UHASSELT

KNOWLEDGE IN ACTION

Faculteit Bedrijfseconomische Wetenschappen

master in de toegepaste economische wetenschappen

Masterthesis

Groeipersistentie en profielkenmerken van snelgroeiende bedrijven in Vlaanderen

Stijn Heeren

Scriptie ingediend tot het behalen van de graad van master in de toegepaste economische wetenschappen, afstudeerrichting innovatie en ondernemerschap

PROMOTOR :

Prof. dr. Jelle SCHEPERS

BEGELEIDER :

Prof. dr. Ghislain HOUBEN

2022
2023

UHASSELT

KNOWLEDGE IN ACTION

www.uhasselt.be
Universiteit Hasselt
Campus Hasselt:
Martelarenlaan 42 | 3500 Hasselt
Campus Diepenbeek:
Agoralaan Gebouw D | 3590 Diepenbeek

UHASSELT

KNOWLEDGE IN ACTION

Faculteit Bedrijfseconomische Wetenschappen

master in de toegepaste economische wetenschappen

Masterthesis

Groeipersistentie en profielkenmerken van snelgroeiende bedrijven in Vlaanderen

Stijn Heeren

Scriptie ingediend tot het behalen van de graad van master in de toegepaste economische wetenschappen, afstudeerrichting innovatie en ondernemerschap

PROMOTOR :

Prof. dr. Jelle SCHEPERS

BEGELEIDER :

Prof. dr. Ghislain HOUBEN

Foreword

This research focuses on high-growth firms (HGFs) located in Flanders. HGFs play a crucial role in the Belgian economy, as they are considered the driving force behind job creation. That is why studying this topic holds significant relevance. The study examines the number of HGFs in Flanders and investigates the persistence of these HGFs (PHGFs), which refers to their ability to maintain their HGF status over multiple three-year periods. Additionally, the research analyzes five characteristics of these HGFs: firm age, size, industry, location, and solvency. Furthermore, the study compares the number of (P)HGFs and the characteristics of these firms with previous studies to analyze whether the Great Financial Crisis (GFC) and the COVID-19 crisis have had any impact on these things.

As a master's student in business economics, I have a keen interest in studying business growth, particularly within Flemish firms. Due to the several crises that occurred in the last couple of years, it seemed to be the perfect opportunity to examine this. I was genuinely excited to choose this topic for my master's thesis as it allowed me to expand my knowledge in this area.

First of all, I would like to address UHasselt itself for providing such a current and compelling research topic. Furthermore, I would like to thank my promoter Professor Dr. Jelle Schepers, and my supervisor Professor Dr. Ghislain Houben for their guidance and support throughout the process. Their expertise and insightful feedback allowed me to successfully complete this research.

Samenvatting

Snelgroeiende bedrijven spelen een belangrijke rol in de economie omdat ze bekend staan als de belangrijkste drijvende kracht achter jobcreatie. Deze masterproef onderzoekt de persistentie en profielkenmerken van snelgroeiende bedrijven (SGB's) in Vlaanderen. Eerdere studies, zoals die van Dillen et al. (2014) voor de periode 2000-2009, hebben al onderzoek gedaan naar SGB's in Vlaanderen. Echter, aangezien deze analyse stopt in 2009, is de volledige impact van de wereldwijde financiële crisis niet weerspiegeld en had de COVID-19 pandemie nog niet plaatsgevonden, waardoor het belangrijk is om de SGB's in Vlaanderen opnieuw te onderzoeken en na te gaan in hoeverre ze beïnvloed zijn door deze crisissen. In dit onderzoek wordt de OESO-definitie gehanteerd om SGB's te definiëren, die luidt als volgt: een SGB is een bedrijf dat gedurende drie opeenvolgende jaren (één subset) een jaarlijkse groei van meer dan 20% realiseert in tewerkstelling of omzet, met een minimum aantal van tien werknemers aan het begin van de onderzochte periode. De analyse wordt uitgevoerd met behulp van de Bel-First-database voor de periode 2014-2021. Aangezien Belgische bedrijven niet verplicht zijn hun omzetcijfers openbaar te maken, wordt de groei gemeten aan de hand van toegevoegde waarde in plaats van omzet. Deze benadering heeft bovendien een bredere maatschappelijke waarde en kan beschouwd worden als een belangrijke groeivariabele. Ook wordt de groei gemeten als een toename van 72.8% tussen het eerste en laatste jaar van de driejarige periode, in plaats van een groei van meer dan 20% per jaar.

Er worden vijf subsets van drie jaar (2014-2017, 2015-2018, … 2018-2021) geïdentificeerd voor 'tewerkstelling SGB's' en vijf voor 'toegevoegde waarde SGB's'. Bedrijven die slechts gedurende één subset snelle groei kunnen handhaven, worden geclassificeerd als 'one-shot SGB's', bedrijven die hun snelle groei gedurende meer dan drie opeenvolgende subsets kunnen volhouden worden beschouwd als persistente snelgroeiende bedrijven (PSGB's). Naast het analyseren van het aantal SGB's en hun persistentie, worden ook vijf profielkenmerken van SGB's onderzocht, namelijk leeftijd, grootte (aantal werknemers), industrie, locatie en solvabiliteitsratio (schulden/passiva). Verder wordt ook een hypothese opgesteld : **er wordt verwacht dat door de wereldwijde financiële crisis en de COVID-19 crisis het aantal Vlaamse 'tewerkstelling en toegevoegde waarde (P)SGB's' lager zal zijn dan in de periode 2000-2009 geanalyseerd door Dillen et al. (2014)**.

Uit het empirisch onderzoek blijkt voor **'tewerkstelling SGB's'** dat er in de onderzochte periode tussen 520 en de 677 SGB's zijn, ten opzichte van het totaal aantal bedrijven ligt dat aantal tussen 3.41% en 4.18% . Opvallend is dat zowel het absolute als het relatieve aantal 'tewerkstelling SGB's' fors daalt in de periode 2017-2020. Deze periode eindigt met het jaar 2020, dit is het jaar dat de Belgische economie het zwaarst getroffen is door de pandemie. Dit resultaat suggereert dat de COVID-19 crisis een grote impact heeft gehad op de 'tewerkstelling SGB's' in de periode 2017-2020. Maar in de laatste geanalyseerd periode werd terug een lichte stijging geobserveerd in absoluut en relatief aantal. Dit geeft aan dat de impact van de crisis momenteel maar van korte duur is. Maar deze conclusie moet wel genuanceerd worden aangezien er maar één post-COVID-19-jaar in de analyse is opgenomen. Verder onderzoek zal moeten uitwijzen of er al dan niet lange termijn gevolgen zijn voor deze 'tewerkstelling SGB's'.

Voor de **'toegevoegde waarde SGB's'** werden absolute aantallen tussen de 1035 en 1563 bedrijven gevonden, de relatieve aantallen lagen tussen de 6.81% en de 8.87%. Net zoals bij de 'tewerkstelling SGB's' werd er een daling in relatief aantal 'toegevoegde waarde SGB's' in de periode 2017-2020 waargenomen. Maar in absolute aantallen werd geen daling gevonden, zelfs een lichte stijging van 5 SGB's. In de periode 2018-2021, steeg het aantal 'toegevoegde waarde SGB's' met maar liefst 376 bedrijven. Dit impliceert dat de COVID-19 crisis zo goed als geen impact heeft gehad op het aantal 'toegevoegde waard SGB's' en zelfs heeft gezorgd voor een enorme boost in het post-crisis jaar. Maar ook hier moet verder onderzoek uitwijzen of er geen lange termijn gevolgen zijn voor de 'toegevoegde waarde SGB's'.

Bij het onderzoeken van de hypothese werd geconstateerd dat er geen grote verschillen waren in het relatieve aantal 'tewerkstelling SGB's' tussen de periode 2014-2021 en de periode 2000-2009 vastgesteld door Dillen et al. (2014), dit was wel zo voor de 'toegevoegde waarde SGB's', namelijk een afname met 1,3 percentpunten . Dit suggereert dat vooral de wereldwijde financiële crisis (gegeven dat er maar twee mogelijke jaren konden beïnvloed worden door de COVID-19 crisis) een negatieve impact heeft gehad op de 'toegevoegde waarde SGB's'.

Verder werden de absolute aantallen van de SGB's van deze studie naast de studie van Dillen et al. (2014) gelegd om zo een globale evolutie te analyseren voor de periode 2000-2021, met uitzondering van de periode 2010-2013 aangezien hier geen data voor beschikbaar waren. Het blijkt dat voor beide SGB types het aantal SGB's fors daalde in de periode 2006-2009 met daarin het jaar 2009 waar de Belgische economie het zwaarst getroffen werd door de wereldwijde financiële crisis. Na deze periode kennen de 'toegevoegde waarde SGB's' geen daling meer. De 'tewerkstelling SGB's' kennen wel een daling zoals eerder vermeld in de periode 2017-2020. Bij beide typen SGB's, maar vooral bij de 'toegevoegde waarde SGB's', is er een aanzienlijke stijging waargenomen in de laatste onderzochte periode 2018-2021.

Wat betreft de persistentie van de SGB's, kan er worden geconcludeerd dat het zeer moeilijk blijft voor SGB's om hun snelle groei voor een lange periode vol te houden. 57% van alle 'tewerkstelling SGB's' zijn geïdentificeerd als *'one-shot SGB's'*, deze bedrijven kunnen hun groei maar voor één subset volhouden. 3.44% werd geïdentificeerd als PSGB. Dillen et al. (2014) vond evenveel *'one-shot SGB's'* maar vond wel 4.36% PSGB's. Dit suggereert dat na de twee crisissen de persistentie van de 'tewerkstelling SGB's' achteruit is gegaan. Hetzelfde geldt voor de 'toegevoegde waarde SGB's', hier is niet alleen het aantal PSGB's hoger (1.51% vs 5.57%) maar is ook het aantal *'one-shot* SGB's*'* lager (65.73% vs 65.95%).

De leeftijd en grootte van de SGB's is niet sterk veranderd na de twee crisissen. 'Tewerkstelling SGB's' zijn gemiddeld 19 jaar en 'toegevoegde waarde SGB's' 23 jaar. De leeftijd is niet veranderd omdat deze 'oudere' bedrijven over de juiste middelen en ervaring beschikken om zich aan te passen aan een crisis. De meeste SGB's hebben nog steeds minder dan 50 werknemers. De wetenschappelijke en technische activiteiten sector, de administratieve en ondersteunende diensten sector en de informatie en communicatie sector blijven voorlopig over gerepresenteerd in beide SGB types na de COVID-19 crisis. Sinds de gezondheidscrisis is Antwerpen niet meer over gerepresenteerd in beide SGB types, Oost-Vlaanderen neemt zijn plaats in. Voor beide types SGB constateren we een dalende solvabiliteitsratio over de periode 2014-2021. Dit impliceert dat SGB's

steeds minder schulden aangaan. De reden hiervoor is gebrek aan toegang tot externe financiering door de wereldwijde financiële crisis en de verhoogde onzekerheid door de COVID-19 crisis. Op lange termijn kan dit de kans op groei doen verhogen aangezien er meer ruimte is voor investering.

Een beperking van dit onderzoek is het ontbreken van gegevens voor de periode 2010-2013, waardoor het niet mogelijk is om een volledig beeld te krijgen van de totale impact van de financiële crisis op Vlaamse SGB's. Een tweede beperking is het gebruik van de parameter toegevoegde waarde in plaats van omzet, wat het vergelijken met internationale studies bemoeilijkt. Bovendien is het op dit moment niet mogelijk om de volledige impact van de COVID-19 crisis op Vlaamse SGB's te beoordelen aangezien er maar cijfers tot en met 2021 beschikbaar zijn. Verdere studies zullen nodig zijn om de langetermijneffecten te onderzoeken.

Table of contents

1. Introduction

Nearly every firm deals with business growth, with some experiencing rapid expansion within a short period. These firms are classified as high-growth firms (HGFs). Analyzing these rapidly growing firms is crucial as they contribute substantially to the creation of new net jobs (Henrekson, M., Johansson, D., 2009). Therefore, HGFs play a vital role in the economy, making it necessary to examine them. Additionally, considering that no figures and insights on the number of Flemish HGFs and their characteristics are available, it becomes even more important to investigate this area. HGFs are defined according to the OECD's definition. The OECD defines an HGF as a firm that experiences annualized growth rates in employees or turnover greater than 20 percent per annum over three years with a minimum of ten employees at the beginning of the study period." (Eurostat - OECD, 2007, p. 61).

