macro variables considering their range.

The global financial crisis hit Croatia hard, and for a long period of time. While the rest of the world started the recession in 2008, and some like USA exited it already in 2009, Croatia only entered the recession in 2009. The recession lasted for 6 years during which the GDP growth rate fell from 5% to -7.5% (The World Bank, 2018). The most pronounced effect was visible in years 2008-2010, therefore an indicator variable of these years was created called 'Economic Shock'.

The dataset also contains categorical variables – 2 environment characteristics and 4 enterprise characteristics. Categorical enterprise characteristics include the variable "innovative" and firmographic variables of size, industry sector, and high-tech industry. The variables "innovative" (if an enterprise is innovative depending on the share of funds spent on concessions, patents, licenses, trademarks, service marks, software etc.) and size (whether the enterprise is small, medium, or large in size) are time and individual specific variables. On the other hand, the industry sector and if an enterprise is high-tech or not are variables fixed for every enterprise i.e., they are individual invariant.

Table 12 - Descriptive statistics of variables "innovative" and "size". Source: Author's calculation.

year		**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	
innovative	**yes**	7.03	6.85	6.69	6.74	6.58	6.54	6.45	
	no	92.97	93.15	93.31	93.26	93.42	93.46	93.55	
year		**2008**	**2019**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
innovative	**yes**	8.23	8.38	8.48	8.26	8.22	8.73	8.29	8.13
	no	91.77	91.62	91.52	91.74	91.78	91.27	91.71	91.87
year		**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	
size	**small**	92.69	92.69	91.47	90.66	89.51	95.78	95.18	
	medium	7.31	7.31	7.88	8.31	9.02	4.03	4.58	
	large	0.00	0.00	0.65	1.02	1.46	0.19	0.24	
year		**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
size	**small**	96.00	95.65	96.02	96.15	96.07	96.10	96.32	96.33
	medium	3.82	4.11	3.80	3.69	3.77	3.75	3.51	3.48
	large	0.17	0.23	0.17	0.17	0.15	0.14	0.17	0.19

The frequencies from Table 12 show that Croatian enterprises are mostly non-innovative. The share of innovative enterprises varies over the years from 6.45% to 8.73%.

As commented earlier, the dataset was constructed from enterprises that were either small or medium-sized in 2001. The first enterprises to become large came about in 2003. The trend that the proportion of large enterprises in the dataset increases is present until 2005, after which it mostly remains in the range of 0.17% to 0.24%. The same is true for medium-sized enterprises. Their share grew from an initial 7.31% to just over 9% and then fell to around 4%.

The remaining two categorical variables are fixed. Both are derived from the "industrial sector" variable in the original dataset. The "industry sector" variable categorises enterprises by activity into 10 categories, and the "high-tech" variable distinguishes two types of enterprise - those that belong to technologically advanced industries and those that do not.

Table 13 - Frequency table of industry variables for Croatian SMEs in 2015. Source: Author's calculation.

Variable name	**Value**	**Share**
High-tech (Industry sector by technology insensitivity)	High-tech	39.94%
	Non high-tech	60.06%
Sector (Industry sector by activity)	Agriculture	2.31%
	Industry	17.17%
	Construction	7.72%
	Trade	35.22%
	Transportation and storage	4.17%
	Accommodation and food	2.91%
	Information and communication	4.36%
	Finance and real estate	1.25%
	Professional, scientific, and technical activities	17.55%
	Education, services, art	7.34%

The only variables in the dataset that are individual variant, but are time invariant, are those related to the industrial sector. They show that, in the case of this dataset, enterprises belong predominantly to non-high-tech industries. In terms of activity, by far the majority of enterprises are in trade. The least number of enterprises are found in "Finance and real-estate" and in "Agriculture". These are closely followed by "Accommodation and Food" and "Transportation and Storage".

Although there is some variation, the overall structure is fairly close to the state of industry as a whole, with the exception of the last industry sector "Education, Services, and the Arts". In the whole economy, they occupy the largest share of enterprises, and this has not changed significantly from 2015 to 2019 (Bureau of Statistics, 2016; Bureau of Statistics, 2019). For exact figures on the shares of industries, see APPENDIX B.

5.3.2 Evolution of enterprise characteristics in Croatian SMEs from 2001 to 2015

Because panel datasets span several years, they also provide insight into how variables have changed over time. This is best seen by looking at the mean values for each year or, more intuitively, by looking at the plotted curves of the mean values. By looking at the curves of the mean values, two things can be observed. Firstly, it is necessary to observe whether there is an underlying influence on the variable. In the case of this dataset, possible influences are the economic crisis and the accession to the EU. Secondly, it can be observed whether the variables show a similar movement over the years.

Again, each group of enterprise characteristics is observed separately.

1. Innovation

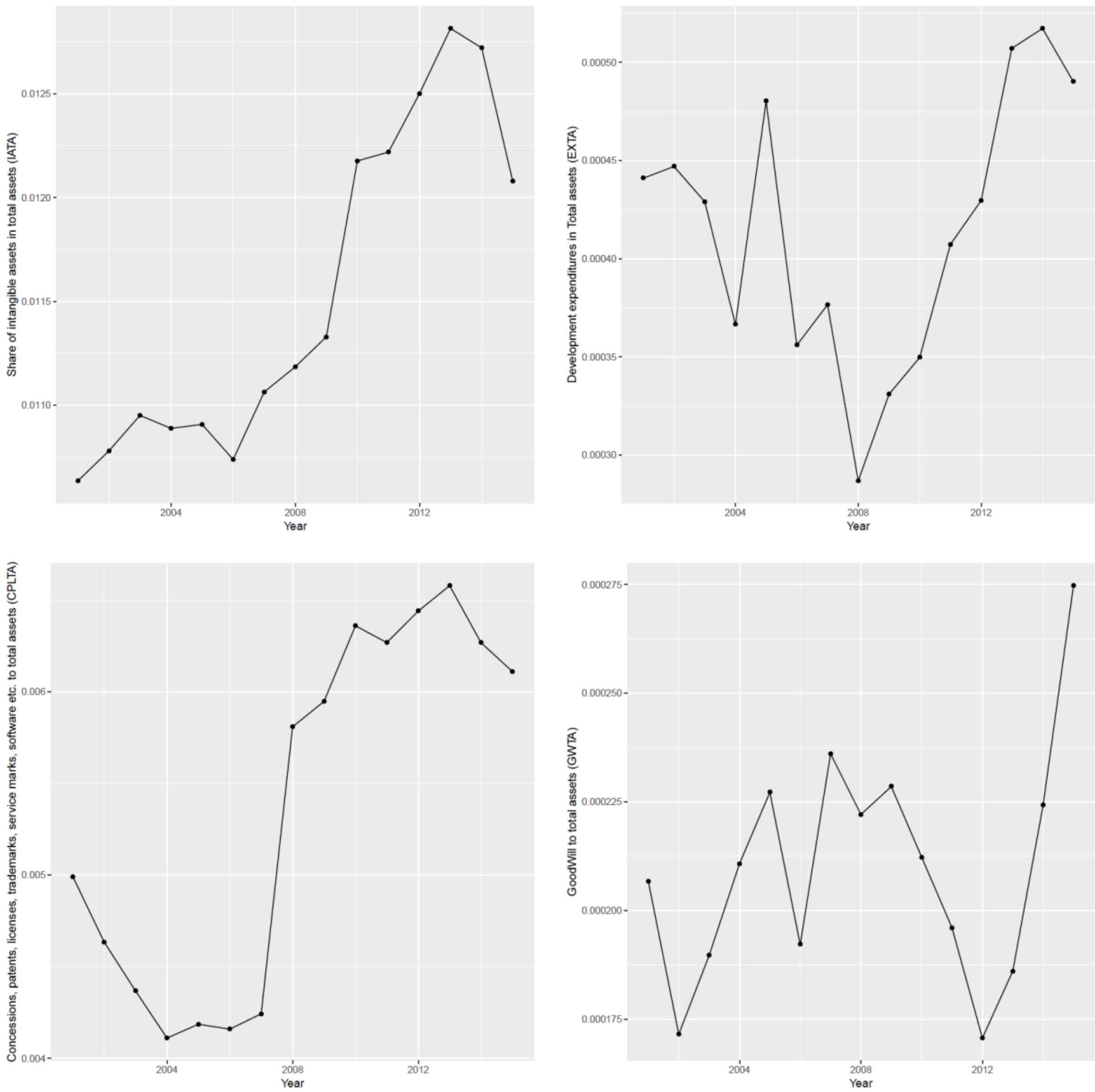


Figure 3 - Average mean values of innovation measures in years 2001-2015. Source: Author's calculation.

Figure 3 plots the curves of the mean values over the years of four innovation metrics. All four ratios are clearly affected by the global economic crisis and show jumps in their curves at the beginning of the global economic crises. While "intangible assets over total assets" and "goodwill over total assets" already show a larger jump in 2007 in anticipation of the crisis, the other ratios "expenditures in development over total assets" and "concessions, patents, licenses, trademarks, service marks, software, etc. over total assets" show the first signs of instability in 2008, when the crisis was in full effect. Signs of a turnaround in the behaviour of innovation measures appeared in 2013 towards 2014, although the crisis in Croatia officially lasted until 2015.

2. Export

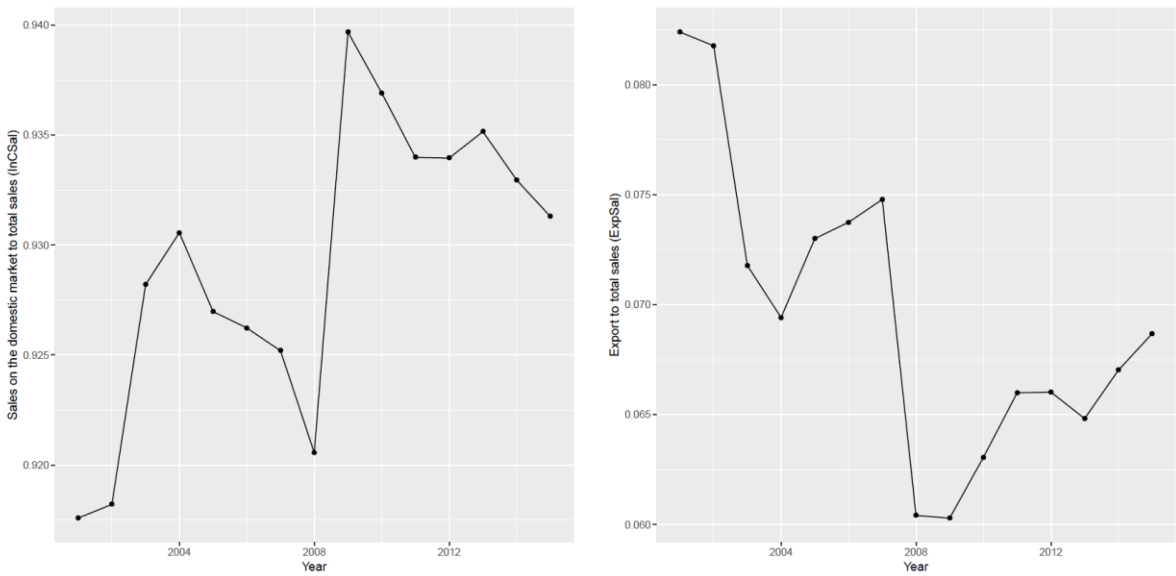


Figure 4 - Average mean values of export measures in years 2001-2015. Source: Author's calculation.

The measures related to exports are largely affected by the crisis, which can be seen in Figure 4. Interestingly, InCSal (the share of revenue from the domestic market in sales) increases when the economic crisis hits. This is probably because the crisis hit Croatia later and enterprises turned to the domestic market when international markets were affected by the crisis. The other indicator "sales from foreign market as a percentage of sales" is directly related to international markets and has a decrease in values in 2008.

3. Liquidity ratios

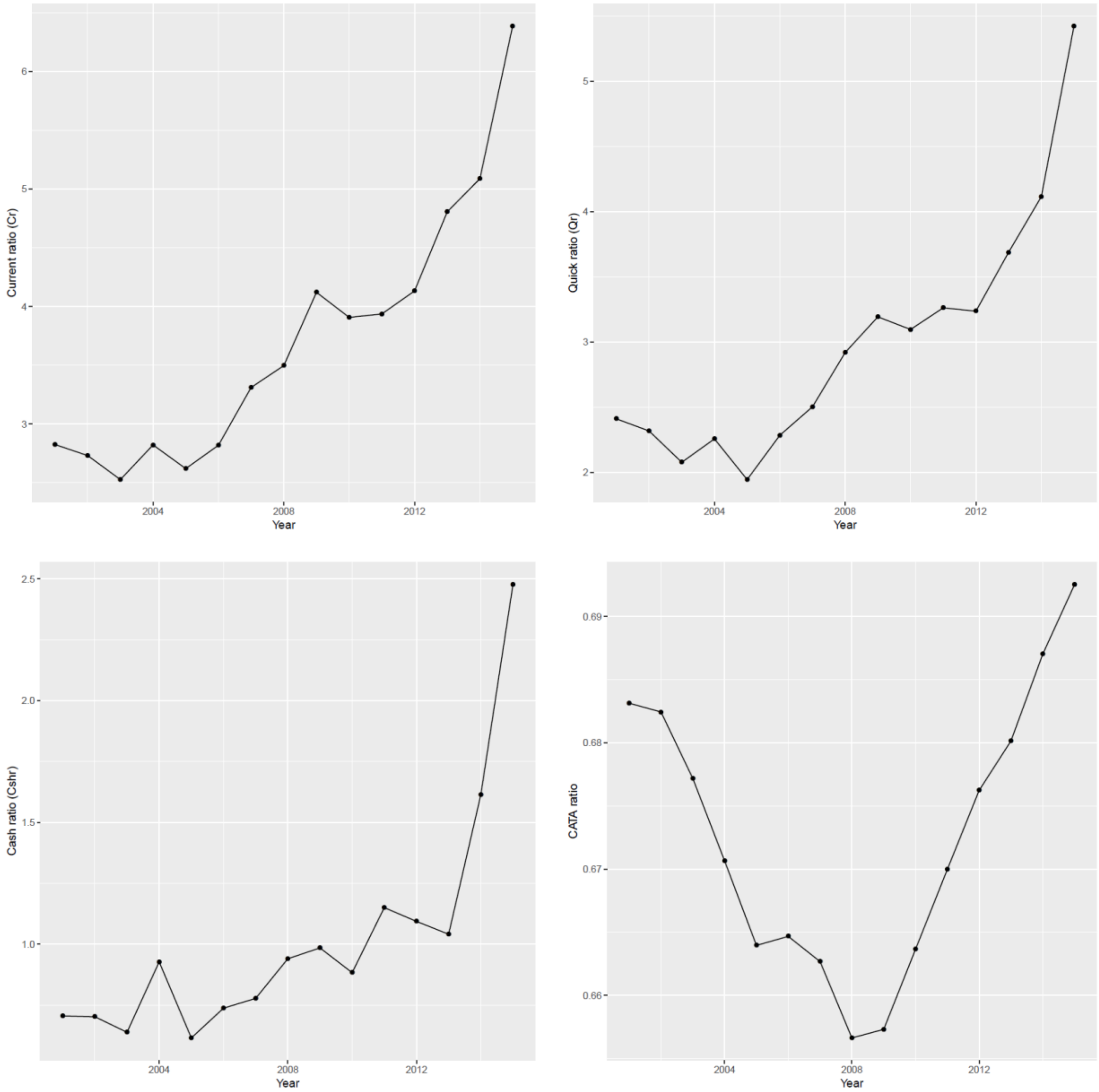
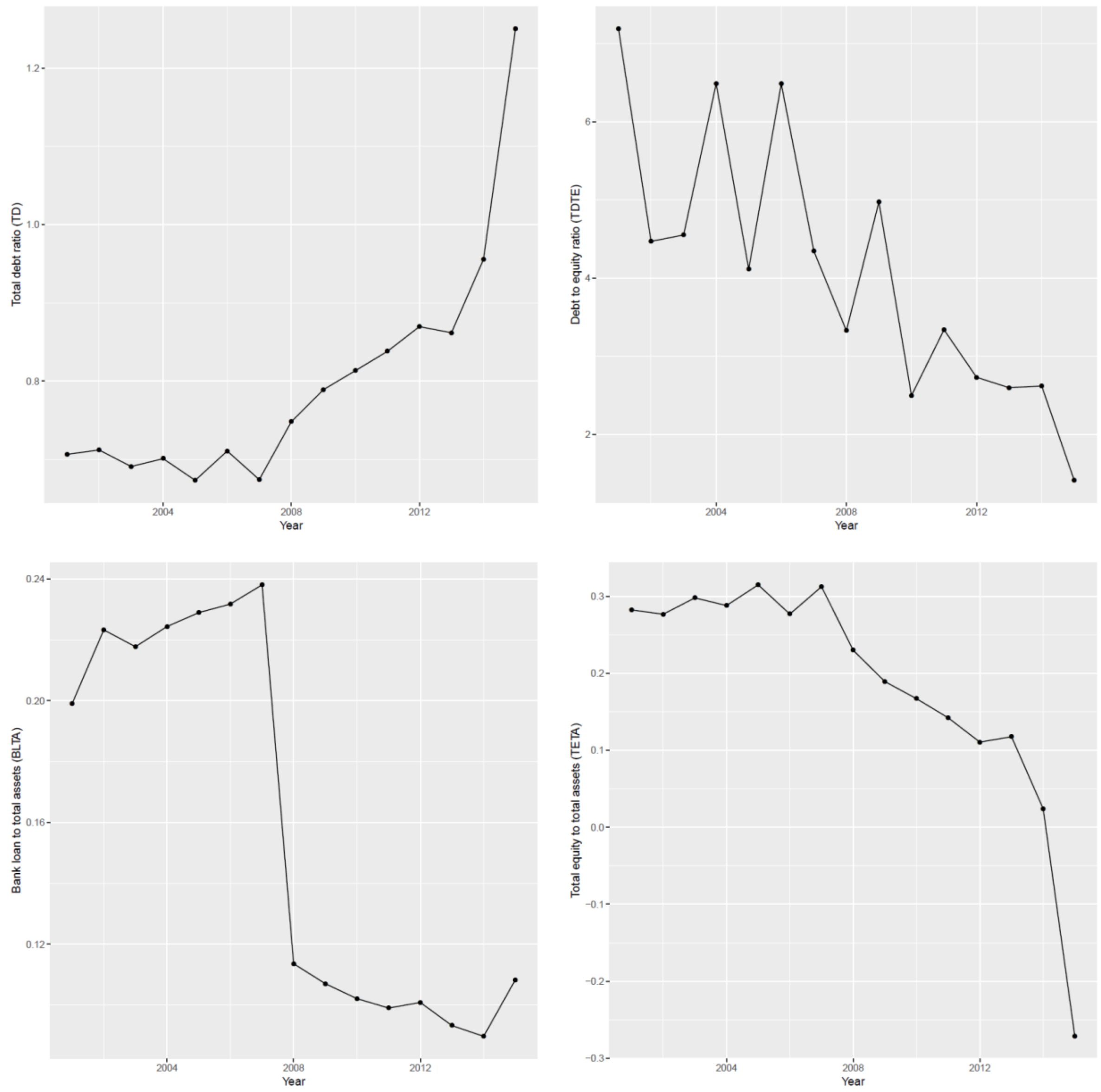


Figure 5 - Average mean values of liquidity ratios in years 2001-2015. Source: Author's calculation.