This research paper analyzes the number of HGFs in Flanders and the persistence of these HGFs. HGFs that are not persistent are so-called 'one-shot HGFs'. 'One-shot HGFs' are firms that sustained their high growth for only one period of three years, whereas persistent HGFs continue their high growth for more than four three-year periods. By analyzing whether HGFs are able to maintain their high-growth status in the face of significant disruptions such as the GFC or the COVID-19 pandemic allows for assessing the adaptability and robustness of these firms. Furthermore, various characteristics of these HGFs will be examined, such as age and size. A lot of studies concluded that most HGFs are small and young firms. But is this really the case? The sectoral distribution is another thing that will be examined. Are there more HGFs in a particular sector or are they in terms of relative numbers over- or underrepresented? The location of the firms is another characteristic that will be analyzed. Are there certain Flemish provinces with more HGFs? Lastly, the solvency of the HGFs will be looked at. Do HGFs typically have more liabilities relative to their total assets? The paper relates only to Flemish firms. The Flemish firms will be analyzed over a period of eight years (from 2014 to 2021). The persistence of HGFs and their characteristics has already been researched by Dillen et al. (2014). They examined growth persistence in a ten-year period from 2000 to 2009. This paper will update his research by analyzing the HGFs for the period 2014-2021. An update is necessary because a lot of things have changed since 2009, like the COVID-19 crisis and the war in Ukraine. Also, the impact of the GFC of 2008 is not yet fully reflected in the results of Dillen. Whatsoever, the war in Ukraine is still ongoing and the analyzed period ends in 2021 so the impact of that war will not be reflected in the results. So, the study by Dillen et al. (2014) is outdated, necessitating an update of the research. Following the update, a comparison can be made between the updated results to determine whether the crises have had any impacts on Flemish HGFs. In addition to that study, Dillen also did another study in 2020 focusing on HGFs across all Belgian firms. The findings of characteristics of the HGFs in that paper will also be compared to the results obtained in this research.

The research in this paper concludes in two big parts. First, a thorough literature study needs to be done in which the GFC and the COVID-19 crisis will be discussed. Further, to acquire the essential insights and results, such as identifying the characteristics to be analyzed in the empirical analysis, other research papers on the persistence of high business growth will be examined. The most significant study to be analyzed is Dillen et al. (2014), as it serves as the foundation for this research

to provide an update on (P)HGFs in Flanders. Out of this literature study, a hypothesis will be formulated.

The second part will be the empirical analysis. The data that will be used in this part, is drawn from the database BEL-FIRST. This is a large Belgian database where a lot of Belgian firms are registered. All the financial information of these firms can be accessed. From this database, all the HGFs will be extracted. An HGF is defined in two different ways by Dillen et al. (2014): one based on employees and one on added value. The OECD definition considers turnover as a growth measure instead of added value. However, since not all Belgian firms are required to disclose their turnover, added value is used as a growth measure, as it also holds a social value (Dillen et al., 2014). Therefore, the empirical analysis will always consist of two parts. Once for all the HGFs determined by employees and once for all the HGFs determined by added value. The data from the HGFs will be exported to Excel. In Excel, further analyses will be done. The number of 'one-shot HGFs' and 'persistent HGFs' (PHGFs) will be calculated. Furthermore, the characteristics of the HGFs will be examined (i.e., firm age, firm size, industry, location, and solvency).

2. Literature

As already mentioned before, this paper will give an update on the two papers of Yannick Dillen and will examine the period 2014-2021. Dillen et al. (2014), examined Flemish high-growth firms (HGFs) and persistent high-growth firms (PHGFs) for the period 2000-2009. However, since then two major crises have occurred: the Global Financial Crisis (GFC) of 2008 and the COVID-19 Crisis. Although the year 2008 is included in the paper of Dillen et al (2014), the impact of the GFC is not all reflected in their results. The impact tends to be reflected several years later. Therefore, it is important to update their paper to examine the impact of the two crises. The following questions arise:

1. What are the profile characteristics (e.g., firm size, firm age, industry, location, and solvency) of (P)HGFs in Flanders (i.e., the northern part of Belgium)?

2. What impact do these two crises have on the amount of Flemish (P)HGFs? A comparison between Dillen, et al. (2014) for the period 2000-2009 and our examined period 2014-2021 will be made.

In this section, first, HGFs will be defined. Second, the general importance of HGFs will be explained. Third, previous findings on HGFs will be discussed at both international and national levels. Fourth, the two crises that could have an influence on previous research will be briefly explained.

2.1 Definition of high-growth firms

First, it is important to clearly define what a high-growth firm (HGF) is. HGFs can be defined in many ways. This paper defines HGFs the same way as Dillen et al. (2014) do. He uses the OECD definition. An HGF is defined by the OECD as "a firm that experiences annualized growth rates in employees or turnover greater than 20% per year over three years with a minimum of ten employees at the start of the study period" (Eurostat - OECD, 2007, p. 61). The growth of 20% per year comes down to a firm having a growth rate of at least 72.8% for the entire period of three years to be categorized as an HGF. A minimum of ten employees is chosen to avoid the dominance of small businesses. Additionally, this paper replaces turnover growth with value-added growth because Belgian firms will be analyzed and Belgian SMEs are not obliged to publish turnover figures. The publication of value-added figures is mandatory. The second reason for replacement is that value-added figures also have an important social value because the sum of all value-added figures is a building block of the domestic product of a region. Persistent HGFs are defined as HGFs that achieve the status of an HGF in four or more periods (Dillen, Y., et al., 2014).

2.2 General importance of HGFs

Before discussing the results of previous studies regarding the number of (P)HGFs and their characteristics at the national and international levels, it is important to highlight the significance of HGFs. HGFs are widely recognized as the key drivers of job creation, making a substantial contribution to employment. In a comprehensive analysis by Henrekson and Johannson (2009), the researchers examined the role of HGFs in job creation across various countries worldwide. Their findings revealed that, on average, HGFs accounted for approximately 4% of all firms and were

responsible for generating between 50% and 70% of the total number of new jobs. Additionally, the studies reviewed by Henrekson and Johansson (2009) consistently demonstrated that HGFs played a disproportionately significant role in job creation compared to other firms examined (Henrekson, M., Johansson, D., 2009). Audretsch (2012) also highlighted that although HGFs only represent a small share of the overall firm population, they make a substantial contribution to employment creation (Audretsch, D., 2012). Fasil et al. (2021) emphasized that HGFs not only play a significant role in job creation but also have a substantial impact on industrial renewal, sectoral productivity, and regional competitiveness. This is attributed to their frequent innovation and technology-based character. Furthermore, HGFs are also crucial during times of crisis as they help mitigate and reverse the negative impacts of a crisis. (Fasil, B., et al. 2021).

Furthermore, Dillen et al. (2020) emphasized the importance of Belgian HGFs for the country's economy by conducting a comparison between the net job creation of all HGFs during the high-growth period and the net job creation of all Belgian firms with more than ten employees during the same period. The findings revealed that between 2009 and 2018, 'employment HGFs' created an average of 49,646 jobs. In contrast, the net job creation by all Belgian firms was lower in almost all three-year periods, except for the periods of 2014-2017 and 2015-2018. Interestingly, the net job creation by HGFs remained stable throughout the entire analyzed period, while significant fluctuations were observed in the net job creation by all Belgian firms (Dillen, Y., et al., 2020). Hence, conducting research on HGFs is of great importance due to their significant contribution to a country's economy, particularly in terms of net job creation.

2.3 HGFs on an international level

2.3.1 Number of (P)HGFs

It is not necessarily informative to compare the absolute number of HGFs across different countries since countries vary in size. However, examining the share of HGFs within a country can provide valuable insights.

Schreyer (2000) investigated the share of HGFs in the 1990s in six countries: Canada (Québec), France, Italy, Spain, Sweden, and the Netherlands. He only examined firms with more than 20 employees. He found that 5% of all French firms were HGFs. Canadian and Italian HGFs had a lower representation, respectively 2.5%, and 2%. The HGFs in the Netherlands and Sweden each have a share of 5%. Spain has the highest share of HGFs, at 10% (Schreyer, P., 2000).

Acs et al. (2008), did research on high-impact firms in the United States. They define high-impact firms in another way than this paper defines HGFs. Whatsoever, high-impact firms and HGFs are both about companies growing the most in a country over a period of more than two years. Acs et al. (2008), found that the ratio of high-impact firms for the period 1994-2006 was on average six percent.

Santos (2021) investigated HGFs in Portugal from 2015-2019, but she only considered large firms (250 or more employees with net assets of more than 43 million euros). She came up with a data set of 432 large firms, of these 432 large firms, 16 HGFs were found using the OECD definition. This comes to a ratio of 3.7% of all large Portuguese firms (Santos, E., 2021).

Furthermore, Guillamon et al. (2017) examined the number of HGFs in Spain. They found that HGFs accounted for 10% of the studied firms in 2007, using the OECD definition (Guillamon, C., et al. 2017). NESTA found an HGF representation of 7% of all UK firms between 2007 and 2010 according to the OECD definition (NESTA, 2011). Mignon (2017) conducted research on HGFs across the entire European Union in 2014 and found that HGFs accounted for 9.2% using the OECD definition, with employment as the measure of growth (Mignon, S. 2017).

Moreover, Fasil et al. (2021) examined the impact of COVID-19 on the share of HGFs. The study revealed that more than 60% of the sectors at risk, including advertising and market research, transportation and storage, accommodation, food and beverage services, employment activities, and travel agency services, exhibited a higher share of HGFs in 2017 compared to the EU average for the overall business economy, which was found to be 11%. This suggests that the pandemic may potentially weaken several high-growth ecosystems (Fasil, B., et al. 2021).

2.3.2 Firm age

Coad and Karlsson (2022) analyzed the firm size and firm age of Swedish HGFs for the period 1990-2016. They came to the conclusion that younger firms represented the biggest share of the Swedish HGFs. Younger firms meant, firms younger than five years. Hence, older firms tend to grow slower in terms of employment growth (Coad, A., Karlsson, J., 2022). Paul Schreyer analyzed 22 years earlier the size of HGFs in five countries (Canada, France, Italy, Spain, and the Netherlands) based on the same OECD definition. He arrived at the same results. Employment growth is negatively correlated with the age of firms. The share of HGFs is the highest among the young ones, firms with an age younger than ten years (Schreyer, P., 2000). Now speaking about numbers, Bianchini et al. (2014) found an average age of 17 years for Italian HGFs, while the average age of other firms was 22 years. An average lower age for HGFs was also found in Spain, France, and the UK. The average age of the HGFs for the remaining three countries was between 10 and 21 years (Bianchini, et al., 2014). Banno and Varum (2021) examined the age of Portuguese (P)HGFs during the period 2006-2014. Their findings revealed that HGFs were younger in age compared to non-HGFs, and PHGFs were even younger than HGFs. On average, Portuguese HGFs were 15 years of age, while PHGFs had an average of 13 years (Banno, M., Varum, C. A. 2021).

2.3.3 Firm size

As already mentioned above, Coad and Karlsson (2022) not only analyzed the age of HGFs but also their size. In terms of the number of employees, most HGFs were found among small firms. Micro-firms tend to be more likely to have high employment growth for three consecutive years, becoming HGFs. Paul Schreyer came to the same conclusion that most HGFs are small firms (Schreyer, P., 2000). However, the study by Coad and Karlsson (2022) concluded that small, old firms have the lowest chances of becoming HGFs. A possible reason is that self-employed entrepreneurs in micro-firms have informal routines and processes that could hinder growth because they are difficult to scale up. As time goes on, it becomes more difficult to train new hires because they do not have this tacit knowledge. So, young, small firms have the greatest probability of becoming HGFs (Coad, A., Karlsson, J., 2022). Bianchini et al. (2014) confirm this result in their research. They found in all four countries (i.e., Italy, Spain, France, and the UK) a lower size in terms of employees for HGFs. Ranging from an average size of 64 in Italy to 1261 employees in the UK. They even extended their findings

by concluding that even persistent HGFs are relatively smaller and also younger (Bianchini, et al., 2014). Furthermore, according to Banno and Varum (2021), during the period 2006-2014, Portuguese HGFs have an average of 15 employees. The study also revealed that the Portuguese PHGFs, on the other hand, were significantly larger, with an average size of 45 employees. This indicates that Portuguese PHGFs tend to have a larger workforce compared to Portuguese HGFs (Banno, M., Varum, C. A. 2021).

2.3.4 Industry

The study by Schreyer (2000) also examined if there were more HGFs in particular industries. The study did not find a significant result. However, there are industries where the concentration of HGFs tends to be higher. For example, knowledge-intensive service industries, the education industry, and the healthcare industry (Schreyer, P., 2000).

Bianchini et al. (2014) analyzed the concentration of HGFs in low-tech and high-tech industries. They concluded that the probability is higher for a firm to become an HGF when the firm is active in a high-tech industry. Being active in a 'more innovative' science-based sector leads to a higher probability of being an HGF (Bianchini et al., 2014). However, the study by NESTA (2011) emphasizes that not all HGFs are high-tech firms. HGFs are found in all industries, they just innovate in other ways like new services, new business models, and new processes. These are as important as the new technologies behind the products (NESTA, 2011). Coad and Moreno (2015) concur with the findings of NESTA (2011) that HGFs are present in all sectors and are not disproportionately concentrated in the technology sector, contrary to popular belief (Coad, A., Moreno, F. 2015).

Lopez-Garcia and Puente (2012) did research on HGFs in Spain between 1996 and 2003. They came to the following representation of HGFs on an industry level. Manufacturing firms represented 30.3% of all HGFs, construction firms represented 12.5% and services firms were the most represented at 57.2% (Lopez-Garcia, et al. 2012).

Fasil et al. (2021) examined the number of HGFs and their corresponding employment shares in COVID-19 risk-related sectors, which are sectors experiencing a significant drop in turnover. The identified sectors at risk include advertising and market research, transportation and storage, accommodation, food and beverage services, employment activities, and travel agency services. The study compared the total number of HGFs and their total employment in these sectors with the total business economy. The findings revealed that, in the EU 27 (average of the 27 countries in the European Union), the potential short-term impact of COVID-19 is likely to be lower for the accommodation, and food and beverage services sectors compared to the advertising and market research, transportation and storage, travel agency services, and employment activities sectors. The potential impact of COVID-19 was determined based on comparing the share of HGFs in a sector to the share of HGFs in the total business economy, with a higher ratio indicating a greater impact of the COVID-19 crisis. Furthermore, the study found that the EU average share of HGFs in the business economy was around 11%, with the highest number of HGFs observed in the employment activities sector, at 22.5%. For the other sectors at risk, the EU average shares of HGFs were 14.5% for the advertising and market research, 13.5% for transportation and storage, 11% for accommodation, 10% for food and beverage services, and 12.5% for travel agency services (Fasil, B., et al. 2021).

2.3.5 Location

Are there regions within a country that have a higher concentration of HGFs compared to others? Schreyer (2000) examined this question in the five countries mentioned above and found that indeed certain regions do exhibit a higher concentration of HGFs compared to others. Regions where economic activity is higher, have a higher share of HGFs. For example, in France, one-third of all HGFs are found in Paris, even though the firms in Paris account for only one-quarter of all French firms in the sample. The same results were for Spain and Germany, the concentration of HGFs is greater in urban areas (Schreyer, P., 2000). Just as Paris is the capital of France, Lisbon is that of Portugal. Santos found that 63% of all HGFs were found in the Lisbon region. This confirms the finding of Schreyer that more urbanized regions have a greater concentration of HGFs (Santos, E., 2021).

2.3.6 Solvency

This paper will also analyze the solvency ratio of HGFs. The solvency ratio is defined as the total debt (long and short-term) divided by the total liabilities of a firm. Lopez-Garcia and Puente (2012) found an average solvency ratio of 67.7% for HGFs in Spain between 1996 and 2003, defining the solvency ratio the same as this paper does (Lopez-Garcia, P., Puente, S. 2012). The average solvency ratio of HGFs in the UK for the period 2007-2010 was 60% (NESTA, 2011).

Bianchini et al. (2014) examined HGFs and persistent HGFs for the period 2004 to 2012 in four countries. They found that the HGFs of Italy had an average debt ratio of 66%, and the average debt ratio for the Italian PHGFs was higher at 72%. HGFs from Spain, France, and the UK had an average debt ratio between 60% and 70%. Also, just as in Italy, PHGFs have a higher average debt ratio than HGFs (Bianchini, S., et al. 2014). Banno and Varum (2021), found that for the period 2006-2014, Portuguese HGFs show less liquidity, moreover, PHGFs show lower liquidity than HGFs (Banno, M., Varum, C. A. 2021).

The study of Fasil et al. (2021) revealed that the willingness of investors to invest in HGFs is crucial for accessing finance. Furthermore, the study emphasizes that the ability of HGFs to secure funding is heavily influenced by the overall economic outlook, which acts as a primary determining factor. Given the importance of access to finance for HGFs, it is found that their solvency ratio has declined as a result of the GFC. Additionally, it is anticipated that the COVID-19 crisis may contribute to a potential decline in the solvency ratio of HGFs (Fasil, B., et al. 2021).

2.3.7 Conclusion

An overview of the HGFs on an international level is given in table 1. The key conclusion of this section is that the relative number of HGFs varies across countries. Depending on the HGF definition used, the relative number of HGFs ranged between 2% and 11%. Furthermore, Schreyer (2000) and Coad and Karlsson (2022) observed that younger HGFs present the biggest share, with these firms typically being younger than ten years. Other studies found average ages of HGFs ranging from 10 to 21 years. The size of HGFs was found to be generally smaller than non-HGFs. As for the industry, there is some inconsistency among studies regarding the specific industries where HGFs are most prevalent. While some studies identified certain sectors as having a higher concentration of HGFs, others found no significant disproportions. Additionally, HGFs were found to be more located in urban

areas. Lastly, the solvency ratio of HGFs has been reported to be higher than non-HGFs, ranging from 60% to 70%.

Table 1: *overview of studies on HGFs at an international level*

Author	Country	Period	Relative Number of HGFs	Age	Size	Industry	Location	Solvency ratio
Schreyer (2000)	Canada, Sweden, France, Italy, Spain, and The Netherlands	1990	2%-10%	Biggest share <10	The biggest share are small firms	No significant results	Greater in urban areas	
Acs et al. (2008)	United States	1994-2006	6%					
Santos (2021)	Portugal	2015-2019	3.7%				Greater in urban areas	
Guillamon et al. (2017)	Spain	2007	10%					
NESTA (2011)	United Kingdom	2007-2010	7%					60%
Fasil et al. (2021)	EU	2017	11%					Higher solvency ratio
Mignon (2017)	EU	2014	9.2%					
Coad and Karlsson (2022)	Sweden	1990-2016		Biggest share <5	Biggest share of small firms			
Bianchini et al. (2014)	Italy, Spain, France, and the UK	2004-2012		10-21	Smaller than non-HGFs	High-tech industry		60%-72%

Banno and Varum (2021)	Portugal	2006-2014		15	15-45 employees			
Lopez-Garcia and Puente (2012)	Spain	1996-2003				Manufacturing, construction, and services		67.7%
Coad and Moreno (2015)						No significant disproportions		

2.4 HGFs on a national level

2.4.1 Number of (P)HGFs

The two papers by Dillen researched the number of HGFs. Dillen, et al. (2014) examined HGFs for the period 2000-2009. They made seven subsets: 2000-2003, 2001-2004, etc. Per subset, they chose to analyze the number of 'employment HGFs' and 'value-added HGFs' because HGFs based on turnover were not a good determinant. After all, this was not available for all firms in their data. They came to the following results: the average HGFs of the seven subsets were 460 Flemish 'employment HGFs' and 1,051 Flemish 'value-added HGFs'. The percentage of 'employment HGFs' relative to the number of Flemish firms with at least ten employees is, on average, 3.2%. The relative number of 'value-added HGFs' is on average much higher, 8.3%. Furthermore, the three subsets from 2003-2008 are the highest and kept increasing in each subset. In the period 2005-2008, the highest relative numbers were found. The relative number of HGFs was 4.39% for the 'employment HGFs' and 9.75% for the 'value-added HGFs'. In the last analyzed period (2006-2009), the relative number declined sharply to 3.68% and 7.58% (Dillen, Y., et al., 2014).

The other study by Dillen et al. (2020) examined HGFs not only in Flanders but all of Belgium. The study used the same method as Dillen, et al. (2014). They came to the following findings for the period 2009-2018: on average, there were 707 Belgian 'employment HGFs' and 1566 Belgian 'value-added HGFs'. To make a comparison of the two papers, the number of Flemish HGFs is calculated in the study by Dillen et al. (2020). In the subset 2015-2018 there were 608 Flemish 'employment HGFs' and 1094 Flemish 'value-added HGFs' (Dillen, Y., et al., 2020). So, the number of 'employment HGFs' has increased by nearly 150 HGFs, while the number of 'value-added HGFs' stayed the same. The relative number of Flemish 'employment and value-added HGFs' for the subset 2015-2018 is respectively 4% and 7.1% (Dillen, Y., et al., 2020).

Dillen et al. (2014) also studied the persistence of these HGFs. For the analyzed period 2000-2009, there was only one Flemish employment HGF that could sustain its strong growth over all seven subsets. Moreover, they found five Flemish 'value-added HGFs' that could maintain their strong growth over the seven subsets. The number of 'one-shot' HGFs was also calculated to analyze the

persistency. As with the 'employment HGFs' as well as the 'value-added HGFs', 57% of all firms were found to be a 'one-shot HGF' (Dillen, Y. et al., 2014).

Mignon (2017) conducted an investigation into the number of HGFs in Belgium. The findings revealed that in 2014, approximately 8% of all Belgian firms with more than ten employees achieved an annualized growth rate in employees of more than 20% consistently over three consecutive years (Mignon, S. 2017).

2.4.2 Firm age

Dillen et al. (2014) found an average age of 'employment HGFs' of 17.1 years. The average age of 'value-added HGFs' was slightly higher: 19.6 years (Dillen, Y. 2014). Dillen et al. (2020) did not analyze the age of the HGFs.

2.4.3 Firm size

Dillen et al. (2014) found an average firm size of 93 employees for 'employment HGFs' and an average firm size of 69.4 employees for 'value-added HGFs'. Dillen et al. (2020) analyzed the size of the HGFs for the period 2015-2018. At the beginning of the period, the average number of employees was 41 for 'employment HGFs' and 43 for 'value-added HGFs'. However, at the end of the period, this increased heavily. The average number of employees for 'employment HGFs' increased to 96 employees, and for 'value-added HGFs', the average number increased to 70 employees. Furthermore, they analyzed the breakdown of the HGFs into three different size classes: firms with 18 to 49 employees, firms between 50 and 249 employees and firms with more than 250 employees. The majority of HGFs, both 'employment HGFs' and 'value-added HGFs', were found in the smallest size class with a workforce between 18 and 49 employees. 56.63% of 'employment HGFs' and 70.29% of ' value-added HGFs were identified in the smallest size class (Dillen, Y., et al., 2020).

2.4.4 Industry

Another study of Dillen that is not part of the two studies that this paper will update analyzed the number of HGFs in terms of industry types. The study divides the industry into four types. High-growth industries, growth industries, stable industries, and declining industries. The high-growth industry has a total employment growth higher than 10%, the growth industry between five and ten percent, the stable industry between zero and five percent, and the declining industry has a total employment growth that is negative. First of all, the study identified 740 Belgian HGFs for the period 2012-2015, 40% of them were classified as stable industries and 33% as high-growth industries. So, it is not a given that high-growth industries are associated with more HGFs. Most HGFs are still in stable industries. However, if a firm is situated in a declining industry, it is less likely to become an HGF (Dilllen, Y., Vandekerkhof, P., 2021).

The study by Dillen et al. (2014) is one of the studies this paper will update. The study analyzed the sectoral distribution of the 'employment HGFs'. The sector that was most represented was NACE-section G, which is the wholesale and retail trade; repair of motor vehicles, and motorcycles sector. Other sectors that represent the most 'employment HGFs' are the manufacturing sector (NACE-section C), the administrative and support service activities sector (NACE-section N), and the construction sector (NACE-section F). The same results were found for the 'value-added HGFs', the four sectors mentioned above were sectors where HGFs were the most represented. However, these

results need to be nuanced because these sectors have the most firms. So, it is self-explanatory that these sectors also have the most HGFs (Dillen, Y., et al., 2014).

The second study that this paper will update is the study of Dillen et al. (2022). That research paper also takes into account the fact that some industries are less represented in the global market. Dillen et al. (2022) analyzed the same sectors and calculated the overall representation of each sector. Afterward, they compared the relative number of firms in the industry with the number of employment and 'value-added HGFs' in that industry. They came to the same results as Dillen et al. (2014) regarding the sectors that are the most represented. However, the manufacturing industry, the wholesale/retail industry, and the construction industry show a clear underrepresentation of both employment and 'value-added HGFs'. Other industries were found to be overrepresented. The IT and communication industry (NACE-section J) shows an overrepresentation. Furthermore, the industry of professional, scientific, and technical activities (NACE-section M) and the industry of administrative and support service activities (NACE-section N) show a noticeable overrepresentation. The human health and social work activities industry (NACE-section Q) is also slightly overrepresented. (Dillen, Y., et al., 2020).

Furthermore, De Mulder et al. (2017) also conducted research on HGFs in Belgium. The study revealed that younger HGFs mostly provide market services. Specifically, 38% of the young HGFs are active in the wholesale and retail sector, 17% offer business and administration services. Moreover, 17% of the young HGFs are engaged in construction, and 9% operate in manufacturing. On the other hand, more mature HGFs show a greater presence in manufacturing but are less active in market services. Among market services, mature HGFs are relatively more engaged in wholesale and transportation (De Mulder, J., et al. 2017).

Lastly, the study of Fasil et al. (2021) also examined the potential impact of COVID-19 on the sectors at risk in Belgium. The study highlighted that Belgium is one of the countries that faced a relatively lower potential negative impact for the identified sectors at risk, including advertising and market research, transportation and storage, accommodation, food and beverage services, employment activities, and travel agency services. The study found that the total number of HGFs in Belgium's overall business economy was 9.6% and the number of HGFs in the sectors at risk was mostly below that threshold. This suggests that the potential negative impact is low in the sectors at risk in Belgium. It is worth noting that Fasil et al. (2021) used a slightly different HGF definition compared to the this study, as HGFs in Fasil's study were defined more broadly (Fasil, B., et al. 2021).

2.4.5 Location

Dillen et al. (2014) did not examine the location of the HGFs. However, Dillen et al. (2022) did examine this. Belgium is divided into 11 provinces: Antwerp, Limburg, East-Flanders, Flemish Brabant, West-Flanders, the Brussels-Capital Region, Namur, Liège, Luxemburg, Hainaut, and Walloon Brabant. The study first calculated the number of firms in each province. Second, they looked at the relative number of 'employment and value-added HGFs' for each region. It was found that the province of Antwerp and the Brussels-Capital region were clearly overrepresented, as for 'employment HGFs' as 'value-added HGFs'. Whereas Hainaut, Namur, Liège, and West-Flanders show a clear underrepresentation. Furthermore, the study also examined the Belgian HGFs on a regional

level. Resulting in a strong overrepresentation of Brussels-based HGFs. Flanders shows an overrepresentation of 'employment HGFs', and Wallonia shows an underrepresentation of both 'employment HGFs' and 'value-added HGFs' (Dillen, Y., et al., 2020).