Out of the four liquidity ratios presented, only CATA (current assets over total assets) is clearly affected by the crisis, compared to the other three ratios it has drastically reversed its trend, from a decreasing trend to an increasing trend. This means that enterprises preferred to be more liquid in the face of the economic crisis, i.e., the ratio of current assets to total assets increased.

The remaining ratios, current ratio, cash ratio, and quick ratio have a relatively small decrease from 2009 to 2010. The only major change for these three ratios is after 2013 when their mean values show a higher jump compared to the previous periods. This is possibly due to Croatia's accession to the EU and the fact that enterprises preferred again to increase liquidity in order to respond more easily to possible challenges when faced with the new state of the economy.

4. Leverage ratios



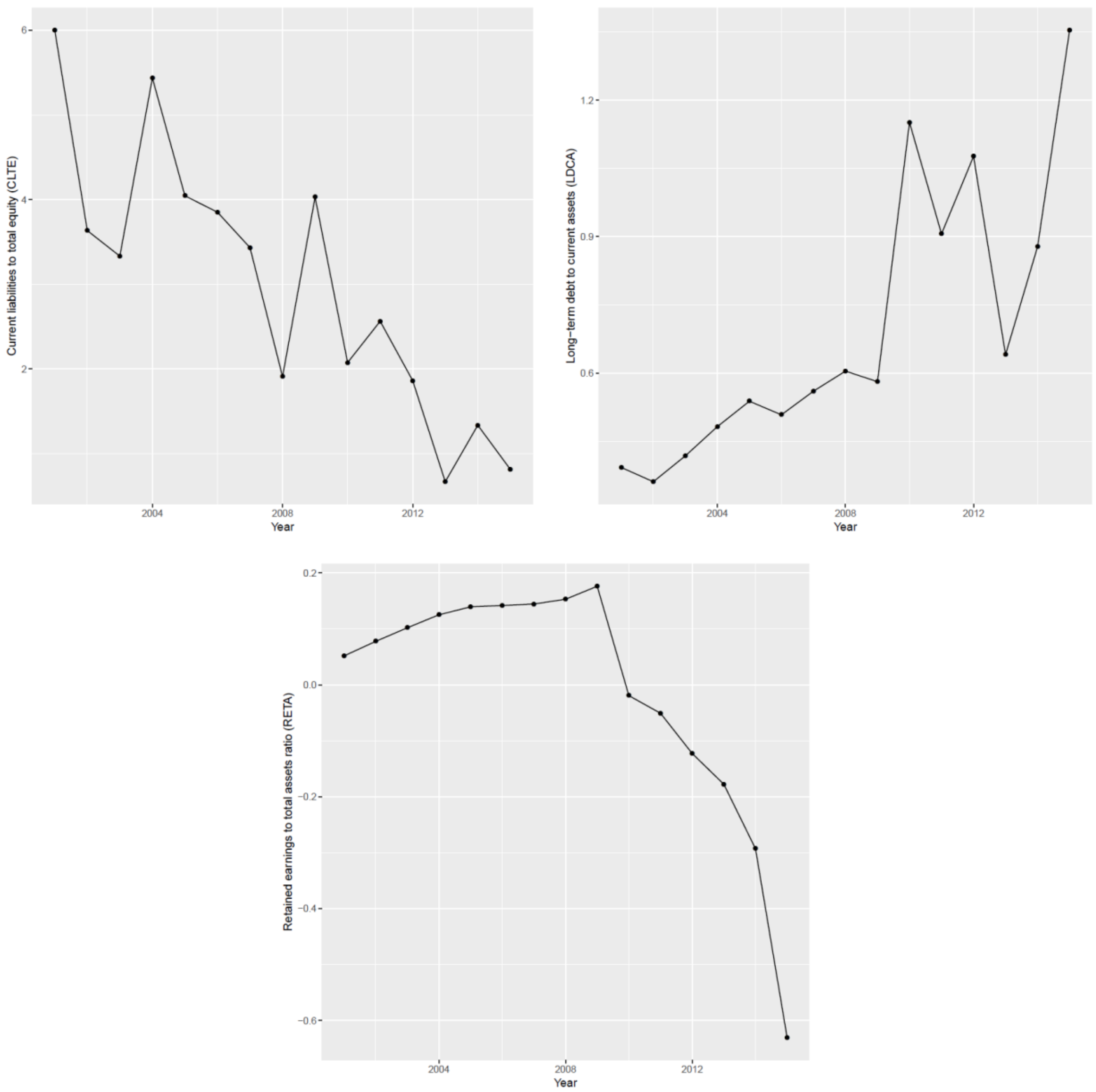
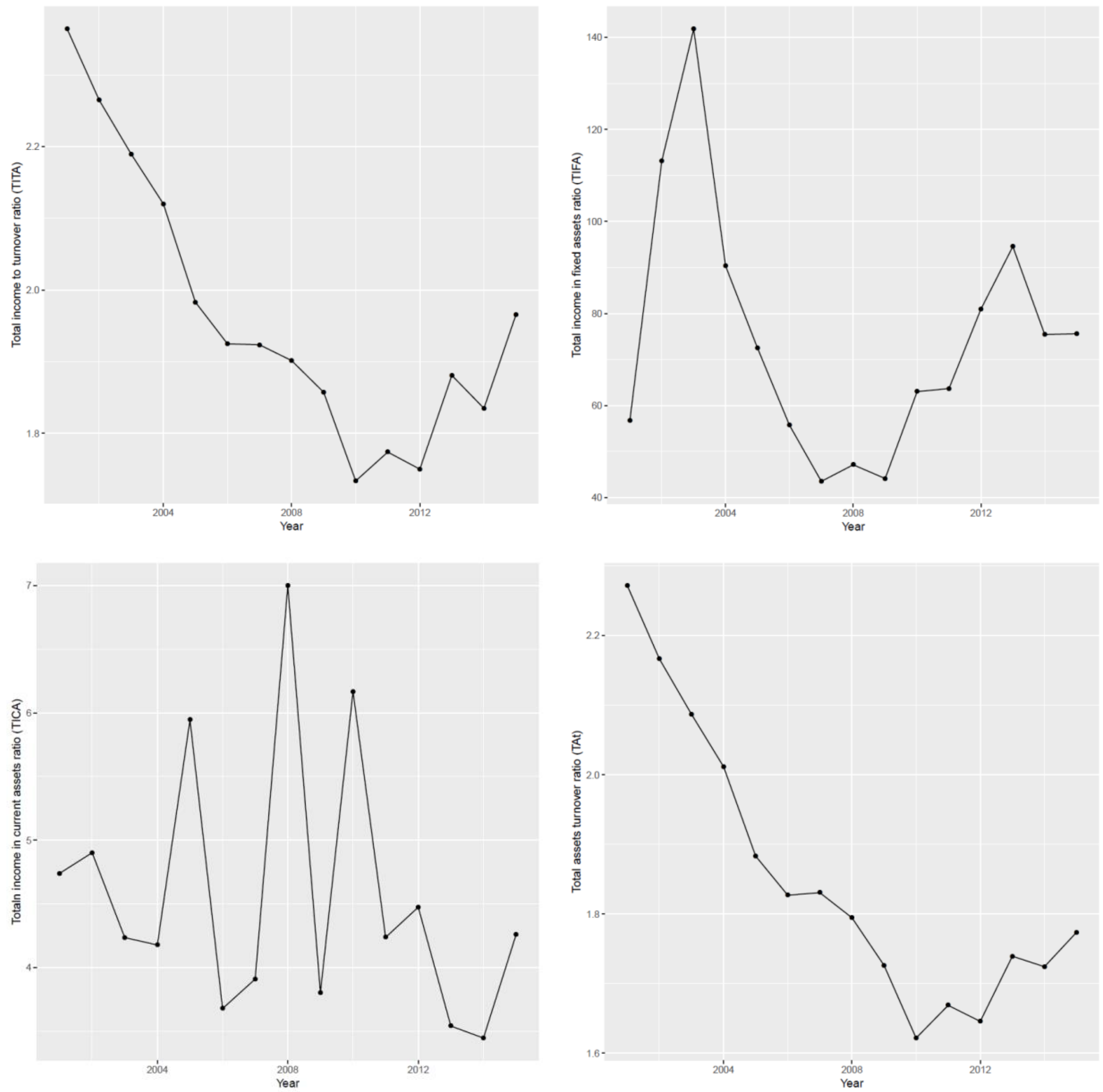


Figure 6 - Average mean values of leverage ratios in years 2001-2015. Source: Author’s calculation.

Out of the 6 leverage ratios, only two do not seem to be particularly affected by the crisis. These ratios are "Debt equity ratio" and "Current liabilities over total equity". On the other hand, "Long-term debt over current assets" had a steady, slowly increasing trend, but with the crisis in Croatia, the ratio had both larger increases and decreases in its average. Interestingly, Total Debt and BLTA (Bank loan to total assets) showed the first signs of change in the year before the crisis. The “Bank credit to total assets” ratio showed a large decline in its averages, although it should be noted here that this is also influenced by banks' policies and how willing they are to lend to enterprises in an increasingly unstable economy, not just when enterprises were interested in obtaining credit. Total debt, on the other hand, started to increase from 2007 to 2008 and continued this trend until 2015, i.e., enterprises found other sources to increase their debt in order to overcome the crisis. The remaining ratio in this group is "Retained earnings to total assets", which increased slowly until 2009, but then decreased until the end of the observation period.

5. Turnover ratios



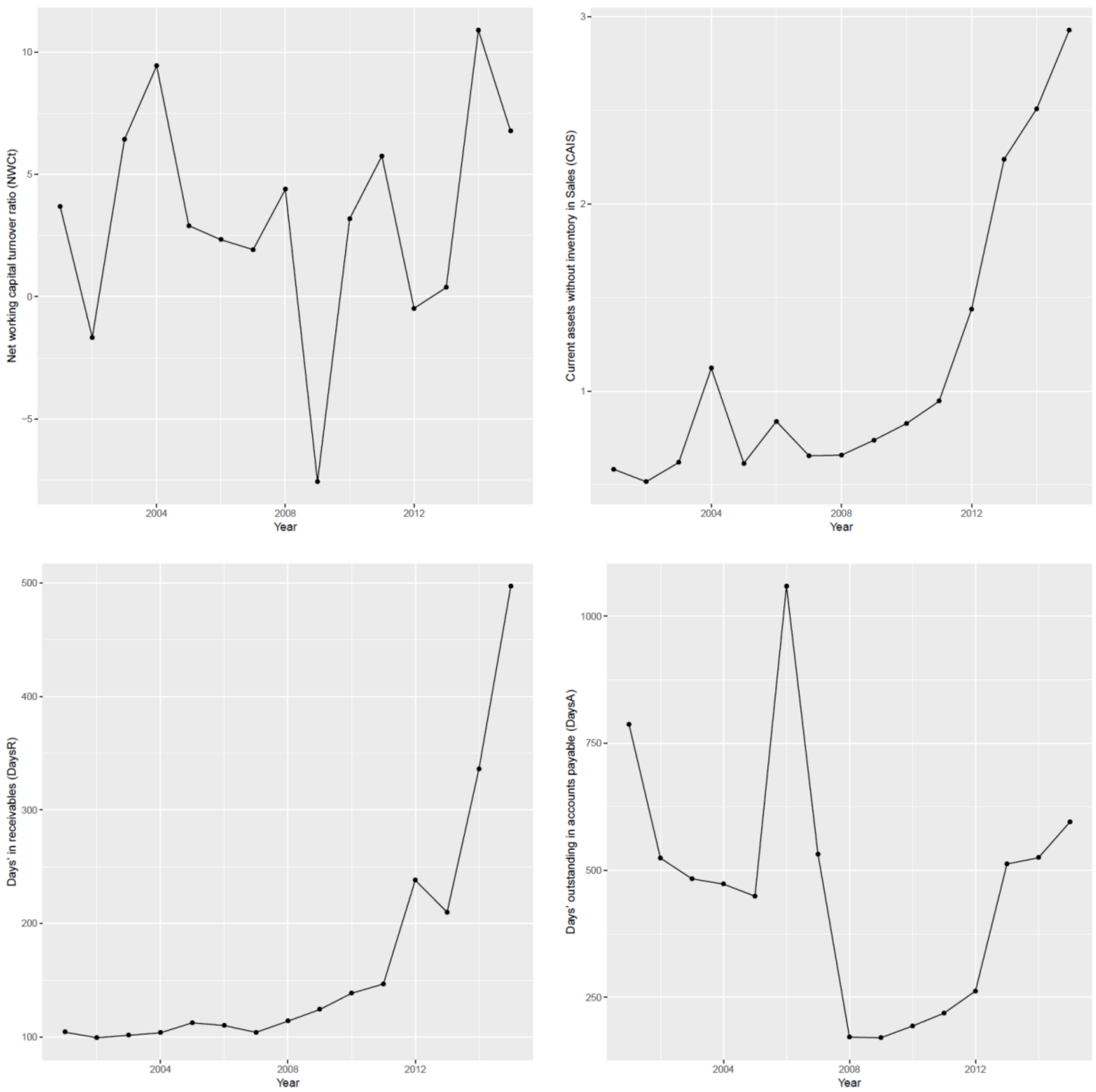


Figure 7 - Average mean values of turnover ratios in years 2001-2015. Source: Author's calculation.

As in all the previously mentioned groups of ratios, the crisis has also affected the graphs of the annual averages of the turnover ratios. However, for most of them the impact is only evident from 2010 onwards, as in the case of "Days' sales in receivables", "Total asset turnover" and "Total Income to total assets". "Days outstanding in accounts payable" peaked in 2006 and remained at a lower level than in the pre-crisis period until 2008. The ratio of total income to total assets also shows very low levels in the early years of the crisis but recovers relatively quickly compared to the other ratios.