De Mulder et al. (2017) found that a majority of HGFs were established in the regions of Flanders and Brussels. The authors defined the Antwerp and Brussels regions as economic clusters, attributing their higher concentration of HGFs to factors such as Antwerp's large harbor and Brussels' proximity to the national airport (De Mulder, J., et al. 2017).

2.4.6 Solvency

The solvency ratio or debt ratio is the number of liabilities divided by the total assets. Dillen et al. (2014) analyzed the solvency ratio of the Flemish 'employment and value-added HGFs'. Resulting in an average solvency ratio between 71% and 75.2% for the 'employment HGF'-subsets. On the other hand, the average solvency ratio of the 'value-added HGFs' was situated between 69.2% and 77.1%. However, 77.1% is significantly higher than all other averages of the 'value-added HGF'-subsets. Furthermore, the average solvency ratio of the latest three analyzed periods (2004-2007, 2005-2008, and 2006-2009) was significantly lower than the first four periods (Dillen, Y., et al., 2014). Dillen, et al. 2020 did not examine the solvency ratio of the Belgian HGFs. However, another study by Dillen and Vandekerkhof (2021) did examine the solvency ratio. They found that the 760 HGFs in the period 2012-2015 had an average solvency ratio of 26.5%. But, they used another formula, equity divided by total assets. So, the converted solvency ratio of 26.5% will be 73.5% with the formula liabilities divided by total assets (Dillen, Y., Vandekerkhof, P., 2021).

De Mulder et al. (2017) conducted research on composition of the passive assets of HGFs. The results show that younger HGFs have lower levels of equity and higher levels of short-term debts compared to young non-HGFs. Young HGFs have less than 20% equity and more than 60% short-term debts, while young non-HGFs have an average equity of 20% and short-term debts of 40%. Additionally, De Mulder et al. (2017) found that more mature firms have significantly higher levels of equity, approximately 40%. Consequently, the solvency ratio, as the defined in this study, is much higher for young HGFs compared to more mature HGFs (De Mulder et al. 2017).

2.4.7 Conclusion

Table 2 provides an overview of studies conducted on HGFs at a national level. Regarding the relative number of HGFs, it appears there is a higher number of firms classified as 'value-added HGFs' compared to 'employment HGFs'. Flemish HGFs, on average, have an age of approximately 20 years old. Furthermore, 'employment HGFs' tend to have around 95 employees, while 'value-added HGFs' are smaller, with an average of 70 employees. Moreover, HGFs are mostly found in the IT and communication sector, and the administrative and support services sector. Although the construction and manufacturing sector also have a considerable number of HGFs, they may be underrepresented when compared to the overall number of firms in these sectors. The regions of Antwerp and Brussels have the highest concentration of HGFs. As for the solvency ratio, HGFs typically range between 60% and 80%.

Table 2: *overview of studies on HGFs at a national level*

Author	Country /Region	Period	Relative number of HGFs	Age	Size	Industry	Location	Solvency ratio
Dillen et al. (2014)	Flanders	2000-2009	'Employment HGFs': 3.2% 'Value-added HGFs': 8.3%	'Employment HGFs': 17 'Value-added HGFs': 20	'Employment HGFs': 93 'Value-added HGFs': 69	Wholesale and trade, manufacturing, construction, administrative and support service		70%
Dillen et al. (2020)	Belgium	2015-2018	'Employment HGFs': 4% 'Value-added HGFs': 7.1% (for Flemish HGFs)		'Employment HGFs': 96 'Value-added HGFs': 70	IT and communication, professional, scientific, and technical activities, administrative and support service	Antwerp and Brussels	
Mignon (2017)	Belgium	2014	8%					60%-80%
Dillen and Vandekerkhof (2021)	Belgium	2012-2015				Not only high growth industries, mostly stable industries		73.5%
De Mulder et al. (2017)	Belgium	1996-2014				Wholesale and trade, construction, business and administrative services	Antwerp and Brussels	

2.5 The Global Financial Crisis

The GFC or also called "The Great Recession" of 2008 was caused by the bursting of the housing market bubble in the United States. US banks and lending institutions lent credit at low-interest rates in the early 2000s. People could buy houses with easy credit, leading to a housing market bubble. Moreover, financial institutions issued mortgages to high-risk customers with poor credit histories, so-called subprime mortgages (Duignan, B., 2023). The recklessness of US banks and other financial institutions resulted in the burst of the housing market bubble. People could not repay these loans, and banks began facing financial difficulties (Loo, A., 2023). Eventually, the US government stepped out to bail out the biggest US banks, like Lehmann Brothers (Lioudis, N., 2023).

The Great Recession had a significant global impact, also in Belgium. In 2007, in Belgium, the banking sector was dominated by three big banks: Fortis, KBC, and Dexia. These three banks provided 70%

of the total outstanding credit in Belgium. The banks were affected immensely by the GFC. In April 2008, they had to write down their equity capital of 2.4 billion euros due to the crisis (TNL/Belga, 2008). This led to a huge decrease in corporate credit supply. The Belgian, Luxembourg, French, and Dutch governments had to bail out the three big banks. Fortis was even sold to the French bank BNP Paribas. The crisis in the Belgian banking sector had, of course, a big impact on Belgian firms, hampering them to finance new investments caused to the reduced access to external (banking) finance (Deloof, M., et al., 2012). In 2009, Belgian corporate investments decreased by 10%, also the GDP[1] decreased by 3% (Burggraeve, K., et al., 2012). The fact that the GFC resulted in a reduced access to finance could have a significant impact on Flemish HGFs. HGFs are more likely to seek external financial capital (Brown, R., Lee, N., 2019). Therefore, with external finance being more difficult to obtain due to the GFC, Flemish HGFs may face obstacles in their growth. However, there are still firms that experienced growth during the GFC. Large and medium-sized firms in the manufacturing and hospitality industries during the recession seem to possess higher growth potentials (Peric, M., Vitezic, V., 2016). The number of small Flemish HGFs may have been reduced due to the GFC, as their growth potentials are lower compared to the large and medium-sized firms.

2.6 COVID-19 crisis

The COVID-19 crisis or the coronavirus crisis is caused by, as the name indicates, the coronavirus. The coronavirus is an infectious disease caused by the SARS-CoV-2 virus. The virus was discovered in December 2019 in Wuhan, a city in China. The virus is very contagious and is easily spread from person to person when an infected person coughs, sneezes, or talks. The illness that comes with the virus depends from person to person. However, people older than 65 years and people with underlying medical conditions are at higher risk for severe illness (CDC, 2021). The virus was spread all over the world in a pretty tight timeframe. All countries took measures to prevent the virus from spreading all over their countries, by going into lockdown. This meant closing borders, closing stores, limiting social contacts, etc. According to the WHO, COVID-19 has resulted in 6.9 million deaths (WHO, 2023).

The impact on the Belgian economy was severe. The virus came to Belgium in April 2020, resulting in the government taking health measures. This meant that a lot of Belgian firms were forced to close for a while. The measures led to a serious decrease in the turnover of Belgian firms. According to the National Bank of Belgium, in 2020, 55% of Belgian firms had a decline in turnover compared to 2019. In a normal year, this would have been approximately 45%, so 10% of the Belgian firms would not have had a turnover loss in a normal situation. This was not only caused by the measures that were directly imposed on the firms but was also caused indirectly by the customers or suppliers that were affected by other measures (NBB, 2021). The investments of Belgian firms also decreased by 11.5% between the first three quarters of 2019 and 2020 (Economische impact van het coronavirus | FOD Economie, 2021). In terms of GDP, Belgium had a decrease of 6.3% in 2020. GDP dropped immensely by 11.9% in the second quarter of 2020, but due to a strong third quarter, the

[1] Gross domestic product (GDP) represents the sum of value added by all its producers. Value added is the value of the gross output of producers less the value of intermediate goods and services consumed in production, before accounting for consumption of fixed capital in production (Worldbank, 2023)

GDP bounced strongly back. The National Bank of Belgium confirms that the COVID-19 crisis had a stronger impact on a larger share of Belgian firms than the GFC of 2008-2009 (NBB, 2021).

Fasil et al. (2021) conducted research on the impact of previous crises on HGFs and explored the anticipated effects of the COVID-19 crisis. They expect that the COVID-19 pandemic will have a greater impact on the HGFs compared to the GFC, primarily due to distinct characteristics such as the cause, scope and the measures implemented. Furthermore, the study revealed that larger HGFs are more heavily affected by a recession in terms of sales. Despite the challenges faced by HGFs during times of crises, they continue to make significant contributions to economic activity, especially larger HGFs (Fasil, B., et al., 2021). Mason (2020) emphasized that the strength of the recovery after the COVID-19 crisis will primarily depend on HGFs (Mason, C., 2020). Therefore, it is crucial to ensure that the number of Flemish HGFs does not decrease significantly to mitigate the potential impact of the COVID-19 pandemic on the Belgian economy. Schepers et al. (2021) discovered that Flemish growth-oriented firms have been significantly affected by threats related to operations and sales resulting from the COVID-19 crisis. To survive this global crisis, these firms took important actions such as managing their cash position, communicating well to all employees, implementing additional health measures, offering COVID-proof products or services, etc. These actions have contributed to building entrepreneurial resilience in response to the COVID-19 crisis (Schepers, J., et al., 2021). However, the extent to which these actions have led to sustained high growth remains uncertain.

3. Hypothesis

A lot has happened since the research of Dillen et al. (2014). The two crises had a great impact on the Belgian economy. Firms were performing less due to the crisis, resulting in a drop in the Belgian GDP. The GFC caused a drop in the GDP of 3% in 2008, the COVID-19 crisis caused a drop of 6.3% in 2020. Firms did not make large investments, primarily due to the lack of access to finance resulting from the GFC, and also because of the uncertainty cause by the COVID-19 crisis. Investments decreased by 10% during the GFC and by 11.5% during the COVID-19 crisis. However, it is not known if these crises also had a big impact on the Flemish HGFs. Did the number of Flemish HGFs drop dramatically? That is what this paper will examine. It is expected that the two crises have had a serious impact on Flemish HGFs. The following hypothesis is formulated:

> *H1: The number of Flemish 'employment and value-added (P)HGFs' is lower in the period 2014-2021 than in the examined period 2000-2009 by Dillen et al. (2014).*

Furthermore, the empirical analysis will analyze the characteristics of the Flemish 'employment HGFs' and Flemish 'value-added HGFs' for the period 2014-2021. These results will be compared with Dillen et al. 2022. Hypotheses regarding the characteristics are not formulated because it is expected that, apart from the number of HGFs, the other characteristics (e.g., firm size, firm age, industry, location, and solvency) will not significantly change. However, this does not imply that investigating the characteristics of HGFs is not important. On the contrary, conducting empirical research on the characteristics of HGFs is crucial to assess any potential changes. This research can provide policymakers with valuable insights for developing policy recommendations that offer targeted support or guidance based on the findings. By conducting empirical research on the characteristics of HGFs, policymakers can gain a deeper understanding of the dynamics and needs of these firms. This knowledge can inform the design of effective policies that address specific challenges and promote the growth and sustainability of HGFs.

4. Empirical research

4.1 Method

4.1.1 Data

The data for the empirical research that will be used is the dataset BEL-FIRST from Bureau Van Dijk. It is a database where much information regarding Belgian companies can be found. BEL-FIRST is an extensive database of Belgian and Luxembourgian companies. The database can be used to make an analysis of individual companies. It is ideal to compare companies or analyze companies in a specific industry for example. Other available information is for example age, size, solvency, added value, etc. The companies' most recent financial statement information in BEL-FIRST is from 2021. Moreover, the earliest year available in the database is 2014. Hence, the analyzed period will be 2014-2021. Not all necessary data is available for all companies, this study only includes companies for which all pertinent data are accessible. As already mentioned, the OECD definition of HGF will be used.

The HGF definition is the following:

> "An HGF is a firm that experiences annualized growth rates in employees or turnover greater than 20 percent per annum over three years with a minimum of ten employees at the beginning of the study period." (Eurostat - OECD, 2007, p. 61).

A minimum of ten employees in the first year of the analyzed period was chosen to avoid an overly dominant group of small HGFs because a company with two employees can easily have growth in employees of more than 20 percent. Moreover, the average annual growth rate of 20 percent should be reviewed. This study opts for a growth rate of at least 72.8 percent over the entire three-year period to qualify as an HGF. Moreover, the OECD definition uses two growth rates, employment growth on the one hand and turnover growth on the other. In this analysis, however, turnover is replaced by value-added as an indicator of growth. There are two reasons for this. First, Belgian SMEs are not required to publish their turnover figures where value-added figures are. Second, value-added figures also have an important social value. Moreover, The sum of all these figures is the domestic product of the region. So, this is a better indicator to classify HGFs because it can more reflect on the impact of the two crises on Belgium's GDP growth.