6. Profitability ratios

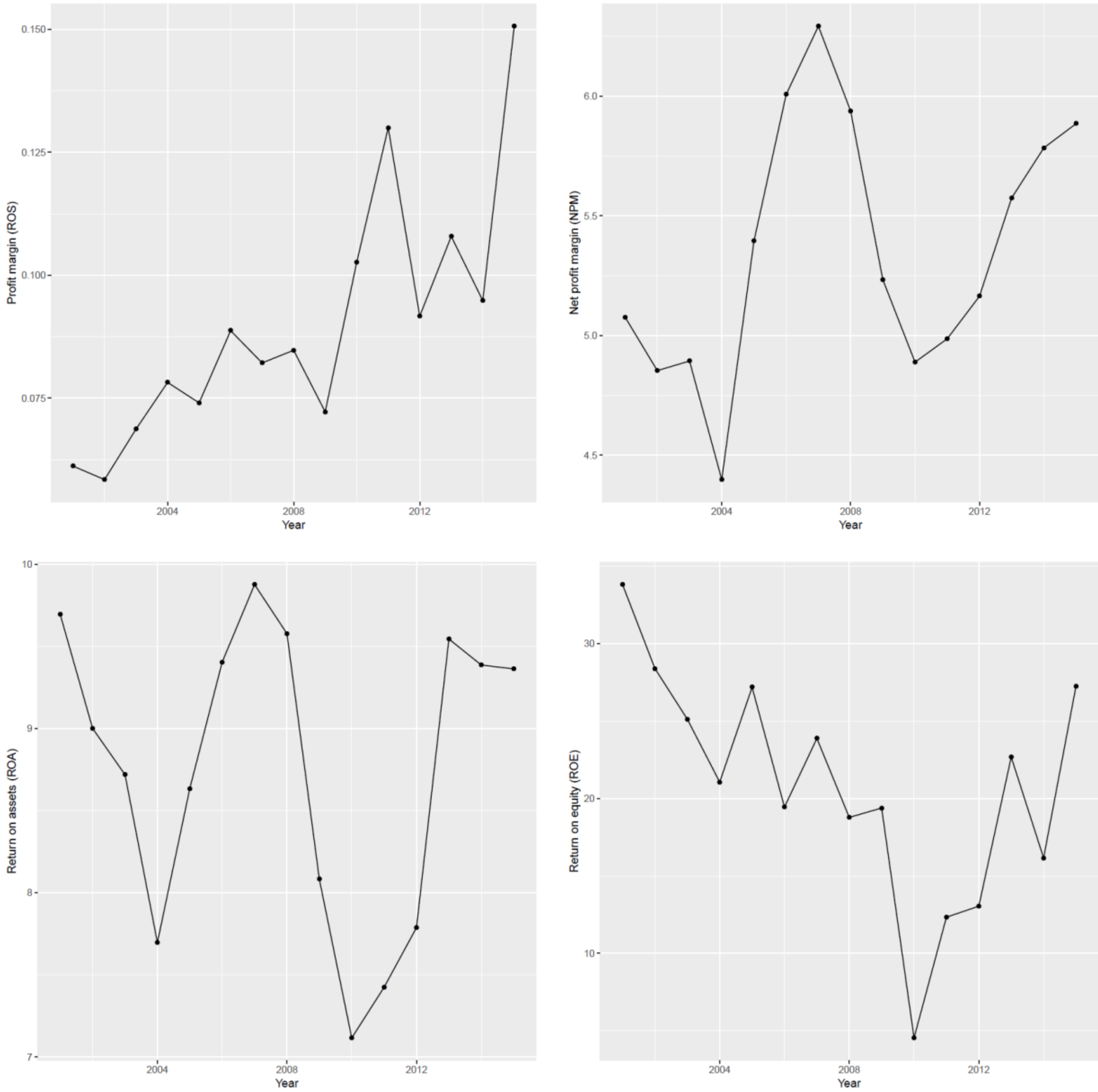


Figure 8 - Average mean values of profitability ratios in years 2001-2015. Source: Author's calculation.

Return on assets and profit margin do not seem to be affected to a greater extent by the crisis. Return on assets shows large fluctuations before and after the crisis but indicates a possible soothing of its curve from 2013 onwards. The return on sales, on the other hand, remains on its upward trend throughout the observation period. The positive trend in net profit margin turned around from 2007 to 2008, but a slow rising trend started again in 2010 when enterprises began to recover.

7. Investment ratios and productivity ratio

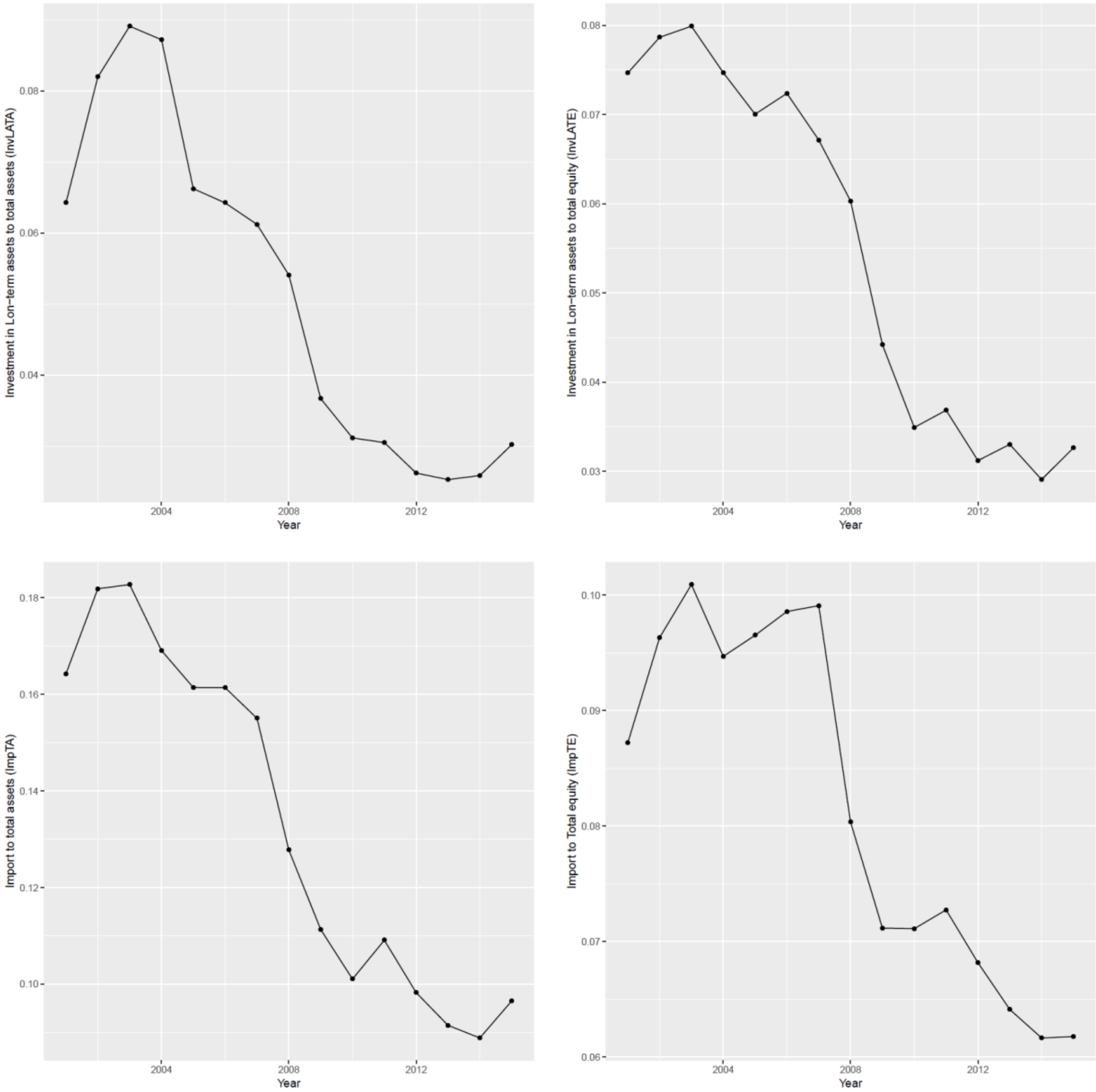


Figure 9 - Average mean values of investment measures in years 2001-2015. Source: Author's calculation.

In contrast to the innovation measures, investment in long-term assets (expressed as a share of total assets, i.e., InvLATA, or as a share of total equity, i.e., InvLATE) had two periods of sharper declines in their mean values. The first decline in investment in Croatian enterprises took place from 2004 to 2005. The second, larger decline was most pronounced from 2008 to 2009. It is expected that this is related to the crisis. Croatian enterprises also started to invest more. This can be seen in the stabilization of investment rates from 2010, and the first signs of recovery can be seen from 2014 to 2015, the year before the official end of the crisis in Croatia.

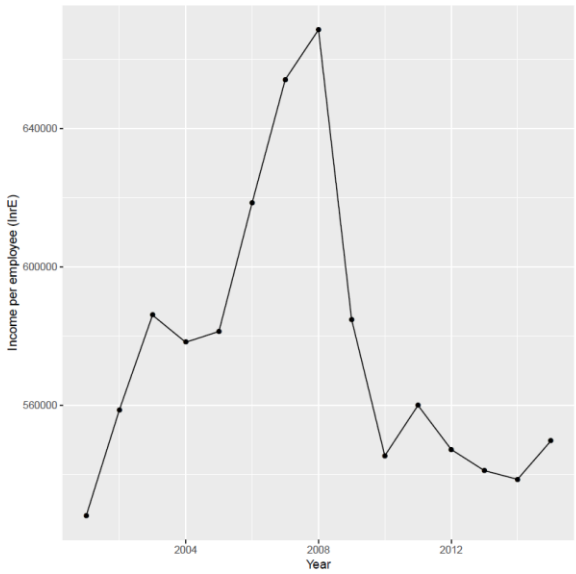


Figure 10 - Average mean values of a productivity ratio in years 2001-2015. Source: Author's calculation.

The productivity measure in the dataset, revenues per employee, has a steady increase until the crisis and a big drop in the first two years of the crisis, setting back enterprises in Croatia (on average) 9 years. Precise numbers of mean values and standard deviation of each measure for every year of the observed period between 2001-2015 can be found in APPENDIX C.

5.3.3 How enterprise characteristics are correlated in the case of Croatian enterprises between 2001-2015

The dataset used is large, and the number of variables is particularly large, so the first step in the modelling was to reduce the number of potentially acceptable models. Potential correlations between predictor variables in the model can greatly affect the magnitude and direction of the influence on the growth variable. To avoid false conclusions as a consequence of high correlations, corelation coefficients are calculated for all entities in all years. The resulting correlation matrix was calculated and can be seen in APPENDIX D. It is evident that most pairs of variables fall into the two lowest categories of little to no correlation (correlation coefficient is less than 0.29) and low correlation (correlation coefficient is between 0.3 and 0.49) (Asuero & Sayago, Gonzalez, 2006). However, some variables are highly correlated. This is the case when the correlation coefficient is above 0.7 (Asuero & Sayago, Gonzalez, 2006). Correlation coefficients above 0.7 are usually found between variables that are from the same group. These pairs with high correlation coefficients can be found in the following tables.

Table 14 - Correlation matrix of innovation measures. Source: Author's calculation.

	IATA	EXTA	CPLTA	GWTA
IATA	**1.000**	0.181	**0.735**	0.115
EXTA		**1.000**	0.044	-0.003
CPLTA			**1.000**	0.035
GWTA				**1.000**

As shown in Table 14, the ratios "Intangible Assets to Total Assets" (IATA) and "Concessions, Patents, Licenses, Trademarks, Service Marks, Software, and other rights to Total Assets" (CPLTA) are the only measures of innovation that are highly correlated. Both measures are shares of Total Assets and, in addition, "Concessions, Patents, Licenses, Trademarks, Service Marks, Software, and other rights" are a large part of Intangible Assets. They are expected to contain similar information and, therefore, should not be used together in a model.

Table 15 - Correlation matrix of export measures. Source: Author's calculation.

	InCSal	ExpSal
InCSal	**1.000**	**-0.989**
ExpSal		**1.000**

The high correlation between the measures of exports is to be expected. Since "sales on the domestic market" and "sales from exports" add up to Total Sales, their proportions in Total Sales add up to 1. Their correlation coefficient is -0.989, which means that when one measure increases, the other automatically decreases proportionally. It is noteworthy that the ratio decreases, not necessarily the other type of sales.

Table 16 - Correlation matrix of investment measures. Source: Author's calculation.

	ImpTA	ImpTE	InvLATA	InvLATE
ImpTA	**1.000**	**0.996**	0.218	0.217
ImpTE		**1.000**	0.216	0.221
InvLATA			**1.000**	**0.984**
InvLATE				**1.000**

In the case of investment ratios, two pairs are very highly correlated, namely the share of "Imports in Total Assets" (ImpTA) with the share of "Imports in Total Expenditures" (ImpTE) and the share of Investments in long-term assets in Total Assets (InvLATA) with its share in Total Expenditures (InvLATE). The high correlation is due to the same numerator.

Table 17 - Correlation matrix of liquidity ratios. Source: Author's calculation.

	Cr	Cshr	Qr	CATA
Cr	**1.000**	0.577	**0.855**	0.405
Cshr		**1.000**	0.637	0.190
Qr			**1.000**	0.307
CATA				**1.000**

As far as liquidity ratios are concerned, only the pair Current Ratio (Cr) and Quick Ratio (Qr) is in the group of highly correlated ratios. Cash Ratio (Cshr) is correlated with both Current Ratio and Quick Ratio, but not highly. All three ratios have "Current Liabilities" in the denominator. The higher correlation between Current Ratio and Quick Ratio is because the only difference between them is that Current Assets are reduced by Inventory in Quick Ratio. Inventory is not an item that is subject to frequent change, so the fluctuations in Current Ratio and Quick Ratio are fairly similar, which is reflected in the high correlation factor. The only liquidity ratio that has little to no correlation with the other liquidity ratios is the "Current Assets to Total Assets" (CATA) ratio because its denominator is total assets.

Table 18 - Correlation matrix of leverage ratios. Source: Author's calculation.

	TD	TDTE	BLTA	TETA	CLTE	LDCA	RETA
TD	**1.000**	0.524	0.379	**-0.970**	0.475	0.230	-0.583
TDTE		**1.000**	0.332	-0.522	**0.951**	0.230	-0.206
BLTA			**1.000**	-0.367	0.215	0.574	-0.203
TETA				**1.000**	-0.474	-0.230	0.608
CLTE					**1.000**	0.023	-0.168
LDCA						**1.000**	-0.141
RETA							**1.000**

Strong correlations are also found in the group of leverage ratios. Pairs with strong correlation include - Total debt ratio (TD) with "Total Equity to Total Assets" (TETA) and "Total Debt to Total Equity" (TDTE) with "Current Liabilities to Total Equity" (CLTE). Again, the cause of high correlation coefficients can be found in the similar definitions of the ratios. The first pair (TD and TETA) both have total assets in the denominator, and the second pair (TDTE and CLTE) has total equity in the denominator. Current liabilities are a part of total debt of enterprises and are among the denominators in the second pair of ratios. The very high correlation coefficients reflect the similar formulas of the ratios and, thus, the similar changes in their values.

Table 19 - Correlation matrix of turnover ratios. Source: Author's calculation.

	TITA	TIFA	TICA	TAt	NWCt	CAIS	DaysR	DaysA
TITA	**1.000**	0.655	0.697	**0.985**	0.280	-0.570	-0.430	-0.220
TIFA		**1.000**	0.071	0.653	0.294	-0.094	-0.081	-0.072
TICA			**1.000**	0.679	0.084	**-0.779**	-0.601	-0.251
TAt				**1.000**	0.290	-0.581	-0.431	-0.217
NWCt					**1.000**	-0.073	-0.024	-0.053
CAIS						**1.000**	**0.736**	0.127
DaysR							**1.000**	0.269
DaysA								**1.000**

The dataset contains 8 turnover ratios, but many of them are highly correlated and, as a result, the highly correlated variables cannot be in the same model. A very high correlation was also found between "Total Income in Total Assets" (TITA) and Total asset turnover (Tat, i.e., Sales in Total assets). Since Sales constitute the largest part of Income, these two ratios contain very similar information and are therefore very highly correlated. Highly correlated pairs of turnover ratios also include "Current assets reduced by inventory in Sales" (CAIS) with "Total Income in Current Assets" TICA and with Days' Sales in receivables (DaysR). The inclusion of these pairs in the same model should also be avoided.

Table 20 - Correlation matrix of profitability ratios. Source: Author's calculation.

	NMP	ROS	ROA	ROE
NMP	**1.000**	**0.996**	**0.923**	**0.760**
ROS		**1.000**	**0.913**	**0.750**
ROA			**1.000**	**0.822**
ROE				**1.000**

Table 20 contains the correlation coefficients of the four profitability ratios. All ratios are highly correlated, and some pairs are very highly correlated, i.e., they have a correlation coefficient greater than 0.9. All four ratios carry "Net Income" in their nominator. Net profit margin (NMP) and Return on sales (ROS) express "Net Income" as a proportion of Total Income and Sales, respectively. As mentioned earlier, fluctuations in Total Income are strongly influenced by fluctuations in sales and, therefore, these two measures are also highly correlated. Return on assets and Return on equity express Net Income as a proportion of Total Assets and Total Equity, respectively. Because of the similar structure of assets and equity, the ratios behave similarly and are highly correlated.

Table 21 - Correlation coefficients between liquidity ratios and leverage ratios (TD and TETA) and a turnover ratio (TIFA). Source: Author's calculation.

	Cr	Cshr	Qr	CATA
TD	**-0.724**	-0.524	-0.676	-0.049
TETA	**0.704**	0.508	0.652	0.055
TIFA	0.285	0.224	0.231	**0.873**

The above table contains the only high correlations that cross between different groups of measures. The only measures that show a correlation with other ratios are the liquidity ratios. Namely, the liquidity ratio "Current Ratio" is highly correlated with the "Total Debt Ratio" (TD) and the ratio "Total Equity to Total Assets" (TETA). All three ratios are shares of total assets. As mentioned earlier, the "Current Ratio" is very highly correlated with the " Quick Ratio" (Qr). Therefore, the correlation coefficients between the "Quick Ratio", "Total Debt Ratio", and the "TETA Ratio" are just below the 0.7 mark, so care should be taken when combining these ratios in modelling. The last high correlation is between the CATA ratio and the TIFA ratio. CATA equals Current Assets over Total Assets, and total assets equals the sum of current and fixed assets, which is the denominator of the TIFA ratio computed as Total Income over Fixed Assets, which influences the high correlation.

When variables with high correlation are combined in the same model as predictor variables, they may influence each other and affect the values of the regression coefficients. Moreover, in this case, it is not possible to observe how a predictor variable affects the growth variable "when all other values are fixed", since correlated variables will inevitably affect each other. In order to avoid such problems, the simplest approach is to avoid combining highly correlated variables in the same model, reduce the number of possible combinations of variables in the modelling due to the many variables in the dataset, and to avoid future problems with included correlated variables. The first step was to avoid such variable pairs.