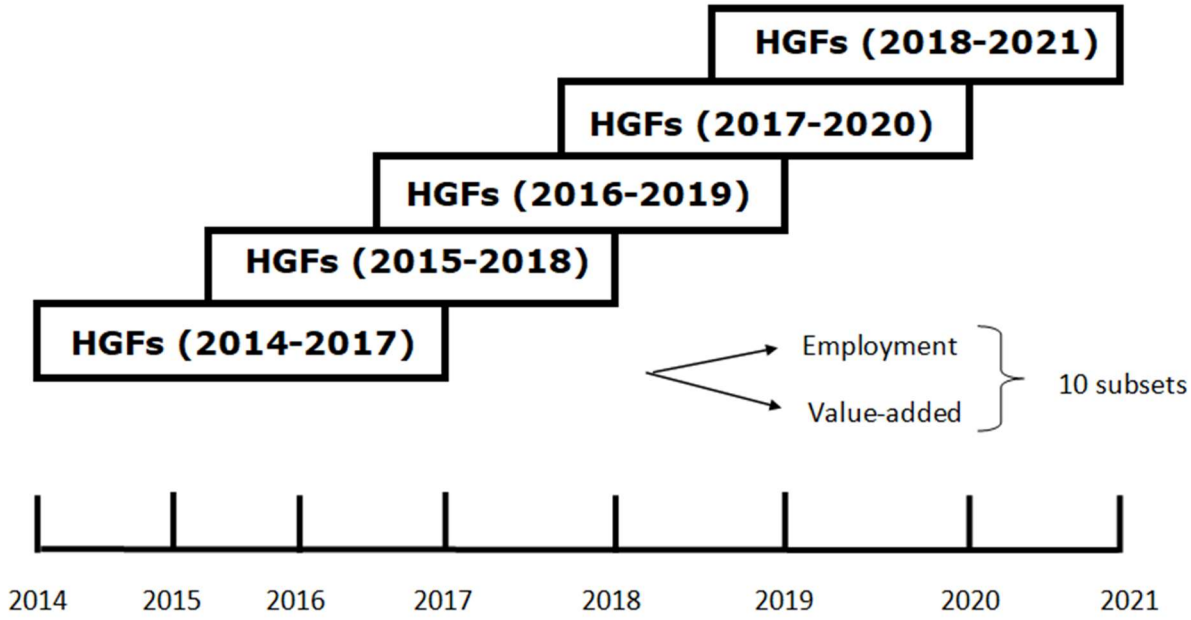
Hence, the study considers an HGF as:

> "a firm that realizes a total growth rate in employees or value-added figures that is greater than 72.8 percent over a three-year period with a minimum of 10 employees at the beginning of the study."

BEL-FIRST has available firm information for eight years (i.e., from 2014-2021). Five overlapping three-year periods are laid out (cf., Figure 1). As already mentioned, HGF will be studied in two ways, one way is by employment growth, and the other way is value-added growth. The two different HGFs will be named 'employment HGFs' and 'value-added HGFs'. 'Employment HGFs' are firms that reached an employment growth greater than 72.8 percent over a three-year period, whereas 'value-added

HGFs' are firms that realized a value-added growth of at least 72.8 percent over a three-year period. A total of ten HGF-subsets are obtained (i.e., five subsets of 'employment HGFs and five subsets of 'value-added HGFs). Figure 1 shows an overall view of all the subsets.

Figure 1: *Schematic overview of the ten analyzed subsets*



4.1.2 Research method

The research consists of two parts. First, the number of HGFs in all ten subsets and the number of PHGFs will be examined and compared with the results of Dillen, et al. (2014). The hypothesis that is set up will be analyzed. To compare to the study of Dillen et al. (2014), only Flemish businesses will be studied. Second, the profile characteristics (i.e., e.g., firm size, firm age, industry, location, and solvency) of 'employment HGFs' and 'value-added HGFs' will be examined in the ten HGF-subsets. These characteristics will be compared with Dillen et al (2014) and Dillen et al (2020).

The data is filtered as follows. There are 681.815 firms in the database, first, all other regions than the Flemish region are excluded. Second, all firms with less than ten employees in the first year of the analyzed subset are excluded. Third, six sectors are excluded from the analysis: financial and insurance activities (section K), public administration and defense; compulsatory social security (section O), education (section P), human health and social work activities (section Q), activities of households as employers (section T), and activities of extraterritorial organizations and bodies (section U) of the NACE-BEL 2008 (Cf., Appendix 1). The exclusion is necessary to ensure a proper comparison with the results obtained by Dillen et al. (2014), as the same approach is employed. Afterward, the number of HGFs is calculated with a growth of at least 72.8% between the first and last year of the subset. All firms without recent financial information are also excluded from the analysis.

4.2 Number of (P)HGFs in the subsets

4.2.1 How many HGFs are there in every subset?

Table 1 gives an overview of the HGFs per subset. It gives the total number of Flemish firms with 10 or more employees in the first year of the analyzed subset, the absolute number of 'employment HGFs' and 'value-added' HGFs, and the relative number of these two kinds of HGFs. 15,207 Flemish firms are found in the subset of 2014-2017, 520 of them were qualified as an 'employment HGF' according to the OECD definition. The number of 'value-added HGFs' are higher, 1,035 HGFs are found for the period 2014-2017. The relative number of Flemish 'employment HGFs is 3.41%'. This means that of all the Flemish firms with at least ten employees, 3.41% of them are qualified as an HGF in terms of employment growth. Moreover, it is found that for the period 2014-2017 the relative number of Flemish 'value-added HGFs' is 6.81%. 311 Flemish firms are found to be both 'employment HGFs' and 'value-added HGFs'. The total number of Flemish firms has a positive trend over the five subsets. The maximum number of Flemish 'employment HGFs' is found for the period 2016-2019, just before the COVID-19 crisis. The number of Flemish 'employment HGFs' decreased by approximately 100 in the following period and increased slightly back in the period 2018-2021. As for 'value-added HGFs', the number did not decline very sharply in the period 2017-2020, there was a positive trend for these HGFs and the maximum occurred in 2018-2021 with 1,563 firms qualified as 'value-added HGFs'. The relative number of the 'employment HGFs' and 'value-added HGFs' is in line with their absolute numbers. The relative number of Flemish 'employment HGFs' is the highest in the subset 2016-2019. The relative number of Flemish 'value-added HGFs' has consistently increased, with only a slight decrease in the period 2017-2020, primarily due to the significant overall increase in the number of Flemish firms. The highest relative number was found in the period 2018-2021, where 8.87% of Flemish firms are qualified as 'value-added HGFS'. During the period 2016-2019, a maximum of 423 firms were identified as both 'employment HGFs' and 'value-added HGFs'.

Table 3: *Evolution in the number of HGFs from 2014-2021*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Total number of Flemish firms (≥10 employees)	15,207	15,665	16,186	16,932	17,626
Number of Flemish 'employment HGFs'	520	625	677	579	608
Number of Flemish 'value-added HGFs'	1,035	1,097	1,182	1,187	1,563
Relative number of Flemish 'employment HGFs'	3.41%	3.99%	4.18%	3.42%	3.45%
Relative number of Flemish 'value-added HGFs'	6.81%	7.00%	7.30%	7.01%	8.87%
Number of firms that are in both HGF subsets	311	369	423	351	405

4.2.2 How persistent are the HGFs?

Persistent high-growth firms (PHGFs) are HGFs that can be classified as HGFs in multiple consecutive subsets. The study, in line with Dillen et al. (2014), defines PHGFs as firms that are able to sustain their high growth over more than three consecutive subsets. Table 4 gives the number of HGFs that are HGFs in 'x' high-growth periods. In total, 1,832 different Flemish firms could be classified as an 'employment HGF' in these five HGF subsets. 1,038 of them could only sustain their growth for one three-year period, which comes down to a percentage of 56.66. These HGFs are called 'one-shot HGFs' as they only can be classified as an HGF in one HGF subset. The remaining 794 firms could persist in their growth for more than one three-year period. As mentioned to be a PHGF, a firm has to sustain its high growth for more than three consecutive subsets. So, firms that are HGFs for more than three consecutive periods are PHGFs. Hence, 63 'employment PHGFs' (i.e. 3.44%) are found. Only 12 firms are qualified as an 'employment HGF' over all five subsets. Regarding the number of 'value-added HGFs', 4,077 different Flemish firms are found to be classified as 'value-added HGFs'. 2,680 or 65.73% are 'one-shot HGFs', these firms could only sustain their growth for one period. The number of PHGFs is very limited, as only a few firms were able to maintian their status as an HGF for four or more periods. 102 'value-added HGFs' (i.e., 2.51%) were able to persist in their high growth in four or more periods. These firms are classified as 'value-added PHGFs'. So, while there are more 'value-added HGFs' in absolute number, the relative numbers show that there are more 'employment HGFs' that qualify as PHGFs. This suggests that is is slightly easier for an 'employment HGF' to sustain high growth compared to an 'value-added HGF'. In total, 21 firms were idenified as 'value-added HGFs' in all five subsets, which is higher than the number of 'employment HGFs'. However, when considering the relative numbers, 'employment HGFs' exhibit greater persistence.

Table 4: *Number of Flemish firms that are qualified as HGFs for one or more three-year periods*

	Number of firms that are x time(s) an HGF	
Number of high-growth periods	**Employment HGFs**	**Value-added HGFs**
One-shot HGFs → 1	1,038 (56.66%)	2,680 (65.73%)
2	486 (26.53%)	930 (22.81%)
3	245 (13.37%)	365 (8.95%)
PHGFs: 4	51 (2.78%)	81 (1,99%)
PHGFs: 5	12 (0.66%)	21 (0.52%)
Total	1,832 (100%)	4,077 (100%)

Table 5 gives an overview of the number of HGFs in the first analyzed subset. The number behind the first arrow is the number of the remaining HGFs of the first analyzed period. This means that for example, of the 520 'employment HGFs' found in the period 2014-2017, 257 of them still remain an 'employment HGF' in the following period 2015-2018 (i.e, 49.42%). 126 firms were still an 'employment HGF' for three consecutive periods (i.e, 24.23%). Currently, the number of HGFs approximately halves each time. However, in the period 2017-2020, only 31 HGFs of the initial 520 HGFs were found (i.e., 5.96%). This number does not half anymore but decreases more strongly. 12 firms or 2.31% of the initial 520 'employment HGFs' were found to be an 'employment HGF' in all five periods, but this has already been spoken about in the previous section. The same tendency was not observed in the number of 'value-added HGFs'. 1,035 'value-added HGFs' were found in the first analyzed period, but only 358 sustained their high growth and remain as HGF in the subsequent three-year period (i.e., 34.59%). The number of 'value-added HGFs' continued to decline more rapidly compared to the 'employment HGFs'. Out of the initial 1,035 HGFs, only 160 remained as 'value added HGFs' in the period 2016-2019 (i.e., 15.46%), and further reduced to just 37 'value-added HGFs' in the period 2017-2020 (i.e., 3.57%). 21 or 2.03% of the 1,035 'value-added HGFs' found in the first subset could sustain the high growth in all five subsets.

Table 5: *Number of consecutive 'employment HGFs' and 'value-added HGFs'*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Number of 'employment HGFs'	520 (100%) ➡	257 (49.42%) ➡	126 (24.23%) ➡	31 (5.96%) ➡	12 (2.31%)
Number of 'value-added HGFs'	1,035 (100%) ➡	358 (34.59%) ➡	160 (15.46%) ➡	37 (3.57%) ➡	21 (2.03%)

The number of 'one-shot HGFs' is interesting to look at. It shows how difficult it is for firms to persist in their high growth. Tables 6 and 7 show an overview of the number of 'one-shot HGFs' in each subset. Out of the 520 'employment HGFs' found in the period 2014-2017, 237 could not persist its high growth in any of the following periods (i.e., 45.58%). They only had three years of high growth in the first period and could not achieve the same growth in another period. However, in the next analyzed period 2015-2018, the ratio dropped sharply by 20 percentage points (i.e., 24.80%). The ratio remained approximately constant in the following two periods. In the period 2018-2021 the largest ratio of 'one-shot employment HGFs' is found (i.e., 50.66%). The trend observed for 'value-added HGFs' is similar. The ratio of 'one-shot HGFs' also dropped sharply in the second period 2015-2018, decreasing by approximately 20 percentage points. The ratio remained low in the subsequent two periods (i.e., 35.62% and 35.21%). Furthermore, in the last period (2018-2021), similar to the 'employment HGFs', the highest ratio of 'one-shot value-added HGFs' was found (i.e., 56.62%).

Table 6: *number of 'one-shot HGFs' in the subset of 'employment HGFs'*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Number of 'employment HGFs'	520	625	677	579	608
Number of 'one-shot HGFs'	237	155	185	153	308
Ratio	45.58%	24.80%	27.33%	26.42%	50.66%

Table 7: *number of 'one-shot HGFs' in the subsets of 'value-added HGFs'*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Number of 'value-added HGFs'	1,035	1,097	1,182	1,187	1,563
Number of 'one-shot HGFs'	560	396	421	418	885
Ratio	54.11%	36.10%	35.62%	35.21%	56.62%

The analysis done so far shows it is not easy for HGFs to persist in their high growth. Moreover, many HGFs can only realize high growth for only one three-year period. But, how many firms that were an HGF in the period 2014-2017 and dropped out as an HGF in the next period 2015-2018 could return as an HGF in one of the three remaining periods? Table 8 shows an overview of these drop-out firms. The table begins with the period 2016-2019 because it provides an overview of firms that were identified as HGFs in the period 2014-2017, ceased to be HGFs in the period 2015-2018, but subsequently regained an HGF status in one of the remaining three subsets. 520 'employment HGFs' are found in the subset 2014-2017 but 263 of them could not maintain their high growth and were no longer an 'employment HGF' in the period 2015-2018. These firms are so-called drop-out firms because they dropped out in the following period. 26 of the 263 drop-out firms could return as an HGF in one of the following subsets. Thus, 9.89% of the drop-out firms achieved to be an 'employment HGF' again in one of the three remaining subsets after a period in which they failed to persist in their high growth. On the other hand, 677 that were a 'value-added HGF' in the first subset, lost the status of 'value-added HGF' in the next subset. 117 of them managed to return as an HGF in one of the other three subsets (i.e., 17.28%). The relative number of firms that could return as an HGF after the drop-out is much higher for the 'value-added HGFs'. Hence, it is easier or less difficult for a 'value-added HGF' to return as an HGF after the drop-out than it is for an 'employment HGF'.