5.3.4 Predicting growth of Croatian SMEs

The growth variable, sales, was predicted using only the values of predictor variables from the previous year, which is in line with other studies (Demirel & Mazzucato 2013; Ipinnaiye et al., 2017; Perić et al., 2020). Lagged value of sales was also used as a predictor variable. In addition, the testing was done via "out-of-sample" approach, i.e., the data from 2015 were omitted from the calculation of the regression coefficients and used to calculate the R^2 values. Due to the use of values from a previous period, i.e., the previous year, the model can be interpreted in terms of how the predictor variables will affect the future values of sales, i.e., how sales will change based on the changes in values of the predictor variables.

Special attention was paid to the influence of the variables among themselves. The calculated correlation coefficients made it possible to avoid strongly correlated pairs of variables. However, to gain a clearer insight into how the variables influence sales on their own and how their influence changes when they interact with other predictor variables, a total of seven models were created. In this way, it is possible to observe whether variables become insignificant when grouped with others, i.e., whether some variables have a stronger impact on growth than others. Five models can be seen in . These cover the groups of enterprise specific characteristics, namely innovation, export, liquidity ratios, leverage ratios, turnover ratios, and profitability ratios. Only the first model in the table, i.e., the Innovation-Export model covers two groups of variables. This is done to show how innovation affects the influence of export on growth and vice versa. The remaining four models each cover one group of financial ratios. In the following table, Table 23, the first model, named Static model, covers all groups of enterprise characteristic variables and the macroeconomic values. The second model in this table also includes the lagged value of sales, which means that this model is a dynamic model. From the dynamic model, the turnover ratios and the Export ratio (share of export in sales) are omitted because they are highly correlated with sales from the same period.

The growth variable is sales, and the predictor variables are the values of the characteristics at a given point in time. The interpretation of the regression coefficients should primarily be that the associated variable affects the level of sales, not whether sales are increasing or decreasing, i.e., growing or falling. Nevertheless, if we observe two equations at two points in time, for example at ‘*t*’ and ‘*t-1*’:

$$sales_t = intercept + \sum_i \beta_i \, x_{it} + u_t \tag{79}$$

$$sales_{t-1} = intercept + \sum_i \beta_i \, x_{it-1} + u_{t-1} \tag{80}$$

if the second equation is subtracted from the first, just one equation will be observed:

$$\Delta sales_t = \sum_i \beta_i \, \Delta x_{it} + \Delta u_t \tag{81}$$

Therefore, interpretation of the following models can be laid out as how changes of predictor variables will affect future growth of sales.

In the case of dynamic models, i.e., where the lagged value of the growth variable acts as a predictor variable in the model, the following is true:

$$sales_t = intercept + sales_{t-1} + \sum_i \beta_i \, x_{it} + \varepsilon \tag{82}$$

$$sales_t - sales_{t-1} = intercept + \sum_i \beta_i \, x_{it} + \varepsilon \tag{83}$$

By denoting $\Delta sales_t = sales_t - sales_{t-1}$ it is evident from equations (82) and (83) that a dynamic model can be interpreted in two ways. The first interpretation is consistent with the interpretation of the static models, that is, the predictor variables affect the level of sales or the change in the predictor variables affect the growth of sales. However, the second interpretation, that the level of predictor variables affects the change in the level of sales, i.e. growth of sales, is only possible in the dynamic model.

Table 22 - Models based on variables from one group and their diagnostics

	Innovation-Export model	**Liquidity model**	**Leverage model**	**Turnover model**	**Profitability model**
Intercept			7662986.53 (***) [7304818.76, 8021154.3]	6843813.038 (***) [6500557.1, 7187068.9]	
EXTA (share of expenditure on R&D in Total Assets)	-446600.8 [-6733889.51, 5840688.37]				
Innovative (=1if spending on patents is above average)	309837.2 (*) [36239.90, 583434.51]				
ExpSal (share of sales revenues from abroad in total sales)	1848919.5 (***) [1415038.54, 2282800.44]				
Innovative ExpSal*	5769564 (***) [3867893.61, 7671234.02]				
CATA (Current assets/ Total assets)		1409760.1 (***) [1063561.6, 1755958.7]			
Qr ((Current assets-inventory)/Current liabilities)		-611.0662 [-2107.37, 885.24]			
BLTA (Bank Loan/ Total assets)			489303.82 (***) [145667.12, 832940.51]		
Tat (Sales/ Total assets)				39075.69 (***) [22253.21, 55898.16]	

DaysA (Days' outstanding in accounts payable)					-2.094 [-5.87, 1.68]	
NPM (Net profit margin)						27633.06 (***) [19239.07, 36027.06]
ES (Economic shock)				-974703.9 [-1109072.5, -840335.4]		
*BLTA*ES*				-599939.62(***) [-957008.90, -242870.34]		
p-values of tests	Hausman	$6.87 * 10^{-66}$	$7.75 * 10^{-8}$	0.0598	0.8114	$2.4 * 10^{-9}$
	Wooldridge-Multiplier	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$
	F test	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$	$< 2.2 * 10^{-16}$
	Breusch-Pegan	0.09	0.077	0.482	0.666	0.593
	Durbin–Watson	0.0687	0.0781	0.058	0.802	0.054
$Ajusted\ R^2$		0.0436	0.042	0.0048	0.018	0.016

Markings of level of significance: 0.1- (‘); 0.05 – (*); 0.01 – (**); 0.001 – (***)
Next to the respective regression parameters, are their confidence intervals in brackets

As can be seen from the table above, all the panel models presented have very low R^2 values (below 0.1). However, these models are primarily used to test the hypotheses of whether the included variables have a significant effect on the level of sales, not to predict the exact value of enterprise sales. R^2 is a measure of predictive power, not model fit (Moksony, 1999). The most important information for testing the stated hypothesis is the significance of the variables in the models.

For all models in Table 22, tests were conducted to decide whether the panel model would be a random effects model, a fixed effects model, or a pooled OLS model. The p-values of the Wooldridge-Multiplier tests and F-tests are all below $2.2 * 10^{-16}$ for all models, indicating that none of the models should be calculated with pooled OLS. The Hausman test was used to observe whether fixed or random effects models should be used. In the case of the Innovation-Export model, Liquidity model, and Profitability model, the p-values of the Hausman test are less than 0.05 and, therefore, Fixed effect panel models were created. Only the Leverage model and Turnover model were created with random effects. Breusch-Pegan test was used to test for heteroskedasticity, and the Durbin-Watson test was used to test for auto-collinearity. Both tests had the desired p-values above 0.05, indicating that the definitions of the models were acceptable.

Table 23 shows only two models. It indicates how the significance of enterprise characteristics and macroeconomic variables changes when the model uses prior values of the growth variable sales in the prediction. Also, a large increase in R^2 can be seen when earlier values of sales are included. The R^2 value for the dynamic model is above 0.7, while it remain below 0.1 in the static model. Nevertheless, as mentioned earlier, according to Moksony (1999), both models are still acceptable for interpreting the significance of the effect of predictor variables on sales when properly defined.

In the case of the Static model, the Wooldridge-Multiplier-test and the F-test once again indicate that either random or fixed effects should be used. The Hausman test has a p-value of 0.0765, i.e., above 0.05, which is in favour of a random effects model. The Dynamic model was built using GMM methods, as these are preferred for panel data with a large number of entities but a small number of time periods. Observed regression coefficients α alongside sales in three models were used to choose between the difference GMM and the system GMM estimator. Since the regression coefficient of the difference GMM is lower than the regression coefficient from the fixed-effects model with the within estimator, the difference GMM estimator was used for modelling.

Table 23 - Models covering enterprise characteristics and macroeconomic variables.

	Static model	**Dynamic model**
Intercept	11053458.75 (***) [10479542.19, 11627375.31]	
$sales_{t-1}$		0.601732 (***) [0.562630152, 0.640834435]
EXTA *(share of expenditure on R&D in Total Assets)*	870338.5908 [-5359611.59, 7100288.77]	-0.14897 [-0.836923077, 0.538991104]
Innovative *(=1if spending on patents is above average)*	435659.8484 (**) [164887.53, 706432.16]	0.002014 [-0.017160465, 0.021188299]
ExpSal *(share of sales revenues from abroad in total sales)*	2073366.291 (***) [1645958.40, 2500774.18]	
Innovative ExpSal*	2050201.965 (***) [897530.05, 3202873.88]	
CATA *(Current assets/ Total assets)*	1325365.508 (***) [978345.20, 1672385.81]	0.25615 (***) [-0.30043435, -0.211869717]
Qr *((Current assets-inventory)/Current liabilities)*	-774.9485826 [-2263.44, 713.55]	0.000129 (**) [0.0000395, 0.000217985]
BLTA *(Bank Loan/ Total assets)*	-13648.95828 [-148867.98, 121570.06]	-0.00844 [-0.046165639, 0.029292426]
Tat *(Sales/ Total assets)*	43449.23283 (***) [26599.73, 60298.73]	
DaysA *(Days' outstanding in accounts payable)*	-2.110984502 [-5.87, 1.65]	
NPM *(Net profit margin)*	10851.36071 (**) [2485.98, 19216.74]	0.00712 (***) [-0.008318528, -0.005918161]
InvLATA *(Investment in long term assets/ Total assets)*	-34245.6 [-455638.21, 387146.96]	0.1184 (***) [-0.144900226, -0.091926673]
High-tech *(=1 if it is a high-tech enterprise)*	243888.5259 (*) [-12676.55, 500453.60]	
GDP_growth	86779.91 (***) [75615.62, 97944.20]	
Inflation_rate	-59459.28013 (***) [-83779.74, -35138.82]	
Unemployment_rate	-230400.2388 (***) [-260290.75, -200509.27]	
EU	1417042.094 (***)	

	[1176477.81, 1657606.38]	
ES (Economic shock)	2024909.11 (***) [1777089.76, 2272728.46]	
*EU*ExpSal*	10111142.11 (***) [9117538.60, 11104745.62]	
*High-tech*ES*	23317.87657 [-277264.63, 323900.38]	
Adjusted R^2	0.0828	0.7938
Testing for the type of model	Wooldridge-Multiplier -tests p-value $< 2.2 * 10^{-16}$ F-tests: p-value $< 2.2 * 10^{-16}$ Hausman test: p-value=0.0765	$\alpha_{OLS} = 0.968$ $\alpha_{within} = 0.7034$
Testing the correctness of the model	Breusch-Pegan test: p-value= 0.1444 Durbin-Watson test: p-value=0.9051	Sargan test: p-value=0.1438
Markings of level of significance: 0.1- (‘) 0.05 – (*) 0.01 – (**) 0.001 – (***) Next to the respective regression parameters, are their confidence intervals in brackets		

As can be seen from Table 23, the Dynamic model has only one additional predictor variable compared to the Static model, namely the prior values of the growth variable. In addition to export variables and turnover variables, which are excluded because of their high correlation with sales from the same period, macroeconomic variables and industry sector variables are also missing compared to the Static model. Excluded from the Dynamic model is the variable 'High-tech', which indicates whether the enterprise is part of a technology-intensive sector. It is a time-invariant variable that cannot be used in the difference GMM. Appropriate instrumental variables that meet all conditions could not be found among data retrieved from financial ratios, so they were chosen from variables on the macroeconomic level. The variables used as instrumental variables in the model are sales, GDP_growth, Inflation_rate, Unemployment_rate, and ES, i.e., indicator of economic shock. All instrumental variables, were lagged twice. Enterprise sales is modelled on lagged values of the predictors, so it is expected that instrumental variables are lagged twice because they are the regressors of the endogenous predictor, which is lagged once. According to the p-value of the Sargan test the instrumental variables are appropriately chosen, and the model is valid. The choice of instrumental variables is in line with the study of Ipinnaiye et al. (2017), which modelled SME growth, measured by sales, using SYS-GMM method and obtained a model that included macroeconomic variables as instrumental variables as well.

Comparing the models in Table 22, which cover only up to two levels of variables, with the Static model in Table 23, we can see that most variables remain at their significance level even when combined with other enterprise characteristics and macroeconomic variables. The leverage ratio "bank loans to total assets" (BLTA) went from a significance level of 0.1 to not significant when combined with others. This is also the case with the dynamic model, the leverage ratio BLTA is not a significant variable in either of these models. On the other hand, although innovation remained significant when combined with other enterprise characteristics and macroeconomic variables in the Static model, innovation is not a significant variable in the Dynamic model when past sales are introduced as a predictor variable and export measures are excluded.

The equations from the obtained Static and Dynamic models are:

$$\begin{aligned} sales_t = intercept &+ \beta_{ExpdnTA} ExpdnTA + \beta_{Innovative} I_{Innovative} \\ &+ \beta_{ExpSal} ExpSal + \beta_{innovative*ExpSal} I_{Innovativ} ExpSal \\ &+ \beta_{CATA} CATA + \beta_{Qr} Qr + \beta_{BLTA} BLTA + \beta_{Tat} Tat + \beta_{DaysA} DaysA \\ &+ \beta_{NPM} NPM + \beta_{InvLATA} InvLATA + \beta_{High\_tech} I_{High-tech} \\ &+ \beta_{GDP\_growt} GDPgrowth + \beta_{inflation\_rate} Inflation_{rate} \\ &+ \beta_{Unemployment_{rate}} Unemployment_{rate} + \beta_{EU} I_{EU} + \beta_{ES} I_{ES} \\ &+ \beta_{ExpSAL*EU} I_{EU} ExpSal + \beta_{High_{tech}*ES} I_{High\_tech} I_{ES} + \varepsilon \end{aligned} \tag{84}$$

$$\begin{aligned} sales_t = intercept &+ \beta_{sales_{t-1}} sales_{t-1} + \beta_{ExpdnTA} ExpdnTA \\ &+ \beta_{Innovative} I_{Innovative} + \beta_{CATA} CATA + \beta_{Qr} Qr + \beta_{BLTA} BLTA \\ &+ \beta_{NPM} NPM + \beta_{InvLATA} InvLATA + \varepsilon \\ sales_{t-1} = \pi_0 &+ \pi_{sales_{t-2}} sales_{t-2} + \pi_{GDP_{growth}} GDP_{growth} \\ &+ \pi_{Inflation\_rate} \text{Inflation\_rate} \\ &+ \pi_{\text{Unemployment}_{\text{rate}}} \text{Unemployment\_rate} + \pi_{\text{ES}} \text{ES} \end{aligned} \tag{85}$$

The Static model is presented in equation (84) and Dynamic model with the equation of instruments is presented in equation (85).

5.4 Discussion of the results from the empirical research

At the centre of this dissertation is the question which enterprise characteristics and macroeconomic characteristics have a statistically significant influence on the sales levels. This is reflected in the main hypothesis that these characteristics can be used to determine SME growth.

5.4.1 Discussion on the influence of enterprise characteristics on sales growth

The enterprise characteristics cover innovation, export, financial ratios, and firmographic characteristics, including industry sector.

Hypothesis H1 concerns the impact of innovation on sales growth. H1 was confirmed, i.e., innovation is a positive determinant of growth.

Variables associated with enterprise innovativeness are included in three models - Innovation-Export model, Static model, and Dynamic model. The innovation variables included in the models are - "share of expenditure on R&D in Total Assets" (EXTA) and the indicator variable "innovative", which is equal to 1 if the enterprise spends a higher share of total assets on concessions, patents, licenses, trademarks, and other rights than the average enterprise. Using these two variables, different conclusions can be drawn regarding the impact of innovation on firm growth.

Looking at the indicator variable "innovative", it can be concluded that innovation has a significant impact on growth. In the model Innovation-Export and in the Static model, this variable was significant. The regression coefficient was positive in both models (Innovation-Export model: 309837.2; Static model 435659.84), which indicates that if the enterprise spends a higher proportion of total assets on concessions, patents, licenses, trademarks, and other rights than the average enterprise in Croatia, its level of sales will be higher. Also, according to equation (81), if an enterprise moves from spending a lower-than-average share of total assets on concessions, patents, licenses, trademarks, and other rights to spending a higher-than-average share, its level of sales will increase. This is consistent with most of the results of previous research, including Lin and Chen (2007), Hölzl (2009), Mason et al. (2009), Stam and Wennberg (2009), Grundström et al. (2012), Garza-Reyes et al. (2018), and Demirel and Danisman (2019), all of which found a significant positive impact of innovation on growth. With successful innovation, which translates into increased spending on concessions, patents, licenses, trademarks, and other rights, enterprises can expect to attract new customers, i.e., increase sales.

The other included innovation variable "share of expenditure on R&D in Total Assets" (EXTA) remained non-significant in all three models. This is because expenditures on R&D may or may not lead to innovation. If there is an innovation, it is likely that the enterprise will continue to spend its resources on concessions, patents, and other rights. Thus, the main difference between these two variables is that in order for enterprises to spend on concessions, patents, and other rights they first have to invest in R&D, while the reverse is not true.

This closely mirrors the findings of Stam and Wennberg (2009) and Demirel and Mazzucato (2013), who also concluded that while innovation is an important determinant of growth, investment in R&D is not. This is also true for Croatian enterprises in the period between 2001-2015. According to the Innovation-Export model and the Static model, it is confirmed that enterprises will benefit from innovation, but not from every expenditure in R&D.

Hypothesis H2a states that export is a significant positive determinant of growth. This was confirmed by the obtained models.