Table 8: Number of HGFs that return after a 'drop-out'

	Number of firms that could return as an HGF after the drop-out	
Period	**Employment HGFs (263 drop-out firms)**	**Value-added HGFs (677 drop-out firms)**
2016-2019	12	54
2017-2020	5	19
2018-2021	9	44
Total	26 / 263 (9.89%)	117 / 677 (17.28%)

4.2.3 Testing the hypothesis

In this section, the hypothesis will be analyzed, and a comparison with the results of the study by Dillen et al. (2014) will be made. The hypothesis that has already been formulated is the following:

> *H1: The number of Flemish employment and value-added (P)HGFs is lower in the period 2014-2021 than in the examined period 2000-2009 by Dillen et al. (2014)*

To analyze whether the number of Flemish 'employment (P)HGFs' and Flemish 'value-added (P)HGFs' is lower in the period 2014-2021 than in the examined period 2000-2009 analyzed by Dillen et al. (2014), the five subsets in this study will be compared with the five most recent subsets of Dillen (i.e., 2002-2005, 2003-2006, …, 2006-2009) because it is more adequate to compare the most recent results of Dillen. Figures 2 and 3 give an overview of the relative number of HGFs in the five subsets. The relative number will be compared over the absolute number because more Flemish firms are found than in the study by Dillen et al. (2014). The blue line is the relative number of HGFs of the last five analyzed subsets in the study by Dillen et al. (2014). The relative number of 'employment HGFs' is higher in the first two subsets compared to findings of Dillen et al (2014). However, in subset 3, the relative number of 'employment HGFs' remains nearly the same. In subsets 4 and 5, the relative number of HGFs is found to be higher in the study conducted by Dillen et al. (2014). Regarding the 'value-added HGFs', the relative number of HGFs is higher in the four first subsets of the study conducted by Dillen et al. (2014) compared to this study. Only in the fifth subset of Dillen's study (for the period 2006-2009), the relative number of 'value-added HGFs' is lower than in this study. Thus, the relative number of 'employment HGFs' is compared to the study conducted by Dillen et al. (2014), and the relative number of 'value-added HGFs' is lower than in Dillen et al. (2014).

Figure 2: Comparison of the relative number of 'employment HGFs' in the five subsets

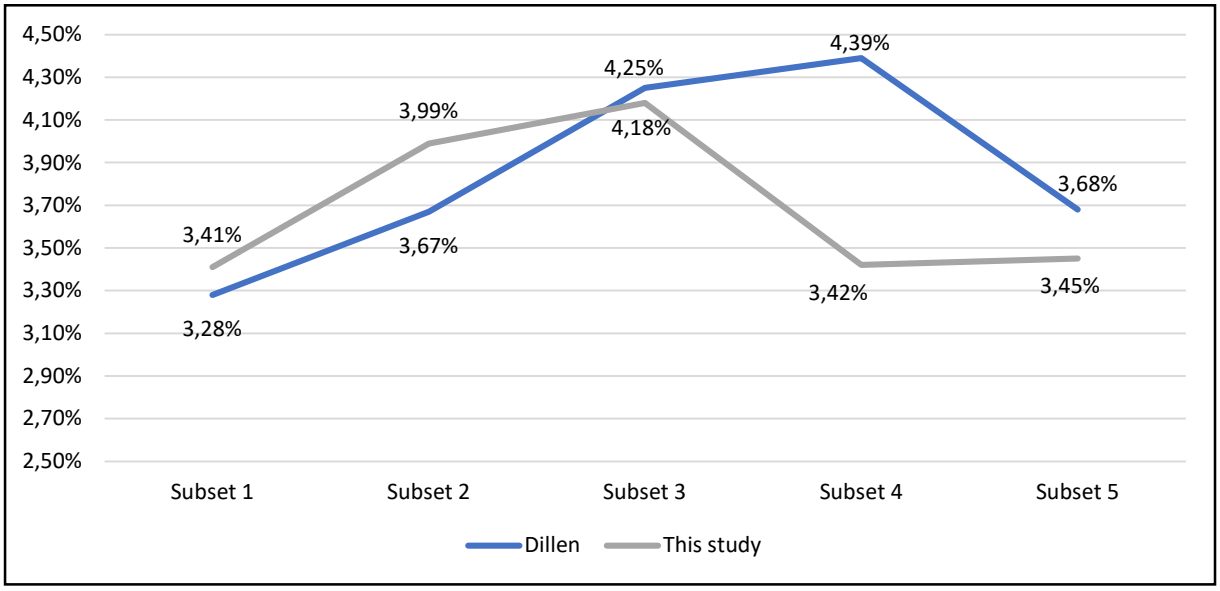
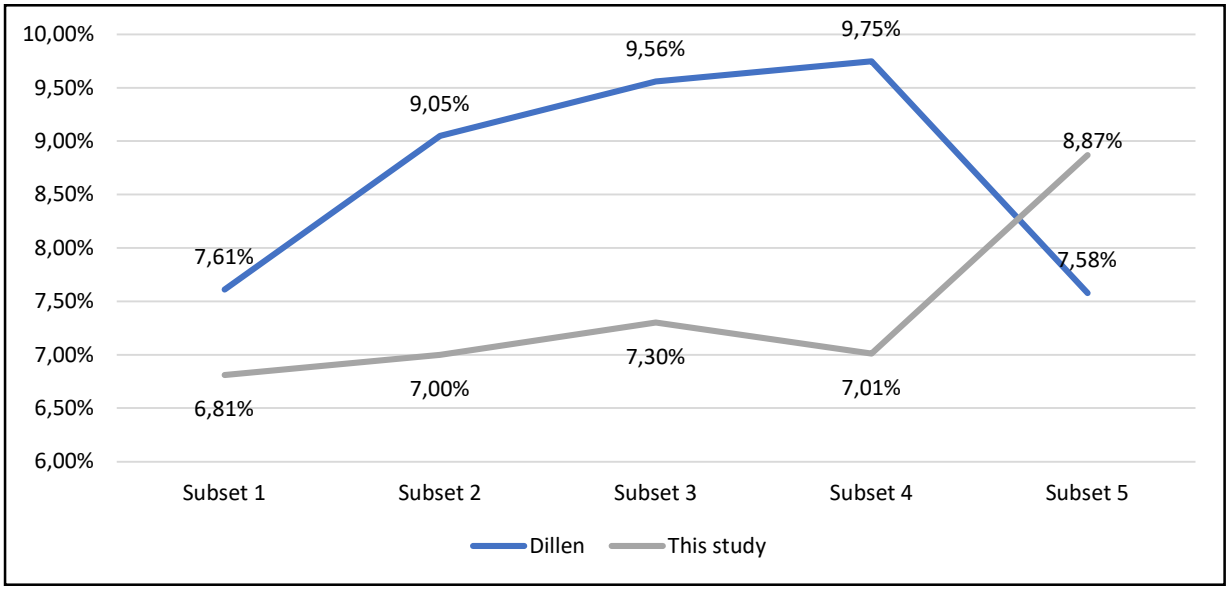


Figure 3: Comparison of the relative number of 'value-added HGFs' in the five subsets



Figures 4 and 5 illustrate the evolution of the absolute numbers of 'employment and value-added HGFs' over time. The data for the period from 2000 to 2009 is taken from Dillen et al. (2014), whereas no data is available for the period 2010-2013. The absolute numbers for the period 2014-2021 are derived from this study. In figure 4 a clear positive trend is found until the period 2006-2009 when a significant decrease occurred. However, the number of 'employment HGFs' started to rise again in the subsequent three high-growth periods. The highest number of 'employment HGFs' was reached in the period 2016-2019, with a total of 677 firms identified as 'employment HGFs'. Following that, there was another reasonable decrease, resulting in a decline of approximately 100 HGFs. After the decrease in the period 2017-2020, the number of 'employment HGFs' increased again by 29 in the period 2018-2021. Figure 5, similar to figure 4, illustrates a consistent positive trend during the initial six three-year periods. Further, in the period 2006-2009 a significant decrease in

the number of 'value-added HGFs' occurred. Similar to the absolute number of 'employment HGFs' after the decrease, the number of 'value-added HGFs' increased again consistently. Unlike figure 4, the highest number of HGFs is not reached in the period 2016-2019. The number of 'value-added HGFs' continues to rise without any further decreases. In the period 2018-2021, there is a significant increase in the total number of 'value-added HGFs', with approximately 350 additional firms, reaching a total of 1563 'value-added HGFs'. Therefore, unlike the 'employment HGFs', the number of 'value-added HGFs' does not decrease in the period 2017-2020 but rather shows a slight increase, followed by a significant rise in the period 2018-2021.

Figure 4: The evolution of the absolute numbers of 'employment HGFs'

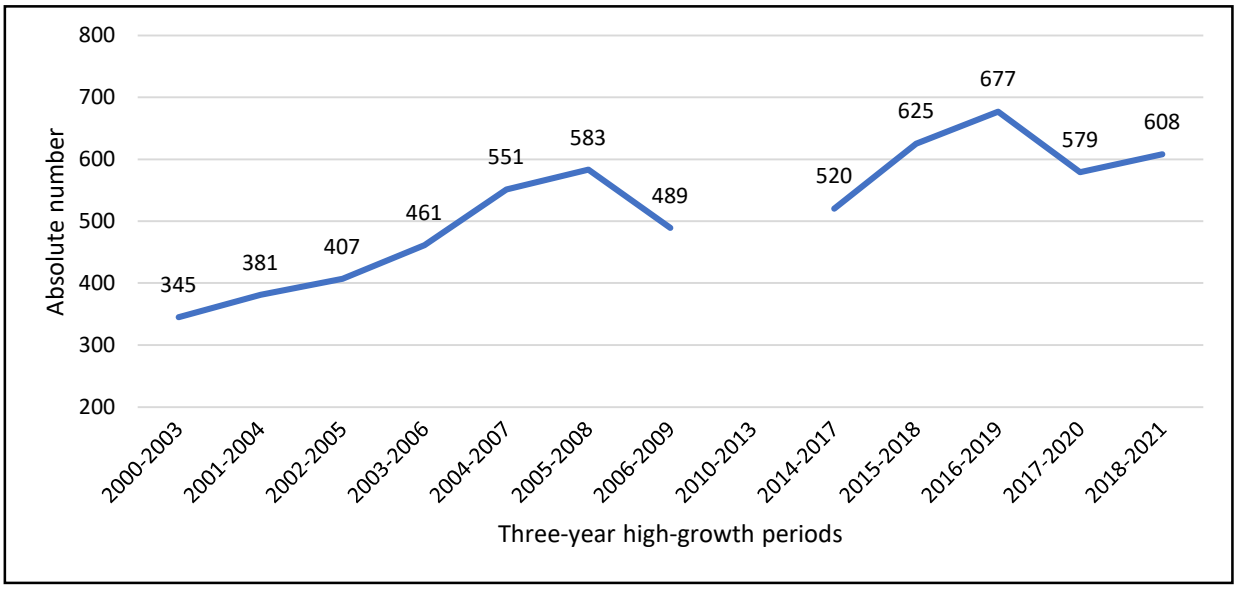
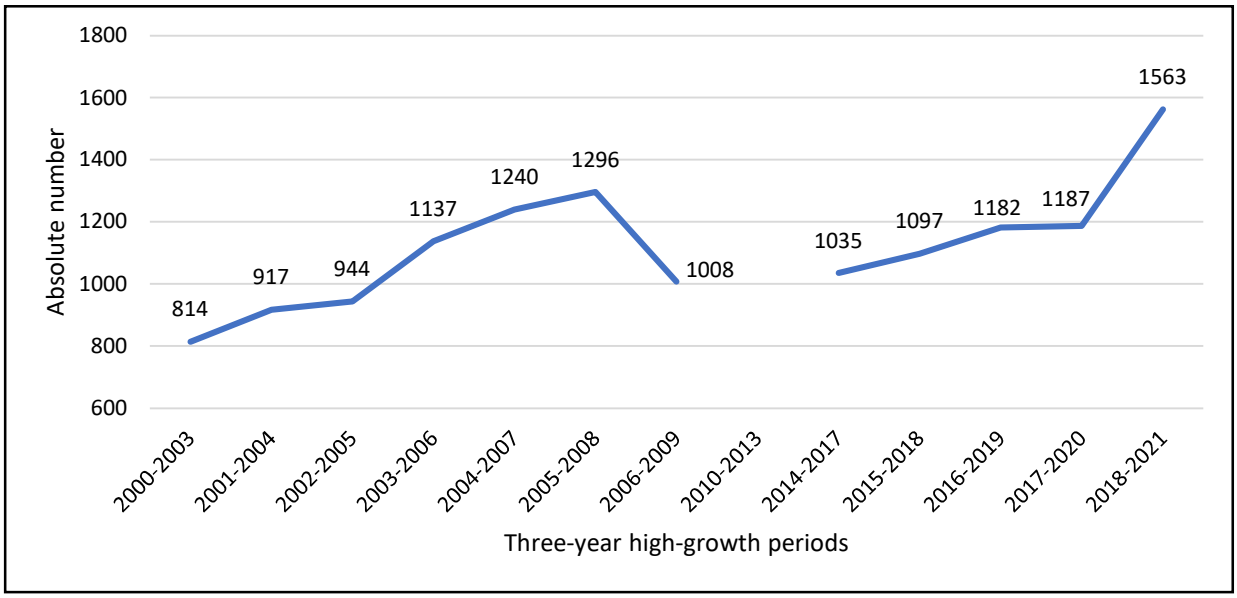


Figure 5: The evolution of the absolute number of 'value-added HGFs'



For the other analysis concerning the comparison of the results and the results of Dillen et al. (2014), the first five subsets of Dillen et al. (2014) will be used (i.e., 2000-2003, 2001-2004, …, 2004-2007) because to compare the persistency of the HGFs the same amount of subsets is necessary. Table 9 gives an overview of the comparison of the two studies. Dillen et al. (2014) found 1,901 firms that are qualified as an 'employment HGF' for one or more three-year periods. 1,083 of them could only maintain this HGF status in one high-growth period and are classified as 'one-shot HGFs' (i.e., 56.97%). Our analysis found a lower number of firms that are qualified as an 'employment HGF', with a total number of 1,832. However, the ratio of 'one-shot HGFs' is nearly the same (i.e., 56.66%). Further, Dillen found 83 'employment PHGFs', these could be qualified as an HGF for four or five three-year periods (i.e., 4.36%). Our analysis only found 63 'employment PHGFs' (i.e., 3.44%).