Export is present as a predictor variable in two models, the Innovation-Export model and the Static model. It was represented by the variable “share of sales revenues from abroad in total sales” (ExpSal). The variable used was significant in both models and the regression coefficients obtained were positive in both models (Innovation-Export model: 1848919.5; Static model: 2073366.291). This suggests that enterprises with a higher proportion of sales from foreign markets in their total sales are likely to have larger sales in the future. Other researchers came to the same conclusion (Dujak et al, 2016; Corner et al, .2017; Šarlija et al, 2017). By exporting, i.e., entering foreign markets, enterprises are likely to gain more customers, in addition to their existing customers in the domestic market. Moreover, enterprises that export have a lower risk of being affected by changes in one market. All of this makes it possible to increase sales.

The next hypothesis, H2b, addresses the joint effect of exporting and innovation on sales and whether this is a significant variable of enterprise growth. The significant coefficients in the models that include the joint effect confirm the H2b hypothesis.

The joint effect, i.e., interaction, is also present in two models, the Innovation-Export model and the Static model. By including the product of the export variable "ExpSal" with the innovation variable "innovative", the models have three additional variables instead of only their product. These variables are the export variable "share of export in sales" (ExpSal), the innovation dummy variable "innovative" and its product ExpSal*innovative, thus estimating three regression coefficients.

Since the regression coefficients of all three variables in the obtained model are positive, it can be concluded that exporting increases sales more for innovative enterprises than it does for non-innovative enterprises for the same amount of exporting. If the enterprise is innovative, the dummy variable "innovative" will have the value 1, so the regression coefficients of the export variable "ExpSal" and the product can be combined. From equation (84) follows:

	$\beta_{innovative} * I_{innovative} + \beta_{ExpSal} * x_{ExpSal}$ $+\beta_{ExpSal*innovative} * I_{innovative} * x_{ExpSal}$
Innovative enterprises $I_{innovative} = 1$	$\beta_{innovative} + \left(\beta_{ExpSal} + \beta_{ExpSal*innovative}\right) * x_{ExpSal}$
Innovation-Export model	$309837.2 + (5769564 + 5769564)x_{ExpSal}$ $= 309837.2 + 11539128x_{ExpSal}$
Static model	$435659.85 + (2073366.29 + 2050201.97)x_{ExpSal}$ $= 435659.85 + 4123568.26x_{ExpSal}$
Non-innovative enterprises $I_{innovative} = 0$	$\beta_{ExpSal} * x_{ExpSal}$
Innovation-Export model	$5769564x_{EpSal}$
Static model	$2073366.29x_{ExpSal}$

Many studies have observed how innovation affects export and vice versa. Even their joint effect, i.e., interaction effect on enterprise growth and performance has been commented on. However, few have confirmed their combined effect on enterprise growth or performance through models. One of the few studies is Golovko and Valentini (2011). The results derived from the models here are consistent with their findings that innovation increases the positive effect of export on sales growth. It follows that exporting contributes even more to sales growth in enterprises that innovate than it already does in enterprises that do not innovate.

The next set of hypotheses concerns financial ratios as determinants of growth. Hypothesis H3a states that liquidity ratios are a positive determinant of growth. The results of the models suggest that liquidity can be a determinant of growth, but it is important how liquidity is measured and what other variables are included in the model.

Liquidity ratios are present in three models - the Liquidity model, the Static model, and the Dynamic model. The first variable CATA - share of current assets in total assets, is significant in all three models, but the second variable Quick Ratio (Qr) is significant only in the Dynamic model when sales from the same year were also introduced. The Quick Ratio had a positive regression coefficient only in the Dynamic Model where it was significant. It was 0.000129. The CATA ratio had a positive regression coefficient in all models. In the model Innovation-Export the coefficient was 1409760.1, in the Static model it was 1325365.508, and in the Dynamic model it was 0.25615. Since the variable 'sales' is not a coefficient but the absolute value of sales, the regression coefficients in the Innovation-Export model and in the Static model are quite large. This is balanced in the Dynamic Model, which also includes previous sales levels as a predictor variable.

Comparing these results with previous studies, several conclusions can be drawn. The aforementioned studies by Voulgaris et al. (2003), Jeger et al. (2016), and Simbaña-Taipe et al. (2019) all used sales as the dependent variable and came up with contradictory results. Voulgaris et al. (2003) and Simbaña-Taipe et al. (2019) used current ratio in their models, and while the first study observed a negative effect, the second study found a positive effect of current ratio on sales growth. Similar to the research of Jeger et al. (2016), two of the models obtained had a positive significant effect of CATA ratio on growth, while other liquidity ratios remained insignificant.

Another study where liquidity was found to be non-significant is Moreira's (2016) study which used growth by number of employees as the dependent variable. Pandey and Diaz (2019) also found no significant relationship between liquidity and its dependent variable - profitability - at least when they did not control for the industry sector. When they created separate models for separate industries, the effect of liquidity was significant.

Hypothesis H3b states that leverage ratios are negative determinants of growth. Leverage ratios are present in three models – the Leverage model, the Static model, and the Dynamic model. This could only be partially confirmed. While a leverage ratio was found to be significant, the direction of influence was influenced by the economic crisis.

Due to the high correlation coefficients among leverage ratios, only one ratio was included into the models. The chosen leverage ratio was BLTA – ratio of bank loans over total assets. This particular ratio was chosen because of the nature of the information it holds. Although enterprises initiate bank loans, these loans are not granted solely because of the desire of the enterprise for a loan. The bank policies play an important role in granting these loans. Furthermore, the willingness of banks to grant loans will further be influenced by the current economic state of the country. To be able to observe all of this, the leverage ratio was also observed with the joint effect of the crisis in the Leverage model. Incidentally, it was significant only in the Leverage model. When other variables are introduced into the model, the leverage ratio turns insignificant. In the Leverage model, the regression coefficient of BLTA was 1958292.45, i.e., it was positive, indicating that enterprises which managed to obtain bank loans would also have higher sales levels, presumably because they are investing them wisely. On the other hand, the interaction effect of the economic shock when the crisis was at its peak in Croatia turns the influence of the leverage ratio:

	$\beta_{ES} * I_{ES} + \beta_{BLTA} * x_{BLTA} + \beta_{BLTA*ES} * I_{ES} * x_{BLTA}$
Economy is at the peak of crisis $I_{ES} = 1$	$\beta_{ES} + \beta_{BLTA} * x_{BLTA} + \beta_{BLTA*ES} * x_{BLTA}$ $= \beta_{ES} + (\beta_{BLTA} + \beta_{BLTA*ES}) * x_{BLTA}$ $= -250414.75 - 71281.51 * \mathrm{x_{BLTA}}$
Economy is not at the peak of crisis $I_{ES} = 0$	$\beta_{BLTA} * x_{BLTA} = -250414.75 + 1958292.45 * x_{ExpSal}$

As can be seen, bank loans would have a negative effect on enterprises during the peak of the crisis. This could be influenced by the fact that, alongside the crisis, enterprises probably already had difficulties, which they tried to overcome with the help of a loan, but at the same time, the loan became an additional burden.

Compared to other research, like Simbaña-Taipe et al. (2019), where a lagged value of leverage ratios was also used when modelling sales growth, they too found a positive significant relationship between leverage and growth by sales. Another research that has obtained similar results is Salman (2019). They commented on leverage ratios in a couple of models, with dependent variables of growth by sales and growth by profitability. Their results showed insignificant negative effects and significant positive effects of leverage on growth in their models, too.

Hypothesis H3b is partially confirmed. Leverage can be a determinant of growth, depending on how the dependent variable is defined and what other variables are included in the model. However, in the case of Croatian SMEs from 2001-2015, it was a negative determinant during the peak of the crisis (2008-2010). Otherwise, it was a positive determinant.

The next hypothesis, H3c, asserts that turnover ratios are a positive determinant of growth. To test this hypothesis, turnover ratios were included in two models, the Turnover model and the Static model. In both models the hypothesis H3c was confirmed.

As mentioned earlier, turnover ratios were excluded from the Dynamic model due to their high correlation with sales, which were also included as a predictor variable in the Dynamic model.

The turnover ratio included in the models was the total asset turnover ratio, which was found to be significant in all models and combinations during the modelling process. Unlike the leverage ratio, it did not become insignificant when other enterprise characteristics were introduced into the model. The regression coefficient in the Turnover model was 39075.69 and in the Static model 43449.23. As can be seen, both are positive, which is not surprising. It is expected that enterprises that increase their sales per unit of currency of total assets will also increase sales overall.

Studies tend to agree on the effect of turnover ratios on growth. In the modelling process of this research, turnover ratios also showed a stable, consistent relationship with future sales. Total asset turnover had a significant positive effect on sales, which is consistent with previous research. Warrad and Al Omari (2015) and Jeger et al. (2016) both found a significant and positive effect of total asset turnover ratio on growth.

The other turnover ratio used in the models was Days' outstanding in accounts payable. Its influence proved to be negative as expected, i.e., as the number of days an enterprise needs to pay its creditors increases, future sales decrease. However, the influence was insignificant in both models.

The total asset turnover ratio showed a significant positive influence on sales, thus confirming hypothesis H3c. Turnover ratios are a positive determinant of growth.

Hypothesis H3d deals with the last financial ratio group, profitability ratios. It states that profitability ratios are positive determinants of growth, which was confirmed.

All possible pairs of profitability ratios had a near-perfect correlation coefficient, so no more than one ratio at a time was included in the models during modelling. The profitability of enterprises was represented by the variable net profit margin. It was included in three models - The Profitability model, the Static model, and the Dynamic model. In each model where net profit margin was included, the ratio was significant, and its effect was positive. In the models where it was present, the ratios are as follows - in the Profitability model: 27633.06; Static model 10851.36; Dynamic model 0.00712. As with the liquidity ratios, a decrease in the size of the regression coefficient can be seen when sales are introduced in the Dynamic model. Although the significance level weakened somewhat (from 0.1% to 1%) when other financial ratios and macroeconomic variables were introduced, it remained significant. On the other hand, significance remained at the same level when sales ratios were not included, as in the Dynamic model, indicating that liquidity has possibly a stronger impact on sales than profitability.

The results are consistent with previous studies on profitability ratios, that is, other researchers also concluded that profitability ratios have a significant and positive impact on growth. Most of the studies that modelled growth used return on assets, equity, or sales as the profitability ratio, which was an additional reason to observe another variable, i.e., net profit margin. These studies include Voulgaris et al (2003) who used ROS and ROA, Diaz Hermelo and Vassolo (2007) also used ROS and Jeger et al. (2016) and Simbaña-Taipe et al. (2019) both used ROE. The study by Borhan et al. (2014) used net profit margin but it was used to model performance. Nevertheless, all of them obtained a positive significant effect of profitability.

The last hypothesis regarding financial ratios, H3d, is also confirmed. Profitability ratios are a positive determinant of growth. This is evidenced by the significant positive effect of net profit margin on sales growth.

Hypothesis H4 addresses the importance of the industry sector as a determinant of enterprise growth. Two variables were available to control for the industry sector. Due to the large number of variables already included in the models, the dummy variable of high-tech versus non-high-tech industry was chosen instead of a factor variable with 10 or more industry sectors. The indicator variable of whether or not an enterprise is part of the high-tech industry was included in the Static model. It was excluded from the Dynamic model, which is a difference GMM model that cannot include time-invariant variables.

The indicator variable high-tech was significant in the Static model, and the obtained regression coefficient in this model was positive, i.e., 243888.53, indicating that enterprises belonging to the high-tech industry have a higher level of sales.

Research on the impact of the role of the industrial sector on growth is quite scattered across a range of approaches. Researchers do not agree on the importance of the influence of the industry sector on growth. Although the prevailing result is that industry affiliation is not significant for growth, some papers, like Wiklund et al. (2009) and Stjepanović and Cita (2017) also found that industry is a significant determinant of growth

5.4.2 Discussion on the influence of environment characteristics on sales growth

The next set of hypotheses revolves around influences at the macroeconomic level. These influences include specific states of the economy - influence of the global crisis and influence of EU membership, as well as macroeconomic measures - GDP growth rate, inflation rate, and employment rate. As with enterprise characteristics, lagged values were used for environment characteristics too.

The first hypothesis regarding environment characteristics is H5, which states that Gross Domestic Product is a positive determinant of growth. The only model that used a GDP measure was the Static model. GDP was introduced by the GDP growth rate instead of the absolute value of GDP. This was done so that its values would be on a similar scale to other variables and it would now be possible to comment on how the change in economic activity affects enterprise growth. Since the regression coefficient of the GDP growth variable is significant and positive (86708.64), it can be concluded that if there is a positive change in economic activity, it is expected that there will be a higher future level of enterprise sales, i.e., if the GDP growth rate increases, it will affect the increase in enterprise sales in the country. Thus, hypothesis H5 was confirmed. GDP is an indicator of economic activity, with growth of GDP levels the economic activity is increased, people buy more and therefore enterprises increase sales.

There are not many studies that have observed the effect of GDP on enterprise growth, but the conclusion derived here is in line with the findings of the few other papers. Both Seens (2015) and Ishak et al (2015) identified a significant positive effect of GDP on enterprise growth. It is worth highlighting the similarity of the results with the previous studies in two key points. Seens (2015) also confirmed the impact of lagged GDP on SME growth, while Ishak et al. (2015) also confirmed that the impact is significant when financial ratios are included.

Next is hypothesis H6 which states that inflation is a significant negative determinant of growth. This hypothesis was tested by including the inflation rate in the Static model. The obtained regression coefficient of inflation rate is -59474.54, which is significant and negative. This, in turn, confirms the H6 hypothesis.

As mentioned earlier, inflation is the most common macroeconomic variable used in the study of growth and researchers mostly agree on it. Although Hashi (2001), Ochanda (2014), Ipinnaiye et al. (2017), and Halim et al. (2017) had very different approaches in exploring different influences on enterprise growth, they all came to the same conclusion - inflation has a significant and negative impact on growth. The results obtained from the models of this research are consistent with them. With higher inflation, the prices of products and services will increase. Therefore, customers will spend less, and sales levels of enterprises will suffer i.e., decrease.

According to hypothesis H7, unemployment should be a negative determinant of growth. Similar to inflation rate and GDP growth rate, unemployment rate is also directly included only in the Static model. The obtained regression coefficient is negative, which is consistent with previous research (Ipinnaiye et al. 2017). The negative coefficient indicates a better economic atmosphere in which the enterprise operates. Moreover, with fewer unemployed people, there are more employees able to spend on products and services offered by enterprises.

EU is an indicator variable indicating whether Croatia was a part of the European Union in that year. In hypothesis H8, it was expected that joining the EU would have a negative effect on enterprise growth, which is not the case for Croatian enterprises, as shown by the positive regression coefficient in the model.

The significant effect of EU accession can be seen in the static model, which is the only one that includes the EU variable. Its regression coefficient is 1417042.09. The coefficient is positive, indicating that enterprises benefit from Croatia's accession to the EU. This contradicts the reports of Voulgaris et al. (2003) whose results showed that Greek enterprises experienced difficulties when Greece became a part of the EU. In the case of Croatia, Croatian enterprises benefited from joining and operating in the EU market. The effect of EU accession for the enterprises was not only the relaxation of export restrictions, but the enterprises were also able to benefit from the EU incentives, the new EU regulations, the expanded market where they could offer their products, etc. In turn, EU accession increased the sales of the enterprises.

In order to observe how EU accession specifically affects the impact of export on sales, the interaction effect of these two variables was included. According to hypothesis H9, export has a greater impact on growth when Croatia is a member of the EU and this was confirmed.

In the static model, the product of "share of export in sales" and the indicator variable whether "Croatia was a part of the EU" was introduced. The variables can be summarized as follows:

	$\beta_{I_{EU}} * I_{EU} + \beta_{ExpSal} * x_{ExpSal} + \beta_{ExpSal*I_{EU}} * I_{EU} * x_{ExpSal}$
Before Croatia joined the EU	$\beta_{ExpSal} * x_{ExpSal} = 2073366.291 \mathrm{x}_{\mathrm{ExpSal}}$
Since Croatia joined the EU	$\beta_{EU} + (\beta_{ExpSal} + \beta_{ExpSal*I_{EU}}) * x_{ExpSal} =$ $1417042.094 + (2073366.291 + 10111142.11)\mathrm{x}_{\mathrm{ExpSal}} =$ $1417042.094 + 12184508.4 x_{ExpSal}$

The regression coefficient of the interaction effect of the sales variable and the EU membership variable was significant with the value 10111142.11. Due to the positive regression coefficient, the influence of export is greater when Croatia is part of the EU.

The global crisis of 2008 is a popular research topic and is the subject of hypothesis H10, according to which enterprises are negatively affected by the crisis. This hypothesis has not been confirmed. As other researchers have noted, the global crisis affects small and medium-sized enterprises differently than larger enterprises (Keskġn et al., 2010). SMEs adapt faster to new conditions and can even benefit from the crisis if they are resourceful enough. Observing Croatian SMEs included in the dataset, one thing is clear - they existed from 2001 to 2015 and, therefore, survived the crisis until its end in Croatia. According to Figure 3-Figure 10, most of the enterprises were visibly affected by the crisis in the years 2008-2010. Therefore, the indicator variable of the years 2008-2010 was introduced into the Static model, a kind of indicator of the most pronounced years of the crisis. The regression coefficient was 2024909.11 and was significant. The positive value of the regression coefficient indicates that the SMEs included in the dataset have benefited from the crisis. This is probably due to the nature of the dataset, since only enterprises that survived the crisis are included, it is likely that they took over customers from the enterprises that went bankrupt due to the crisis.

Only the Dynamic model included past sales as a predictor variable. It was significant, even cancelling out some previously significant variables, and still increased R-squared by quite a bit. Although R-squared is not a good measure of model fit for panel models as it is for linear regression, it is the only measure available at this point. The regression coefficient was positive, indicating that a positive trend in the level of sales causes a further increase in sales.

All hypotheses were at least partially confirmed. In particular, all observed enterprise characteristics and environment characteristics were confirmed as determinants of growth. This, in turn, leads to the conclusion that sales growth is influenced by characteristics at both levels, the macro level and the enterprise level, which is what the main hypothesis H0 claims.

6 Conclusion

For as long as enterprises have existed, their owners have had an interest in continuing to improve them. Some owners want their enterprises to be recognized and respected, others want them to do good for their community, but most want their enterprises to grow and bring them as much profit as possible. Therefore, researchers have become interested in how growth is achieved and what influences growth. Various theories have been developed, ranging from neoclassical theories, behavioural and orthodox theories to evolutionary theory. These theories mainly revolved around the owner or manager of the enterprise and how their characteristics and actions affect the growth of their enterprise. However, with new technology and the ability to process large amounts of data, the scientific community turned to other sources of information and newer methods of processing this data. With the new technologies available to a wider mass, opportunities presented themselves to utilize the large amounts of data available from financial reports of enterprises. In this study, the data from financial statements were examined. These financial statements belong to Croatian enterprises and are derived from 2001 to 2015.

The aim of this dissertation was to create predictive models for SME growth, measured by sales, using enterprise specific characteristics and environment characteristics. Most studies of enterprise growth, especially SME growth, still revolve around the characteristics of the entrepreneur. Uniqueness of this research lies in the broad spectre of variables that were considered as predictors. Environment characteristics are rarely used as predictors of SME growth, especially on the macroeconomic level. Here the variables spanned over macroeconomic indicators, membership in the EU, and the global economic crisis of 2008. Furthermore, the enterprise characteristics covered more potential influences than is usual. Characteristics of the enterprise covered measures of innovation, export, firmographic measures, liquidity ratios, leverage ratios, turnover ratios, and profitability ratios. The obtained models achieved the objective. It was confirmed that SMEs growth is influenced by characteristics of the enterprise and the economy to which these enterprises belong.

All the above groups of characteristics were included in several models. To get a better insight into how predictor variables react to each other, especially whether they will lose significance in predicting growth, and to observe which predictors contribute more to the prediction of growth, a total of seven models were built. Five models included only one or two groups of predictor variables. The Innovation-export model included predictor variables from the groups of innovation variables and export variables and their joint effect on growth. Leverage ratios were observed jointly with the economic shock in the Turnover model. Turnover, profitability, and liquidity ratios were the only group of variables represented in their respective models. The remaining two models covered as many groups of variables as possible without encountering multicollinearity. One of these two models is a static model, like the first five, and the other is a dynamic model, i.e., it incorporates past values of the dependent growth variable.

Innovation was represented by two variables in the obtained models. While one variable, the "ratio of expenditures in total assets", was consistently not significant and the direction of influence changed over the course of modelling, the other one, the innovation variable, was an indicator variable "if the enterprise spends more than average on concessions, patents, licenses, etc." and it was significant. The indicator variable distinguished enterprises with successful innovations. From this, the distinction between the influence of R&D and innovation can be observed. Innovation has a positive effect on growth, but the effect of R&D is highly dependent on the outcomes that result from investment in R&D. The results show that enterprises need to be cautious when investing in R&D. The potential rewards of successful innovation will lead to increases in sales. On the other hand, it may lead to problems for the enterprise if the investment does not pay off. Enterprises should assess the risks of investment and consider whether the risk is worth the potential reward.

Enterprises that start exporting or increase exporting gain new customers and generate new sales, so an increase in sales can be expected. This was confirmed by the models that included export measures as predictor variables. An additional benefit of exporting for enterprises is that they gain insight into products and services outside their home market. They can use this new knowledge to improve their existing goods, i.e., innovate them. As innovation occurs, demand increases and so do sales, both in the domestic and foreign markets. It is a cycle of innovation and export that has a positive effect on sales growth, which is also a result of the obtained model that includes the interaction effect of export and innovation on sales. Because of this cycle, sales on the domestic market can be expected to increase as well, as an indirect consequence of exporting. According to other research that deals specifically with exporting, enterprises should approach exporting with caution and be aware of the process of exporting and the market they are entering.

Four groups of financial ratios were included in the models – liquidity, leverage, turnover, and profitability.

Liquidity was represented in the models by the ratio of current assets to total assets and proved to have a positive impact on growth. A higher value of this ratio indicates higher liquidity of the enterprise. Enterprises that have an adequate level of liquidity are able to meet all their short-term obligations and grow from there. The group of leverage ratios was represented by the ratio of bank loans to total assets. Interestingly, its significance varied greatly, depending on which other variables were included. This suggests that bank loans can promote the growth of the enterprise if invested wisely. Furthermore, both the turnover and profitability ratios were significant in predicting enterprises growth. Turnover was represented by the ratio of total assets turnover. A positive regression coefficient indicated that increasing turnover per unit of total assets stimulates future growth in sales. Out of the profitability ratios, Net profit margin was included in the models. It remained significant in all models in which it was included and had a persistent positive effect on sales. This metric confirmed that by increasing profitability in the current period, sales can be expected to grow in the future. Since it is a measure of the relationship between cost and price in doing business, it can be interpreted that, out of all the enterprise characteristics, special attention must be paid to the management and how well they are doing their job.

Some conclusions can be drawn from the obtained results on financial ratios. If one of the enterprise goals is to increase sales, then special attention should be paid to sales, profitability, and liquidity. It is advisable for enterprises to increase the ratio of sales to total assets in order to promote the future growth of sales. Furthermore, good and responsible management is of utmost importance. Their actions to increase current profitability will also stimulate future sales growth. This is consistent with the amount of research that has been done on how entrepreneurial characteristics affect enterprise growth. In addition, increased liquidity should be a concern as long as it does not come at the expense of the enterprise's profitability. Finally, bank loans can have a positive impact on future sales if used wisely. Considering that the importance of leverage varies compared to other financial ratios, it should probably be considered by entrepreneurs only after other options of financing have been exhausted.

Five characteristics of the environment were considered as predictors of sales growth. Three were macroeconomic measures – GDP, inflation, and unemployment. The remaining two were indicators of the economy – the global crisis and membership in the EU. It was confirmed that enterprises’ sales are influenced by the level of GDP in the economy as a whole and whether it is increasing or decreasing. The relationship between sales and GDP is positive, that is, a positive, prosperous environment allows enterprises to achieve higher sales. Governments are able to relax taxes and other requirements and restrictions on businesses when the economic climate is positive and GDP is rising. In addition, they can even offer some incentives. These steps, when taken by the government, can lead to sales growth. With higher sales growth, GDP will increase.

Unemployment rate had a significant negative effect on future turnover. Lower unemployment rates are an indicator of a better state of the economy. With fewer people unemployed, a larger percentage of the labour force will be employed. Higher employment rates mean that customers will have wages to spend on products and services, meaning that enterprise sales will increase. Inflation also proved to be an important determinant of growth. Like the unemployment rate, the effect of inflation on sales was negative. Lower inflation rates are also an indicator of a positive economic climate. From the customers' perspective, a lower inflation rate means that their purchasing power will increase and they will be able to spend more money on the products and services offered by enterprises. The increased spending will, in turn, lead to higher sales for enterprises.

From these three conclusions on the influence of macroeconomic variables on enterprises, important suggestions can be made for policy makers. If possible, it is advisable to support the private sector by providing incentives and easing taxes and restrictions and allow the economy to recover or even move forward on its own. When considering significant enterprises' characteristics, it is evident that policy makers should support innovation and exporting in enterprises as these lead to enterprises' growth which, in turn, improves the overall economy.

The remaining two variables are indicators of how the recession and EU accession affect enterprises in Croatia. EU accession had a significant positive effect on Croatian enterprises, i.e., on their sales growth. Although the relaxation of import restrictions for enterprises from EU markets suddenly increased competition on the domestic market for Croatian enterprises, the overall effect of Croatia joining the EU had a positive effect on sales growth. The new competition took over some of the customers from the domestic market. However, in the case of Croatian enterprises, they benefited from Croatia's accession to the EU and all the changes it brought. Exporters have especially increased their sales, even more since Croatia joined the European Union, which is a consequence of the relaxed export policy.

The effect of the global crisis, which spanned from 2008 to 2015, was not included over the entire period of its lasting in Croatia. Rather, the indicator variable of 2008-2010, the period when Croatian enterprises were most affected by the global crisis, was used. It was referred to as an economic shock. The research here confirmed that the crisis is a determinant of growth. Contrary to common sense, the crisis had a seemingly positive effect on sales. Many enterprises were massively hit by the crisis and went bankrupt. These enterprises were not included in the dataset. The used dataset was a balanced dataset, meaning that all enterprises had to exist in each year from 2001 to 2015, i.e., they had to have survived the crisis. The customers of the insolvent enterprises had to find new sellers among the enterprises that overcame the crisis, which increased sales for enterprises included in the dataset. Also, no evidence was found that high-tech enterprises coped better with the crisis than others.

In summary, the results confirm that there are determinants of growth among enterprise characteristics and environment characteristics when growth is measured by sales. Innovation, export, liquidity, leverage, turnover, and profitability are influences that are specific to each enterprise and entrepreneurs can take steps to alter these. However, at the macroeconomic level, there are variables that affect enterprise growth, but they cannot be altered by enterprises. These include the gross domestic product, the unemployment rate, inflation, accession to an association of states (in this case the EU), and the effects of an economic crisis. A positive effect on sales trends is confirmed for changes in innovation, exports, financial ratios, gross domestic product, entry into the EU, and the global crisis. Negative effects were found for inflation and unemployment rate.

The results are useful for enterprise owners and managers, banking sector, policy makers, and the scientific community. Enterprise owners and managers benefit most from the results regarding enterprise-specific variables. If they have a promising innovation, they should consider investing in it and innovating so that they can benefit from it. Exporting has a positive effect on innovation and vice versa. If owners and managers are looking for other avenues of growth besides innovation and exporting, the results offer insight into meaningful financial ratios. Increasing current assets as a percentage of total assets and sales as a percentage of total assets can have a positive impact on future sales growth and net profit margin. Increasing the enterprise's leverage ratio through the use of bank loans can increase sales growth, but the effect can easily turn negative, so caution is advised.

Policy makers can also benefit from the results, especially policy makers in Croatia. As previous research shows, Croatia had a particularly difficult time overcoming the 2008 global crisis. Compared to other economies, the crisis lasted 2 to 3 times longer in Croatia. The approach chosen by the Croatian government to overcome the crisis was clearly not the best solution. Instead of the levies imposed by the Croatian government, Germany and the US invested 1.6 and 2.8 percent of their GDP, respectively. This helped enterprises overcome the difficulties they faced due to the crisis. Once enterprises recover and experience positive sales growth, they will continue to increase their sales, according to the results. In turn, the overall economy will also recover. This is important to note especially with the expected new upcoming crisis due to the pandemic in 2020. In addition, policy makers could use the obtained models to identify which enterprises have the highest growth potential, i.e., the potential for higher growth. The results could help create new policies that accommodate Croatian enterprises and help them increase their sales. By calculating the growth potential of enterprises, it would be possible to design policies to support enterprises that have growth potential but need that extra push. Enterprise sales growth would lead to other aspects of enterprise growth, such as the number of employees. If both sales and employment grow on a macro level, the GDP will increase, and the unemployment rate will decrease. This puts the economy on a positive trend.

The banking sector could use the models obtained to gain more information about the prospects of an enterprise in which it is interested, especially in cases where enterprises want to borrow. The models presented here could indicate in which direction an enterprise's sales might develop, and thus provide more insight into whether it is advisable to grant the enterprise the desired loan.

The main practical contribution of this research are the obtained models for predicting enterprise growth. In some cases, the predictor variables included in several models will have a significant influence on sales growth, but when combined with other predictors in other models, their influence on sales growth will become insignificant. This allows the observer to get a sense of the varying degrees of importance of different determinants. Additionally, the models cover enterprise and environment characteristics, which is rare in research. Environment characteristics are not common in research on enterprise growth, but especially in quantitative research which includes modelling environment is rarely used as a predictor.

Furthermore, the effects of the global crisis and accession to the EU are included, which were not found in previous research of modelling SME growth.

Beneficiaries of the practical contributions are enterprise owners, policy makers, and the banking sector. Owners and managers can use the models to see what level of sales growth they can expect based on their current situation. In addition, the models can indicate where improvements are needed and what aspect of the enterprise or its environment they should shift their focus to. Policy makers could use them to monitor where enterprises are struggling the most and offer support. The banking sector could use the models to feed information into decisions about whether to grant an enterprise the loan it wants.

Practical contributions to the scientific community include specific influences of variables and how they react to each other. Particularly interesting are the confirmations of the previously suspected positive effects of the crisis on enterprises in Croatia. Namely, while some enterprises went out of business, the level of competition decreased, and the increase in sales due to less competition was outweighed by the decrease in purchasing power. The results also showed that this effect did not vary between enterprises in high-tech industries and other industries. In addition, it was shown that exports and inflation not only affect each other, but also reinforce each other in their positive effect on future sales growth. Furthermore, the models showed that, in the case of Croatia's accession to the European Union, the negative effect of increasing competition was outweighed by the positive effect of export simplification.

The scientific contributions are drawn from the available panel dataset. Although many studies use panel datasets, i.e., datasets that vary across entities and over time, most do not make full use of them. Some studies do not create models at all, others use modelling techniques that do not fully exploit panel data. In terms of descriptive statistics, in addition to the overall mean, the standard deviation was measured in a total of three ways - the overall standard deviation, the average deviation within entities across years, and the deviation between entities in a year. This provides more information about how the values in the dataset differ across years and across entities. This excludes macro-level variables as they are constant between entities in a year. Additionally, graphs were created to show how enterprise-specific variables have changed over the years, which was particularly interesting to observe as the effects of the global crisis are clearly visible. The second scientific contribution is the use of panel methods to build models. In particular, this allowed us to observe how changes in the economy affected enterprises over time. A panel dataset is not necessary to observe the impact of GDP, inflation, and unemployment rate on growth. They can be observed in cross-country research. However, the impact of the global crisis can only be observed if a longer period is considered, as it hit the world economy, more or less, at the same moment in time. The effect of EU accession is also difficult to study in cross-national research. Not all countries had to meet the same conditions and Croatia was the only country that joined the EU at that moment. The third contribution lies in the way variables were introduced into the models. While most studies include only one variable at a time, i.e., on its own, here the linked, interactive effect was also observed. This means that for some variables, the product of two variables was also included, which allows conclusions to be drawn as to whether one variable strengthens or weakens the influence of another variable. Another scientific contribution lies within the layout of research of growth theories. The acquired outline of theories is derived from multiple sources, and systemised into one logical overview, which was not yet found in this form in previous research.

Several problems were encountered during the modelling process. First, the dataset had inconsistencies and outliers. Croatian enterprises are required to file their financial statements, but the penalties are relatively mild, so some enterprises choose not to file their financial statements. Enterprises that did not file their financial statements in every year of the 2001-2015 period and those that had outliers or very pronounced discrepancies were dropped from the dataset. In addition, the financial statements changed forms twice over the years. Missing values were also an issue, as enterprises often do not complete the entire statement and FINA's coding for missing values changes over the years. The dataset is not representative of all enterprises or all SMEs in Croatia during this period, as it only included enterprises that had their financial statements in the FINAs database in each year from 2001-2015. Therefore, conclusions had to be derived cautiously.

In terms of problems, there is room to take this research further:

- The models could be tested on a new dataset. Since most of the results are consistent with previous research, it would be interesting to see how the models perform in a new period for Croatian enterprises. It would be especially interesting to check how well the models created for the 2008 global economic crisis would handle the upcoming economic crisis caused by the pandemic.

- The Croatian government approached the crisis differently than most, and enterprises also had their idiosyncrasies, so similar models from another country might also provide new insights.
- Problems arose because only a subset of all SMEs were used for modelling. Possible extensions of the research could be in an unbalanced dataset.
- The variable of industry sector was almost underrepresented in the study compared to other variables. A recommendation could be to build similar distinct models for smaller specific industries.
- In this study, the characteristics of the enterprises and the environment were captured, but the characteristics of the owner and/or manager were not included. Potential new insights could be gained by adding variables that address owner/manager characteristics to the variables used in this study.
- The variable that contributed most to the increase in R-squared was prior sales levels. It would be interesting to investigate how well autoregressive (AR) models could handle the prediction of sales. AR models could be compared with the models from this study and it could be seen whether panel modelling is worthwhile in the case of predicting sales growth.
- Studies like this are rare, with predictors of growth at multiple levels and on a panel dataset. Nevertheless, the choice of a measure of innovation was limited by the information that could be obtained from the available dataset of financial statements. An interesting extension would be to include other measures of innovation, especially measures that indicate how the level of innovation evolves over time, such as whether the enterprise holds patents and whether it continuously creates new patents.

Compared to previous research, this study has confirmed some truths that are already more or less accepted. This relates to not only how the characteristics of the enterprise and the environment affect growth, but also how they interact. It gave a clear insight into how the growth of Croatian enterprises has been affected by major economic changes, accession to the EU, and the global crisis.