Furthermore, Dillen et al. (2014) found a total of 4,300 different Flemish 'value-added HGFs'. 2,449 or 56.95 percent of them are 'one-shot HGFs'. 235 'value-added PHGFs' were found by Dillen (5.47%). This research found 4,077 different firms, 65.73 percent were 'one-shot HGFs', and 2.51 percent were 'value-added PHGFs'. Thus, the relative number of 'one-shot employment HGFs' and the relative number of 'employment PHGFs' is nearly the same. Whatsoever, the relative number of 'one-shot value-added HGFs' is approximately 9% higher in our results, and the relative number of 'value-added PHGFs' in Dillen et al. (2014) is double compared to this study. It appears that in the studied period of Dillen et al (2014), firms were more persistent in terms of added value.

Table 9: *the comparison of HGFs of the two studies and their persistency*

	Relative number of firms that are x time(s) an HGF			
Number of high-growth periods	**Employment HGFs**		**Value-added HGFs**	
	This study	Study of Dillen	This study	Study of Dillen
One-shot HGFs → 1	56.66%	56.97%	65.73%	56.95%
2	26.53%	24.25%	22.81%	24.67%
3	13.37%	14.42%	8.95%	12.91%
PHGFs 4	2.78%	3.58%	1.99%	4.05%
PHGFs 5	0.66%	0.78%	0.52%	1.42%
Total	100%	100%	100%	100%

Returning to the hypothesis, it is found that the relative number of 'employment HGFs' is higher in the period 2014-2021 compared to the period 2000-2009. However, the difference is not significant enough to draw a conclusive result. In contrast, the relative number of 'value-added HGFs' is lower in this studied period compared to the period examined by Dillen et al. (2014). This difference is more pronounced than the difference found for the 'employment HGFs'. Across all subsets, the relative number of 'value-added HGFs' in the period 2014-2021 is approximately 1% lower.

Moving on to the second part of the hypothesis, the persistence of HGFs. In the persistence of the 'employment HGFs', no big differences were found. The relative number of 'one-shot HGFs' is nearly the same and the relative number of 'employment PHGFs' is similar. However, there are some notable differences for 'value-added HGFs'. This study found approximately 9% more 'one-shot HGFs', indicating that fewer firms were able to persist their growth for more than one period in the period 2014-2021 compared to the period 2000-2009. Moreover, the relative number of PHGFs in terms of value-added growth is more than 2.5% higher compared to the period examined by Dillen et al. (2014).

4.3 The profile characteristics of the different HGF-subset

The profile features of the HGFs will be the next focus of the analysis. This includes exploring questions such as: Are HGFs relatively young? How large are these firms? Are they more overrepresented in certain sectors and regions? Are HGFs solvent?

4.3.1 Firm age

An overview of the average age of the HGFs is given in table 10. The average is taken from the last year of each analyzed period. A positive trend is found in the average firm age of 'employment HGFs'. The average age continues to increase slightly over the five subsets.

For the 'value-added HGFs', the average firm age remains relatively constant in the first three analyzed periods. However, in the period 2017-2020, there is a one-year increase in average age, followed by a further increase of 1.5 years in the subsequent period (2018-2021).

Moreover, it is noteworthy that, on average, the age of 'value-added HGFs' is higher than that of 'employment HGFs'. The highest average firm age for both 'employment HGFs' and the 'value-added HGFs' is found in the last period, 2018-2021.

Table 10: *The average firm age of the HGFs*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Average firm age of 'employment HGFs'	17.9	19.0	19.1	19.2	19.3
Average firm age of 'value-added HGFs'	22.9	22.8	22.5	23.5	25.0

4.3.2 Firms size

The average size of the HGFs, measured by the number of employees at the end of the three-year high-growth period, is shown in table 11. The average firm size of the 'employment HGFs' decreased by about two employees each period, until the period 2017-2020, when the average firm size dropped by approximately 20 employees. However, in the last analyzed period, there was an increase in the average firm size of 'employment HGFs' by 11 employees.

In contrast, the average firm size of 'value-added HGFs' did not follow the same trend. It initially dropped by about six employees in the second period but then increased by six employees in the following period. In the period 2017-2020, there was a sharp decrease of 20 employees in the average firm size. In the last analyzed period, the average firm size increased to 64 employees.

It appears that, on average, the firm size of 'employment HGFs' is higher compared to that of 'value-added HGFs'.

Table 11: *The average size of the HGFs – measured by the number of employees*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Average firm size of 'employment HGFs'	98.8	96.7	94.2	75.8	87.0
Average firm size of 'value-added HGFs'	76.0	69.7	75.7	53.4	64.0

Furthermore, table 12 gives an overview of the average number of employees at the start of the period 2018-2021 and the average number of employees at the end of the period 2018-2021. Besides that, table 12 also gives an overview of the distribution of the HGFs in each class size that is set up. On average 'employment HGFs' start with 36 employees and after three years this has grown to 87 employees. Moreover, 64.80% of the 'employment HGFs' are firms with a workforce between 18 and 49 employees in 2021. Only 6.58% are firms with more than 250 employees. The 'value-added HGFs' started on average in 2018 with 39.9 employees and after three years these HGFs have on average 64 employees. As with the 'employment HGFs', the most 'value-added HGFs' are found in the lowest size class (i.e., 80.49%). 15.16% of the 'value-added HGFs' are firms with a headcount between 50 and 249 employees and 4.35% are firms with more than 250 employees in 2021.

Table 12: the size of HGFs in the period 2018-2021

	'Employment HGFs' (2018-2021)	**'Value-added HGFs' (2018-2021)**
Average number of employees in 2018	35.8	39.9
Average number of employees in 2021	87.0	64.0
Relative number of firms with a workforce between 18-49 employees in 2021	64.80%	80.49%
Relative number of firms with a workforce between 50-249 employees in 2021	28.62%	15.16%
Relative number of firms with more than 250 employees in 2021	6.58%	4.35%

4.3.3 Industry

Table 13 shows an overview of the industries in which the HGFs for the period 2018-2021 are active. The relative number of firms with more than 10 employees is calculated in the fifth column. The sixth and seventh columns show the relative number of 'employment HGFs' and 'value-added HGFs' in each industry. The box is colored red when there is an underrepresentation of the HGFs in the industry, so the relative number of firms with more than ten employees in the industry is higher than the relative number of HGFs in that industry. The box is colored green when an overrepresentation is found. The wholesale and retail trade industry (section G) is the highest represented with the result that it also has the highest relative number of HGFs. However, the results show a clear underrepresentation of the 'employment HGFs'. 26.47% of all analyzed firms are active in the wholesale and retail trade industry but only 24.01% of 'employment HGFs' are found in this industry. Whatsoever, the wholesale and retail trade industry shows a clear overrepresentation of the 'value-added HGFs' with a relative number of 32.31%. Furthermore, the manufacturing industry (section C), the construction industry (section F), and the accommodation and food service activities industry (section I) show an underrepresentation of both 'employment HGFs' and 'value-added HGFs'. Industries that are clearly overrepresented in both 'employment HGFs' and 'value-added HGFs' are the information and communication industry (section J), the professional, scientific, and technical activities sector (section M), and the administrative and support service activities industry (section N).

Table 13: *Sectoral distribution of the HGFs (NACE Rev. 2 sections)*

Industry breakdown **(NACE Rev. 2 sections)**	**Number of firms (≥10 empl.) in this industry**	**Number of 'employment HGFs' in this industry**	**Number of 'value-added HGFs' in this industry**	**Relative number of firms (≥10 empl.) in this industry**	**Relative number of 'employment HGFs' in this industry**	**Relative number of 'value-added HGFs' in this industry**
A. Agriculture. forestry and fishing	287	11	45	1.63%	**1.81%**	**2.88%**
B. Mining and quarrying	11	1	2	0.06%	**0.16%**	**0.13%**
C. Manufacturing	3,244	67	252	18.40%	**11.02%**	**16.12%**
D. Electricity. gas. steam and air conditioning supply	27	1	4	0.15%	**0.16%**	**0.25%**
E. Water supply. sewerage. waste management	149	4	31	0.85%	**0.66%**	**1.98%**
F. Construction	2,518	70	157	14.29%	**11.51%**	**10.04%**
G. Wholesale and retail trade; repair of motor vehicle	4,665	146	505	26.47%	**24.01%**	**32.31%**
H. Transporting and storage	1,533	62	118	8.70%	**10.20%**	**7.55%**
I. Accommodation and food service activities	1,247	20	39	7.07%	**3.29%**	**2.50%**
J. Information and communication	735	57	110	4.17%	**9.38%**	**7.04%**
L. Real estate activities	223	1	10	1.26%	**0.16%**	**0.64%**

M. Professional. scientific and technical activities	1,295	84	151	7.35%	**13.82%**	**9.66%**
N. Administrative and support service activities	1,099	67	102	6.26%	**11.02%**	**6.53%**
R. Arts. entertainment and recreation	297	8	21	1.68%	**1.32%**	**1.34%**
S. Other service activities	296	9	16	1.68%	**1.48%**	**1.02%**
Total	17,626	608	1,563	100%	100%	100%

4.3.4 Location

Table 14 provides an overview of all HGFs in each of the five provinces of Flanders. West Flanders ranks third in terms of the number of firms with more than ten employees, accounting for 20.5% of such firms. However, West Flanders shows a clear underrepresentation of 'employment HGFs' with only 17.27% of the total 'employment HGFs' and a slight overrepresentation of 'value-added HGFs' (i.e., 20.67%). Antwerp, Limburg, and Flemish Brabant, similar to West Flanders, are found to be overrepresented in one of the two types of HGFs. On the other hand, East Flanders is the only province that is overrepresented in both 'employment HGFs' and 'value-added HGFs'.

Table 14: *The geographical distribution (provinces) of the HGFs for the period 2018-2021*

Breakdown by Province	**Number of firms (≥10 empl.) in this region**	**Number of 'employment HGFs' in this region**	**Number of 'value-added HGFs' in this region**	**Relative number of firms (≥10 empl.) in this region**	**Relative number of 'employment HGFs' in this region**	**Relative number of 'value-added HGFs' in this region**
Antwerp	5,405	194	479	30,66%	**31.91%**	**30.64%**
Limburg	2,309	74	211	13,10%	**12.17%**	**13.50%**
East Flanders	3,819	145	344	21,67%	**23.85%**	**22.01%**

Flemish Brabant	2,480	90	206	14,07%	**14.80%**	**13.18%**
West Flanders	3,613	105	323	20,50%	**17.27%**	**20.67%**
Total	17,626	608	1,563	100%	**100%**	**100%**

4.3.5 Solvency

Table 15 shows an overview of the average solvency of HGFs in the last year of each period. The solvency ratio is measured by dividing the liabilities by the total assets. For the 'employment HGFs', the average solvency ratio ranges from 68.0% to 72.6%. There is a decrease in the solvency ratio of approximately one percentage point in each period, except for the period 2017-2020 where the solvency remains the same.

Concerning the 'value-added HGFs', there is some fluctuation in the average solvency ratio. The average ratio ranges from 64.4% to 67.9%, with the highest ratio observed in the period 2015-2018 and the lowest in 2018-2021.