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GDP	Gross domestic product
GLS	Generalised least squares
GMM	Generalised Method of Moments
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary least squares
RoPDE	Return on Product Development Expense
PDE	Product Development Expense
PMTO-combination	product-market-technology-organization combination
SME	Small and medium enterprises
SYS-GMM	System Generalised Method of Moments

Appendices

APPENDIX A: Overview table of previous research on determinants of growth

Study	**Size of the dataset**	**Observed time period**	**Used methods**	**Dependent variable**	**Significant variables to influence growth**
Avlonitis and Salavou (2007)	149 Greek manufacturing SMEs	---	Exploratory factor analysis and ANOVA	product performance (7-point Likert scale of in terms of sales volume, growth in revenues, gross profit margin, net income, market share, change in market share, entry to new markets)	innovation is a positive influence in active entrepreneurs
Badrinas Ardèvol (2015)	6 enterprises	---	Qualitative research	growth streams	product innovation generates growth
Battaglia et al. (2018)	221 SMEs	2014	multiple regression analysis	Sales growth	Investment in R&D has a positive effect on sales growth when the export share of sales is below 10%, this effect becomes negative when the export share is above 50%. This is true for SMEs that are less than 10 years old. Enterprises older than 10 years have a positive effect of R&D on sales growth
Booltink and Saka-Helmhout (2017)	947 SMEs	2011 and 2013	hierarchical multiple regression	performance growth	U-shaped relationship between R&D investment and enterprise performance; marginally internationalized enterprises achieve the highest performance boost when R&D investment is increased to 5.8%, and fully internationalized SMEs reach their optimal level of R&D investment at 18.1%

Borhan et al. (2014)	one chemical enterprise	2004-2011	multiple regression analysis	net profit margin	positive influence of current ratio; significant positive effect of debt ratio; significant positive effect of net profit margin
Botazzi and Secchi (2003)	US publicly traded manufacturing enterprises	1982-2001	AR models and linear regression	Sales growth	size has a significant negative influence
Burger et al (2013)	1.7 million enterprises from Central and Eastern Europe	2000-2012	panel method VAR	employment growth and investment growth	The results showed that, controlling for exports, the decline in demand has a stronger negative effect on growth through employment for non-exporters compared to exporters. The decline in cash flow also has a negative effect on investment growth, but exporters are more successful in adjusting investment to the new cash flow compared to non-exporters.
Coad et al (2015)	Spanish SMEs	2004-2012	panel quantile regression	sales, employment and productivity	influence of innovation stronger in younger enterprises
Corner (2017)	700 Canadian SMEs	2010-2014	logistic regression	growth by sales, employment and profit	exporting had a significant positive effect on growth when measured by sales and profit, but not on growth employment
Demirel and Danisman (2019)	5100 SMEs from 28 European countries	2016	robust cross-sectional regression estimation	SME growth	at least 10% of revenues should be invested in eco-innovation for SMEs to benefit
Demirel and Mazzucato (2013)	publicly quoted pharmaceutical enterprises in the U.S.	1950-2008	Arellano-Bond panel GMM estimator	Sales growth	no significant relationship between R&D and sales growth if the enterprise was not a patent holder. The relationship was significantly positive only for small enterprises that are

					permanent patent holders, and significantly negative for all other groups
Diaz Hermelo and Vassolo (2007)	34 enterprises in Argentina	1994-1996	regression models	Sales growth	profitability ratio was significant positive (return on sales); size is not significant
Dujak et al (2016)	logistic enterprises vs other SMEs in Croatia	2010-2014	logistic regression	sales growth	export is significant determinant of growth
Fernandes et al (2013)	61 enterprises	---	linear regression	productivity growth and enterprise size growth	product innovation significant for growth
Gambini nad Zazzaro (2011)	5440 Italian enterprises	1998-2003	regression analysis	total assets growth and employment growth	size is not significant
Garza-Reyes et al. (2018)	308 SMEs in Mexico	308 Mexican SMEs	SEM	performance growth	positive influence of innovation on growth
Golovko and Valentini (2011)	manufacturing enterprises in Spain	1990-1999	fixed effects panel analysis, fixed effects modelling with an AR (1) process, and multinomial probit regression	Sales growth	exporting and innovation are mutually beneficial, that innovativeness magnifies the positive effect of exporting on sales growth, and that exporting increases the positive effect of innovation on growth
Grundström et al. (2012)	409 Swedish SMEs	2001-2010	statistical test (t-test)	High-growth based on turnover growth	positive influence of innovation
Halim et al. (2017)	SMEs in Malaysia	2002-2015	multiple regression analysis	growth of SME GDP rates	negative influence of inflation
Hashi (2001)	SMEs in Kosovo	1997	OLS regression	assets	negative influence of inflation

Hashi and Krasniqi (2011)	2100 observation	1999/2005	OLS regression	Sales growth	industry is not significant
Hölzl, (2009)	20000 manufacturing enterprises	1998-2000	t-test and quantile regression	gazelles, high-growth enterprises	innovation was significant for gazelles and high-growth enterprises in technological frontier countries
Huang (2019)	6500 Canadian SMEs	2007-2011	probit models	High-growth	both investment in R&D and export affect growth
Ipinnaiye et al. (2017)	manufacturing enterprises in Ireland	1991-2007	panel methods		negative influence of inflation and unemployment rates
Ishak et al. (2017)	10 enterprises in the service and trading sector	2001-2015	multiple regression analysis	net profit margin	positive influence of liquidity ratios (current ratio and quick ratio); GDP has a significant influence when combined with financial ratios
Jamali and Nor (2012)	200 manufacturing enterprises in Iran	1995-2002	panel methods - GMM	Employment growth	Export has a positive effect on growth.
Jeger et al (2016)	Croatian SMEs	2010-2014	logistic regression	high-growth by assets	liquidity (current ratio) affects growth positively, leverage ratios - Current liabilities over equity had a positive effect, but it was not significant. A significant positive effect was confirmed for the retained earnings over total assets ratio and total debt over total assets ratios; turnover ratios - ratio of sales to total assets was significant and positive; profitability ratio (return on equity) was significant and positive
Krasniqi (2007)	178 growing SMEs	2002	OLS regression	employment growth	size has a significant negative influence
Liem et al (2019)	3504 Vietnam SMEs	2011-2015	pooled OLS	performance, sales and profits	All combined effects (reactive innovation in exporting enterprises, reactive innovation by

					large enterprises, and reactive innovation by enterprises with more than one owner) were significant and negative. Therefore, their recommendation for SMEs with low constraints (SMEs that export or have more than one owner) was either to innovate proactively or not at all
Lin and Chen (2007)	877 manufacturing enterprises	2000-2005	hierarchical regression analysis	growth of sales	administrative relationship has a positive influence
Love and Roper (2015)	avaialble literature	----	meta-analysis	performance by growth or productivity	positive relationship between innovation, exporting, and performance
Mansfield (1962)	American steel, petroleum refining, rubber tire, and automobile industries.	1916-1957	OLS regression	Sales growth	size has a significant negative influence
Mason et al (2009)	178188 UK enterprises	2002-2005	TOBIT analysis and OLS regression	high-growth (annual 20% in 3 years)	positive influence of innovation
Mateev Anastasov (2010)	560 enterprises	2001-2005	panel methods	sales, employment, revenues and total assets growth	short-term liquidity is found to have a negative impact on growth, capital and labour productivity are positively related to enterprise growth, size is significant when measured by total assets, but insignificant when measured by employment, industry is not significant,
Mazzucato and Parris (2014)	U.S. pharmaceutical companies	1963-2002	quantile regression	Sales growth	innovation significant in high competition, but not in low competition

Moreira (2016)	1327 enterprises	---	OLS regression	employment growth	liquidity is insignificant for growth
Ochanda (2014)	100 SMEs in Kenya	2009-2013	linear regression	growth is expressed as a percentage of previous year	access to credit influenced growth positively, financial innovation was significantly positive, high financial sector regulation, inflation and interest rates hindered growth
Pandey and Diaz (2019)	US technology and financial enterprises	2014-2017	multiple linear panel regression models	return on assets	liquidity ratios were significant - positive influence of current ratio in financial enterprises and a negative influence in technology enterprises; leverage ratios were significant - long-term debt ratio was negative and that of total debt ratio was positive; turnover ratio (fixed assets to total assets) was significant - positive for the technology sector and negative for the financial sector and overall; profitability ratios were significant - return on sales had a positive effect, return on equity a negative effect
Perić et al. (2020)	7563 SMEs	2008-2013	dynamic panel methods	revenues, assets and employment growth	size is significantly positive
Rosenbusch et al. (2011)	42 studies on 21270 enterprises		meta-analysis		younger enterprises benefited more from innovation
Salman (2019)	2 enterprises of Pakistan's tobacco industry	2011-2016	multiple regression analysis	corporate growth defined by market measures and profitability ratios	leverage ratios, insignificant for market value growth, significant positive for profitability growth
Šarlija and Bilandžić (2018)	Croatian SMEs	2012-2015	statistical test (t-test), logistic regression	high-growth	export is not significantly different between high-growth and non high-growth
Šarlija et al (2017)	Croatian SMEs	2012-2015	logistic regression	high-growth	SMEs that are export-oriented, smaller, younger, and use high technology also have a greater prospect of achieving high-growth.

Silva and Santos (2012)	134 SMEs	2007-2009	SEM	turnover growth	liquidity (current ratio) affects growth positively
Simbaña-Taipe et al. (2019)	143 manufacturing SMEs	2010-2015	quantile regression analysis	Sales growth	Liquidity ratios (Current ratio) affects growth positively, leverage ratios (total debt to equity ratio and total equity to total assets ratio) affect growth positively; profitability ratio (return on equity) was significant and positive; size is a significant, negative influence
Stam and Wennberg, (2009)	647 start-ups from Netherland	1994-2000	OLS regression	High-growth by employment	innovation facilitates growth, but R&D was found to have a relationship with growth in new high-tech enterprises, but the same could not be confirmed for low-tech enterprises
Udoh et al (2018)	Nigeria	1986-2016	error correction model	overall summarized growth of SMEs	inflation is not significant
Uhlaner et al (2013)	299 -Dutch enterprises	1999,2000 and 2002	ordinary least squares	sales growth	process innovation has a positive impact, but product innovation does not; product and process innovation increased sales growth more in micro and small enterprises than in medium enterprises
Virtanen (2019)	14714 enterprises in Finland	2005-2016	black-box methods	employment and turnover high-growth	age of enterprise, industry sector, previous growth by personnel, revenues and productivity
Voulgaris et al. (2003)	143 manufacturing SMEs	1988-1996	panel methods (fixed effect)	Sales growth	leverage ratios affect growth negatively, liquidity (current ratio) do not affect growth; significant negative influence of turnover ratio (sales to fixed assets); profitability ratios (return on assets and return on sales) were significant and positive; size has a significant negative influence
Warrad and Al Omari (2015)	11 manufacturing	2008-2011	ANOVA test and linear regression	return on assets	positive influence of turnover ratios (total asset turnover and fixed asset turnover)

	sectors in Jordan				
Wiboonchutikula (2001)	3 datasets of enterprises in Thailand, in 1996 there were 92100 enterprises	1987-1996	factor productivity indices	employment growth	export facilitates same growth in large enterprises and SMEs
Widyastuti (2019)	food and beverage industry of Indonesia	2015-2017	partial least squares SEM	net profit margin, return on assets, return on equity	positive influence of liquidity ratios (current ratio, quick ratio and cash ratio), leverage and turnover ratios were insignificant
Wiklund et al. (2009)	413 small enterprises in Sweden	1996-1999	partial least squares	employment growth	industry has a significant influence
Yang and Li (2020)	2085 SMEs	2014-2016	multiple regression analysis, factor analysis	through factor analysis a common indicator of growth is extracted from financial ratios	size has a significant influence on growth - negative influence in state owned enterprises, and positive in privately owned enterprises
Yasuda (2005)	14000 enterprises in Japan	1992-1998	sample selection model with full information, using maximum likelihood	employment growth	R&D has a significant positive effect on growth, age and size have a significant negative effect on growth
Yeboah (2015)	121 SMEs in Ghana	---	descriptive statistics and Cramer's V statistical test	Sales growth	enterprise age and size have a significant positive effect, industry is not significant

Table 24 - Previous research on determinants of growth

APPENDIX B: How the share of industry sectors in Croatia changed from 2015 to 2019.

Industry sector	**Share in 2015.**	**Share in 2019.**
Agriculture	2.12%	1.90%
Industry	11.03%	10.63%
Construction	10.38%	9.83%
Trade	22.35%	19.20%
Transportation and storage	3.10%	3.99%
Accommodation and food	7.52%	8.71%
Information and communication	3.94%	4.36%
Finance and real estate	4.28%	3.87%
Professional, scientific and technical activities	11.88%	13.32%
Education, services, art	23.41%	24.18%

Table 25 - Share of industry sectors in Croatia in 2015 and 2019

APPENDIX C: Mean values of inflation, export and financial ratios in years 2001-2015:

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
IATA	mean	0,011	0,011	0,011	0,011	0,011	0,011	0,011	0,011	0,011	0,012	0,012	0,013	0,013	0,013	0,012
	sd	0,053	0,051	0,053	0,052	0,052	0,052	0,053	0,053	0,054	0,057	0,058	0,059	0,060	0,060	0,058
EXTA	mean	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001
	sd	0,011	0,011	0,012	0,010	0,011	0,008	0,009	0,007	0,008	0,009	0,010	0,011	0,011	0,011	0,011
CPLTA	mean	0,005	0,005	0,004	0,004	0,004	0,004	0,004	0,006	0,006	0,006	0,006	0,006	0,007	0,006	0,006
	sd	0,035	0,033	0,033	0,030	0,033	0,033	0,033	0,038	0,038	0,039	0,040	0,041	0,041	0,040	0,040
GWTA	mean	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	sd	0,008	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,006	0,008

Table 26 - Mean of inflation ratios from 2001-2015

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
lnCSal	mean	0,914	0,914	0,924	0,927	0,923	0,922	0,921	0,916	0,935	0,932	0,930	0,930	0,931	0,928	0,927
	sd	0,240	0,235	0,217	0,211	0,217	0,219	0,218	0,230	0,196	0,201	0,205	0,206	0,202	0,205	0,208
ExpSal	mean	0,086	0,086	0,076	0,073	0,077	0,078	0,079	0,065	0,065	0,068	0,070	0,070	0,069	0,072	0,073
	sd	0,240	0,235	0,217	0,211	0,217	0,219	0,218	0,195	0,196	0,201	0,205	0,206	0,202	0,205	0,208

Table 27 - Mean of export ratios from 2001-2015

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cr	mean	2,798	2,707	2,510	2,796	2,602	2,792	3,273	3,451	4,058	3,855	3,890	4,074	4,736	5,018	6,282
	sd	34,603	32,853	21,548	57,742	26,991	19,699	43,749	40,286	103,09	50,734	36,608	55,194	50,142	80,850	103,84
Cshr	mean	0,692	0,689	0,628	0,908	0,604	0,722	0,763	0,919	0,962	0,864	1,126	1,069	1,019	1,580	2,419
	sd	12,157	10,416	7,062	39,382	3,481	9,308	9,406	16,334	19,878	6,705	21,449	30,462	10,720	50,930	77,439
Qr	mean	2,379	2,288	2,057	2,231	1,929	2,257	2,471	2,875	3,141	3,051	3,217	3,188	3,633	4,056	5,331
	sd	34,212	32,763	20,009	44,279	6,008	16,360	20,841	39,497	67,356	37,024	35,663	43,109	37,971	61,149	93,305
CATA	mean	0,678	0,678	0,672	0,666	0,659	0,660	0,658	0,652	0,652	0,658	0,665	0,670	0,674	0,681	0,686
	sd	0,268	0,268	0,268	0,268	0,268	0,266	0,267	0,270	0,275	0,279	0,282	0,286	0,290	0,291	0,293

Table 28 - Mean of liquidity ratios from 2001-2015

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TD	mean	0,702	0,707	0,687	0,697	0,670	0,706	0,671	0,743	0,783	0,807	0,832	0,864	0,856	0,948	1,254
	sd	0,810	1,452	0,861	1,912	0,789	4,785	1,276	6,081	9,752	10,125	6,030	3,461	3,170	6,706	17,937
TDTE	mean	7,055	4,740	4,619	6,395	4,097	6,384	4,325	3,347	4,867	2,579	3,305	2,725	2,640	2,533	1,394
	sd	157,66	95,620	140,93	241,91	168,12	329,85	88,376	147,58	136,02	85,079	73,767	44,689	371,21	157,72	156,76
BLTA	mean	0,199	0,223	0,218	0,225	0,229	0,232	0,238	0,115	0,109	0,104	0,101	0,103	0,096	0,093	0,115
	sd	0,418	1,059	0,424	0,362	0,420	0,475	0,498	0,184	0,185	0,181	0,195	0,275	0,195	0,198	1,760
TETA	mean	0,287	0,281	0,302	0,292	0,318	0,281	0,315	0,234	0,195	0,172	0,148	0,116	0,122	0,030	-0,276
	sd	0,809	1,452	0,860	1,912	0,788	4,785	1,274	6,080	9,752	10,124	6,029	3,459	3,169	6,706	17,937
CLTE	mean	5,877	3,896	3,362	5,347	4,004	3,802	3,416	1,957	3,967	2,099	2,535	1,855	0,747	1,308	0,800
	sd	148,91	75,169	108,14	200,78	147,48	105,16	81,183	119,76	116,73	74,434	63,987	35,761	318,44	91,238	154,04

LDC	mean	0,408	0,376	0,430	0,492	0,545	0,516	0,566	0,609	0,590	1,146	0,912	1,083	0,664	0,886	1,352
	sd	4,989	3,257	3,176	3,840	4,845	3,217	4,472	5,121	4,057	49,743	30,251	38,701	4,269	14,379	64,022
RETA	mean	0,050	0,076	0,100	0,123	0,137	0,139	0,141	0,150	0,172	-0,020	-0,051	-0,123	-0,177	-0,291	-0,640
	sd	0,367	0,373	0,371	0,645	0,392	0,402	0,915	0,737	0,950	9,558	5,685	3,462	3,661	7,778	18,132

Table 29 - Mean of leverage ratios from 2001-2015

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TIT	mean	2,336	2,240	2,166	2,097	1,963	1,906	1,904	1,882	1,836	1,714	1,754	1,731	1,858	1,813	1,943
	sd	5,056	2,440	2,204	2,419	2,016	2,042	3,441	3,265	9,399	5,299	5,374	2,840	9,950	5,812	9,420
TIFA	mean	55,511	110,423	138,277	88,215	71,211	54,837	42,593	46,159	43,216	61,350	62,036	78,736	91,927	73,307	73,800
	sd	839,557	3002,473	5301,377	1927,441	1593,849	1390,776	600,754	623,809	477,239	1620,924	645,94	1597,56	2855,363	804,36	1092,226
TIC	mean	4,694	4,854	4,203	4,143	5,863	3,658	3,880	6,886	3,772	6,072	4,192	4,425	3,525	3,425	4,218
	sd	24,930	38,971	12,183	16,909	151,59	10,846	21,220	363,74	20,721	297,39	97,124	81,580	16,369	15,028	46,241
TAt	mean	2,243	2,141	2,064	1,989	1,863	1,809	1,811	1,776	1,706	1,603	1,649	1,627	1,718	1,703	1,753
	sd	4,929	2,024	1,885	2,036	1,778	1,791	3,375	2,181	5,878	4,551	4,896	2,572	5,013	5,490	5,040
NWCt	mean	3,792	-1,782	6,493	8,329	2,912	2,341	1,965	4,187	-7,239	3,338	5,778	-0,498	1,125	10,500	6,648
	sd	705,323	270,070	545,283	402,300	534,965	461,365	375,847	256,010	596,516	236,086	347,970	339,097	511,892	1049,955	414,205
CA	mean	0,587	0,513	0,617	1,104	0,613	0,835	0,656	0,660	0,808	0,843	0,976	1,459	2,257	2,521	2,958
	sd	5,868	3,346	11,183	65,548	5,547	23,861	6,636	5,615	8,343	8,548	13,423	26,702	80,873	78,852	42,033
DaysR	mean	103,813	98,955	101,494	103,299	112,336	110,472	103,809	113,159	136,857	137,669	146,347	240,319	215,098	336,332	494,974
	sd	654,749	417,666	816,695	841,191	1049,222	650,409	491,006	984,299	1618,731	581,802	706,177	5438,738	1990,546	5086,745	8271,226
DaysA	mean	785,318	525,935	487,654	474,534	451,370	1044,034	532,007	211,653	219,459	195,976	230,363	268,768	511,654	540,821	603,154
	sd	8131,504	3636,623	2548,440	3600,256	2778,454	44649,933	9957,351	5258,589	6046,359	1144,910	2053,564	3284,794	19770,166	11952,965	17177,969

Table 30 - Mean of turnover ratios from 2001-2015

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NPM	mean	5,046	4,830	4,866	4,386	5,368	5,961	6,243	5,885	5,190	4,842	4,948	5,130	5,535	5,755	5,855
	sd	7,299	7,063	7,188	6,776	8,204	8,731	9,077	9,076	8,696	8,535	8,785	9,397	9,208	9,766	9,972
ROS	mean	0,061	0,058	0,068	0,078	0,074	0,088	0,082	0,084	0,076	0,101	0,129	0,093	0,110	0,097	0,154
	sd	0,242	0,197	0,948	2,192	0,555	0,971	0,494	0,725	0,660	2,559	6,762	1,764	3,048	1,463	6,515
ROA	mean	9,565	8,879	8,602	7,592	8,519	9,264	9,726	9,424	7,944	6,996	7,311	7,714	9,369	9,241	9,227
	sd	16,908	16,607	13,675	17,959	15,132	15,255	15,647	34,255	47,950	25,523	22,269	31,482	58,815	55,036	39,831
ROE	mean	33,429	28,145	24,809	20,759	27,098	19,317	23,687	18,554	18,856	4,714	12,203	12,907	22,306	16,742	26,749
	sd	903,51	347,78	614,85	329,72	872,17	388,09	272,79	229,19	231,43	893,72	205,66	194,56	1147,2	577,74	1017,7

Table 31 - Mean of profitability ratios from 2001-2015

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Inv	mean	0,064	0,082	0,089	0,087	0,066	0,064	0,061	0,054	0,037	0,031	0,030	0,026	0,025	0,026	0,030
	sd	0,151	0,165	0,176	0,199	0,152	0,129	0,124	0,128	0,106	0,110	0,118	0,093	0,100	0,221	0,608
Inv	mean	0,075	0,079	0,081	0,075	0,071	0,073	0,068	0,061	0,045	0,035	0,037	0,032	0,034	0,030	0,033
	sd	0,798	0,498	0,345	0,261	0,343	0,386	0,302	0,552	0,332	0,207	0,352	0,164	0,372	0,207	0,357
Imp	mean	0,169	0,187	0,187	0,173	0,165	0,166	0,159	0,132	0,114	0,104	0,112	0,101	0,095	0,093	0,109
	sd	0,616	0,548	0,509	0,492	0,528	0,728	0,448	0,391	0,778	0,490	0,770	0,352	0,324	0,339	1,316
Imp	mean	0,090	0,100	0,104	0,098	0,100	0,102	0,102	0,083	0,074	0,073	0,075	0,071	0,067	0,064	0,064
	sd	0,268	0,242	0,243	0,212	0,269	0,502	0,472	0,201	0,192	0,202	0,199	0,185	0,183	0,188	0,182
InrE	mean	$5,75 * 10^5$	$6,1 * 10^5$	$6,38 * 10^5$	$6,33 * 10^5$	$6,37 * 10^5$	$6,82 * 10^5$	$7,12 * 10^5$	$7,57 * 10^5$	$6,52 * 10^5$	$6,06 * 10^5$	$6,16 * 10^5$	$6,02 * 10^5$	$6,07 * 10^5$	$5,87 * 10^5$	$5,88 * 10^5$
	sd	$2,54 * 10^6$	$2,94 * 10^6$	$3,10 * 10^6$	$3,33 * 10^6$	$3,21 * 10^6$	$3,80 * 10^6$	$2,90 * 10^6$	$5,4 * 10^6$	$3,95 * 10^6$	$2,32 * 10^6$	$2,03 * 10^6$	$2,5 * 10^6$	$2,75 * 10^6$	$1,55 * 10^6$	$1,17 * 10^6$

Table 32 - Mean of investment and productivity ratios from 2001-2015

APPENDIX D: Correlation matrix of all predictors:

	IATA	EXTA	CPLTA	GWTA	InCSal	ExpSal	ImpTA	ImpTE	InvLATA	InvLATE	Cr	Cshr	Qr	CATA	TD	TDTE	BLTA	Zkvf	CLTE	LDCA	RETA	TITA	TIFA	TICA	TAt	NWCt	CAIS	DaysR	DaysA	NMP	ROS	ROA	ROE	InrE	EU	GDP_growth	inflation_rate	unemployment_rate
IATA	**1.00**	0.18	**0.74**	0.12	-0.11	0.11	0.11	0.11	0.17	0.17	-0.02	-0.03	-0.02	-0.10	0.01	0.02	0.08	-0.02	0.00	0.12	-0.04	-0.02	-0.09	0.04	-0.02	0.00	-0.03	-0.01	0.02	-0.02	-0.01	-0.02	-0.01	0.07	0.04	0.05	-0.01	-0.01
EXTA		**1.00**	0.04	0.00	-0.04	0.04	0.02	0.02	0.04	0.05	-0.01	-0.02	-0.01	-0.07	-0.02	0.00	0.03	0.01	-0.01	0.06	-0.04	-0.05	-0.07	-0.01	-0.05	-0.01	0.01	0.02	0.03	-0.02	-0.02	-0.03	-0.03	0.00	0.00	-0.01	0.00	0.01
CPLTA			**1.00**	0.04	-0.13	0.13	0.12	0.13	0.13	0.14	0.01	-0.01	0.01	-0.06	-0.02	0.00	0.05	0.01	-0.01	0.10	-0.02	-0.02	-0.06	0.01	-0.03	0.00	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00	0.08	0.07	0.10	-0.02	0.00
GWTA				**1.00**	-0.03	0.03	0.02	0.02	0.02	0.02	0.00	-0.01	0.00	-0.03	-0.01	0.00	0.02	0.00	0.00	0.03	-0.01	-0.02	-0.03	-0.01	-0.02	-0.01	0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.01	0.02	0.00	0.00	0.00	0.00
InCSal					**1.00**	**-0.99**	-0.37	-0.37	-0.14	-0.15	-0.08	-0.02	-0.09	-0.01	0.04	-0.03	-0.08	-0.04	-0.01	-0.12	-0.03	0.05	0.02	0.06	0.04	-0.04	-0.07	-0.08	-0.02	-0.08	-0.07	-0.06	-0.08	-0.25	-0.02	-0.02	-0.01	0.01
ExpSal						**1.00**	0.37	0.37	0.14	0.15	0.08	0.03	0.09	0.01	-0.04	0.03	0.08	0.04	0.01	0.12	0.03	-0.05	-0.02	-0.06	-0.04	0.04	0.07	0.08	0.03	0.08	0.07	0.06	0.08	0.25	0.02	0.01	0.00	0.00
ImpTA							**1.00**	**1.00**	0.22	0.22	0.08	-0.05	-0.02	0.11	0.02	0.10	0.13	-0.02	0.09	0.13	0.06	0.00	0.07	-0.10	0.00	0.09	-0.04	0.06	0.15	0.05	0.04	0.05	0.09	0.41	-0.03	-0.03	0.02	-0.02
ImpTE								**1.00**	0.22	0.22	0.08	-0.05	-0.02	0.10	0.02	0.10	0.13	-0.02	0.09	0.13	0.07	-0.04	0.05	-0.13	-0.04	0.07	-0.02	0.08	0.16	0.05	0.05	0.04	0.08	0.41	-0.03	-0.02	0.02	-0.02
InvLATA									**1.00**	**0.98**	-0.01	0.03	0.02	-0.17	-0.02	0.08	0.19	0.01	0.05	0.19	-0.01	0.04	-0.13	0.12	0.04	0.03	-0.07	-0.03	0.02	0.11	0.11	0.12	0.15	0.13	-0.13	-0.13	0.06	-0.05
InvLATE										**1.00**	0.00	0.02	0.03	-0.20	-0.03	0.07	0.20	0.02	0.03	0.21	-0.01	-0.07	-0.20	0.05	-0.07	0.01	0.00	0.02	0.03	0.12	0.12	0.09	0.13	0.12	-0.12	-0.11	0.06	-0.06
Cr											**1.00**	0.58	**0.86**	0.41	**-0.72**	-0.36	-0.26	**0.70**	-0.41	-0.05	0.49	0.03	0.28	-0.29	0.03	0.36	0.29	0.13	-0.31	0.35	0.35	0.35	0.21	0.15	0.06	0.09	-0.01	-0.04
Cshr												**1.00**	0.64	0.19	-0.52	-0.31	-0.31	0.51	-0.32	-0.17	0.30	0.20	0.22	0.04	0.20	0.18	0.13	-0.17	-0.40	0.32	0.32	0.37	0.25	0.02	0.01	-0.01	0.00	-0.01
Qr													**1.00**	0.31	-0.68	-0.35	-0.29	0.65	-0.38	-0.08	0.41	0.06	0.23	-0.20	0.06	0.29	0.47	0.26	-0.35	0.38	0.38	0.38	0.26	0.07	0.04	0.06	-0.01	-0.03
CATA														**1.00**	-0.05	-0.02	-0.30	0.06	0.08	-0.42	0.17	0.30	**0.87**	-0.35	0.30	0.26	0.24	0.19	0.05	0.13	0.13	0.23	0.20	0.18	0.01	-0.02	-0.01	0.03
TD															**1.00**	0.52	0.38	**-0.97**	0.48	0.23	-0.58	0.03	-0.02	0.07	0.02	-0.20	-0.16	-0.01	0.36	-0.37	-0.37	-0.35	-0.16	-0.03	-0.06	-0.09	0.02	0.04
TDTE																**1.00**	0.33	-0.52	**0.95**	0.23	-0.21	0.00	-0.02	0.01	0.00	0.06	-0.08	0.06	0.31	-0.13	-0.13	-0.12	0.29	0.16	-0.11	-0.13	0.03	0.01
BLTA																	**1.00**	-0.37	0.21	0.57	-0.20	-0.14	-0.30	0.06	-0.14	-0.06	-0.13	-0.01	0.19	-0.12	-0.12	-0.16	-0.03	0.08	-0.14	-0.20	0.06	-0.02
Zkvf																		**1.00**	-0.47	-0.23	0.61	-0.01	0.03	-0.06	0.00	0.20	0.14	0.00	-0.36	0.37	0.36	0.36	0.15	0.01	0.06	0.07	-0.01	-0.04
CLTE																			**1.00**	0.02	-0.17	0.08	0.09	0.01	0.08	0.07	-0.08	0.07	0.33	-0.12	-0.12	-0.09	0.31	0.16	-0.12	-0.15	0.03	0.02
LDCA																				**1.00**	-0.14	-0.26	-0.43	0.05	-0.26	-0.03	-0.08	0.01	0.09	-0.07	-0.07	-0.15	-0.06	0.13	0.01	0.09	0.03	-0.09
RETA																					**1.00**	0.00	0.12	-0.13	0.01	0.17	0.11	0.07	-0.17	0.16	0.15	0.15	0.04	0.12	0.05	0.14	0.00	-0.11
TITA																						**1.00**	0.65	0.70	**0.99**	0.28	-0.57	-0.43	-0.22	0.01	0.00	0.32	0.27	0.14	-0.09	-0.15	0.02	0.04
TIFA																							**1.00**	0.07	0.65	0.29	-0.09	-0.08	-0.07	0.10	0.08	0.30	0.26	0.19	-0.03	-0.08	0.00	0.04
TICA																								**1.00**	0.68	0.08	**-0.78**	-0.60	-0.25	-0.09	-0.09	0.14	0.11	0.00	-0.08	-0.12	0.02	0.02
TAt																									**1.00**	0.29	-0.58	-0.43	-0.22	0.01	-0.01	0.32	0.27	0.15	-0.09	-0.15	0.02	0.04
NWCt																										**1.00**	-0.07	-0.02	-0.05	0.12	0.11	0.22	0.24	0.18	-0.04	-0.06	0.01	0.00
CAIS																											**1.00**	**0.74**	0.13	0.18	0.19	-0.01	-0.01	-0.08	0.06	0.10	-0.02	-0.02
DaysR																												**1.00**	0.27	0.05	0.06	-0.09	-0.04	0.01	0.01	0.04	-0.01	-0.01
DaysA																													**1.00**	-0.11	-0.11	-0.18	-0.04	0.18	-0.14	-0.22	0.03	0.03
NMP																														**1.00**	**1.00**	**0.92**	**0.76**	0.17	-0.02	-0.04	0.01	-0.02
ROS																															**1.00**	**0.91**	**0.75**	0.16	-0.02	-0.04	0.01	-0.02
ROA																																**1.00**	**0.82**	0.21	-0.05	-0.09	0.02	0.00
ROE																																	**1.00**	0.28	-0.10	-0.15	0.03	0.01
InrE																																		**1.00**	0.01	0.06	0.02	-0.06
EU																																			**1.00**	0.49	-0.37	0.37
GDP																																				**1.00**	0.14	-0.38
inflation rate																																					**1.00**	-0.29
unemployment rate																																						**1.00**

Table 33 Correlation matrix of all predictors

AUTHOR BIOGRAPHY

Ana Bilandžić was born on April 22, 1989 in Vukovar. During elementary school she moved around a lot with her family and attended four schools in Germany and Croatia. She graduated from high school in Vukovar in 2007. She received her bachelor's degree in mathematics in 2010 and her master's degree in mathematics and in Education of mathematics and computer science in 2013. In 2014, she enrolled in the doctoral program "Entrepreneurship and Innovativeness" at the Faculty of Economics in Osijek.

In 2013 and 2014 she worked in elementary schools and an economy high school in Vinkovci. From 2015 to 2020 she is employed as a researcher on a project at the Faculty of Economics in Osijek. Her involvement extends to database maintenance, data processing, paper writing, and some involvement in mathematics education.

Most of her work is on predicting the growth of small and medium sized enterprises through various modelling techniques. She has published 12 papers on this topic and participated in four international scientific conferences in Croatia and abroad.

List of published papers:

1. Bilandžić, Ana; **Non-Financial Determinants Of Smes' Growth Potential** // 7th International Scientific Symposium, ECONOMY OF EASTERN CROATIA - VISION AND GROWTH / prof. dr. sc. Anka Mašek Tonković, izv. prof. dr. sc. Boris Crnković (ur.). Osijek: Sveučilište Josipa Jurja Strossmayera u Osijeku, Ekonomski fakultet u Osijeku, 2018. str. 933-942
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