Table 15: *The average solvency of the HGFs – measured by liabilities/total assets*

	2014-2017	2015-2018	2016-2019	2017-2020	2018-2021
Average solvency of 'employment HGFs'	72.6%	71.6%	69.6%	69.5%	68.0%
Average solvency of 'value-added HGFs'	67.0%	67.9%	67.8%	65.1%	64.4%

4.3.6 'One-shot HGFs' versus 'PHGFs'

Tables 16 and 17 provide an overview of some compared profile characteristics between 'one-shot HGFs' and PHGFs. It is important to note that the results need to be nuanced due to the significantly larger number of 'one-shot HGFs' compared to PHGFs. 1,038 'one-shot employment HGFs' and 63 'employment PHGFs' were identified. On average, it appears that 'employment PHGFs' are sligthly older compared to 'one-shot employment HGFs'. The average firm size of 'employment PHGFs' is understandably higher given their longer period of employment high growth, the average firm size of 'employment HGFs' is nearly three times the average size of 'one-shot employment HGFs'. Further, on average 'employment PHGFs' have a slightly lower solvency ratio (liabilities to total assets) compared to 'one-shot employment HGFs'.

As for the 'value-added HGFs', PHGFs are on average nearly six years younger than 'one-shot HGFs'. In terms of liabilities relative to toal assets, PHGFs have on average a higher values value compared to 'one-shot HGFs'. Additionally, the average size of the PHGFs is more than double the average size

of 'one-shot HGFs'. Overall, it appears that the differences in profile characteristics between 'one-shot HGFs' and PHGFs are more significant for 'value-added HGFs' than for 'employment HGFs'. Specifically, 'value-added PHGFs' are on average much younger and have a higher solvency ratio compared to 'one-shot HGFs'.

Table 16: *'One-shot employment HGFs' versus 'employment PHGFs'*

	'One-shot employment HGFs' (1,038)	**'employment PHGFs' (63 firms)**
Average firm age	18.1	18.8
Average firm size	64.8	189.1
Average solvency	72.0%	71.2%

Table 17: *'One-shot value-added HGFs' versus 'value-added PHGFs'*

	'One-shot value-added HGFs' (2,680)	**'value-added PHGFs' (102)**
Average firm age	24.7	19.3
Average firm size	57.9	125.3
Average solvency	65.6%	68.5%

5. Discussion

5.1 Number of (P)HGFs

On an international level, Schreyer (2000) found a relative number of HGFs between 2 and 10 percent. Acs, et al. (2008) found an average of six percent concerning HGFs in the United States. Other studies from Santos, Guillamon, and NESTA also found a relative of HGFs not higher than 10%. Nearly all of these studies except Santos's study are studies from before the GFC and the COVID-19 crisis. Thus, the impact of the crises is not reflected in these studies. Santos (2021) found 3.7% of all Portuguese firms to be an HGF. However, only large firms were taken into account. On a national level, Dillen (2014) found an average of 3.2% of Flemish 'employment HGFs' and 8.3% of Flemish 'value-added HGFs'. The relative number of HGFs found in Dillen (2020) was 4% and 7.1% respectively for Flemish 'employment HGFs' and Flemish 'value-added HGFs'. This was analyzed for the period 2015-2018. As for this study, it is found that the relative number of 'employment HGFs' is also around 4% and the relative number of 'value-added HGFs' is approximately 7% for the period between 2014-2019. It appears already that the relative number of 'value-added HGFs' is much lower than Dillen et al. (2014). Since the study of Dillen et al. (2014) is analyzed before the COVID-19 crisis, the GFC may explain the decline of the relative number of 'value-added HGFs'. Because the economic crisis caused Belgium's GDP, calculated as the sum of the added value of all producers, to fall by 3% (Burggraeve, K., et al., 2012).

Furthermore, the results of this study show that in the period 2017-2020, which included the roughest year of COVID-19 in Belgium, there was a sharp decline in the relative number of 'employment HGFs' from 4.18% to 3.42%. This decline can be explained by the impact of the COVID-19 crisis on HGFs. As firms faced uncertainty and financial constraints, they were less likely to hire more employees, resulting in a reduction in the number of 'employment HGFs'.

Despite the fact that in 2020, Belgium's GDP decreased by 6.3%, the relative number of 'value-added HGFs' did only decline by 0.29 percentage points. In the next period, the relative number even increased sharply from 7.01% to 8.87% (for the period 2018-2021). Thus, the impact of the GFC and the COVID-19 crisis was not the same.

When examining the evolution of the absolute number of HGFs from 2000 to 2021, by considering these results and the findings of Dillen et al. (2014), two distinct decreases can be identified for the 'employment HGFs'. Dillen et al. (2014) found a decline of approximately 100 'employment HGFs', from 583 to 489 firms, between the period 2005-2008 and the period 2006-2009. Therefore, after including the year 2009, which witnessed a 10% decrease in Belgian corporate investments and a 3% decline in Belgium's GDP (Burggraeve, K., et al., 2012), resulted in a significant drop in the absolute number of 'employment HGFs'. Moreover, it should be noted that there is no data available for the period between 2010 and 2013, which is considered as a limitation of this research as it hinders a comprehensive analysis of the full evolution of the Flemish HGFs. However, compared to the period 2006-2009, an increase in the number of 'employment HGFs' is observed in the period 2014-2017. The absolute number of 'employment HGFs' continued to rise in the subsequent periods until the period 2017-2020, which includes the year 2020 when the Belgian economy was greatly impacted by the COVID-19 crisis, resulting in a 6.3% drop in Belgium's GDP (NBB, 2021). As a

consequence of this crisis, a significant decline in the absolute number of 'employment HGFs' occurred, with approximately 100 firms, decreasing from 677 to 579. Following this highly impacted period, the absolute number of 'employment HGFs' increased once again.

On the other hand, the similar trend is observed for the 'value-added HGFs'. In the period 2006-2009, there was a significant decrease of approximately 300 firms, from 1296 to 1008. However, after this substantial drop, no further decreases in the absolute number of 'value-added HGFs' were observed. In fact, even in the period 2017-2020, there was a slight increase of 5 firms in 'value-added HGFs'. In the most recent period, a significant increase of approximately 400 firms was observed, from 1187 to 1563. This indicates that after the COVID-19 crisis, the number of HGFs experienced substantial growth. This is a positive sign, as these HGFs continue to play a crucial role in contributing to economic activity (Fasil, et al. 2021) and are crucial in the economic recovery (Mason, C., 2020). It can be said that the actions taken by firms to build entrepreneurial resilience in response to the COVID-19 crisis (Schepers et al. 2021) have shown some effectiveness. However, it is important to note that this assessment is based on only one year after the COVID-19 crisis. In order to fully understand the impact of the crisis on Flemish HGFs, a more comprehensive analysis will need to be conducted in the coming years. This will provide a clearer picture of the long-term effects and the overall resilience of HGFs in the face of such challenges.

The persistence of the Flemish HGFs was still considered to be difficult. Even with greater differences in persistence compared to the study of Dillen et al. (2014). This study revealed a higher share of 'one-shot value-added HGFs' compared to Dillen et al. (2014) (65.73% vs 56.95%). This could also be attributed to the impact of the two major crises, which led to significant declines in Belgium's GDP. Moreover, there was no significant difference in the relative number of 'one-shot HGFs'. Hence, the persistence of the 'employment HGFs' in terms of 'one-shot HGFs' remained the same across the two analyzed periods. Furthermore, Dillen et al. (2014) identified a higher proportion of 'employment and value-added PHGFs'. Specifically, there were approximately 0.92% more 'employment PHGFs' and 2.96% more 'value-added PHGFs'. These findings suggest that PHGFs are still relatively rare, and sustaining high growth over a longer period remains challenging for firms.

5.2 Firm age

The results concerning the average age of HGFs of Coad and Karlsson (2022) and Schreyer (2000) are very different from the results of this study. They concluded most HGFs from Sweden, Italy, France, Spain, and the Netherlands are younger firms. Coad and Karlsson (2022) refer younger firms to those younger than five years, while Schreyer (2000) considers them younger than ten years. However, in this study, 'employment HGFs' have an average age of 19 years, and 'value-added HGFs' are on average 23 years old. Whatsoever, these HGFs are considered older due to the OECD definition used, which excludes firms with fewer than 10 employees. Consequently, a larger number of younger firms are excluded from the analysis. The results of Bianchini et al. (2014) and, Banno and Varum (2021), align more closely with the findings of this study. Biachini et al. (2014) found an average age of 17 years for the Italian HGFs. Additionally, they reported the HGFs in Spain, France, and the UK had an average age ranging from 10 to 21 years (Bianchini et al. 2014). Banno and Varum (2021) found an average age of 15 years for Portuguese HGFs.

Dillen et al. (2014) found, similar to this study that Flemish 'employment HGFs' are younger than 'value-added HGFs'. According to Dillen et al. (2014), Flemish 'employment HGFs' and 'value-added HGFs' have an average age of 17 and 20, repectively.

5.3 Firm size

Schreyer (2000) and Coad and Karlsson (2022) both concluded that most HGFs are found among small firms. Bianchini et al. (2014) concur with the finding that most HGFs are small firms. The results of this study are consitent with these findings. In the period 2018-2021, more than 60% of all 'employment HGFs' were smaller than 50 employees, and more than 80% of the 'value-added HGFs' were classified in the smallest class. Similarly, Dillen et al. (2020) found that in the period 2015-2018, the majority of HGFs were in the class with less than 50 employees. As in the findings of this study, Dillen et al. (2020) reported a higher proportion of small 'value-added HGFs' compared to 'employment HGFs' (56.63% vs 70.29%).

5.4 Industry

According to most literature,t HGFs tend to be more active in knowledge-intensive service industries and high-tech industries. Only Nesta (2011) emphasized that not all HGFs are high-tech firms. Lopez-Garcia et al. (2012) found the manufacturing sector, the construction sector, and the services firm to be the most represented. Dillen et al. (2014) and Dillen et al. (2020) both observed that HGFs are the most represented in the manufacturing industry, the wholesale sector, and the construction industry. However, Dillen et al. (2020) discovered a significant underrepresentation of these industries in terms of relative number of HGFs. The findings of this study are consistent with those of Dillen et al. (2020), confirming the ongoing underrepresentation of HGFs in these industries. As for the industries that show a clear overrepresentation the same industries are identified: the information and communication industry and the professional, scientific, and technical activities industry, and the administrative and support service activities industry.

Furthermore, Fasil et al. (2021) indicated the sector acommodation and food service activities is at higher risk, suggesting that the potential impact of COVID-19 is greater in this sector. The findings of this study support this, as both 'employment HGFs' and 'value-added HGFs' show a significant underrepresentation in the accommodation and food service activities sector. Moreover, Dillen et al. (2020) analyzed the industries where HGFs were the most active for the period 2015-2018, prior to the COVID-19 crisis. They found a clear overrepresentation of 'employment HGFs' in the accommodation and food service activities sector. Therefore, it suggests that as a result of the COVID-19 crisis, there has been an underrepresentation of 'employment HGFs' in this sector. The findings confirm the the findings of Fasil et al. (2021). However, they emphasized that the potential negative impact is low in Belgium, but the findings of this study show that there is indeed an impact on the 'employment HGFs' in the accommodation and food service activities sector.

5.5 Location

Schreyer (2000) and Santos (2021) concluded that HGFs are greater concentrated in urban areas. Regarding the Flemish HGFs, Dillen et al. (2020) found in the period 2015-2018 a clear overrepresentation in the province of Antwerp for both 'employment HGFs' and 'value-added HGFs'. In contrast, the results of this study indicated otherwise. While, Antwerp remained overrepresented

for the 'employment HGFs', Antwerp was found to be slightly underrepresented for the 'value-added HGFs'. Moreover, unlike the findings of Dillen et al. (2020), East Flanders emerged as the only province to be overrepresented in both HGF types.

5.6 Solvency

The average solvency ratio of HGFs has been found between 60% and 72% by Lopez-Garcia, Nesta, and Bianchini et al. These HGFs are located in Italy, Spain, France, and the UK. However, Dillen et al. (2020) and Dillen and Vandekerkhof (2021) found a higher average solvency ratio for Belgian HGFs. According to the research of Dillen et al. (2020), 'employment HGFs' had an average solvency ranging from 71% to 75.2% and 'value-added HGFs' had an average solvency ratio between 69.2% and 77.1% (Dillen et al. 2020). Dillen and Vandekerkhof (2021) found an average solvency ratio of 73.5%. These results are found to be a bit higher than de results of this study.

Furthermore, the results indicate that the average solvency ratio of the 'value-added HGFs' (ranging from 64.4% to 67.9%) is slightly lower than that of 'employment HGFs' (ranging from 68% to 72.6%). The average solvency ratio of both HGF types declined sligthly each period. Fasil et al. (2022) had previously reported a decline in the solvency ratio as a result of the GFC and suggested that the COVID-19 may contribute to a potential decline in the solvency ratio of HGFs. Therefore, the findings are consistent with the findings of Fasil et al. (2022).

6. Conclusion

6.1 High-growth persistence of Flemish firms

After conducting a literature review, it was expected that the number of HGFs would significant decline due to the impact of the GFC and the COVID-19 crisis. When comparing the relative number of 'employment HGFs' and 'value-added HGFs' to the findings of Dillen et al. (2014), no major differences were observed for the 'employment HGFs'. This suggests that the overall impact of the two crises on the relative number of 'employment HGFs' is currently relatively limited. However, a larger difference was found in the relative number of 'value-added HGFs', with on average a decrease of 1.3 percentage points in the period 2014-2021. This indicates that the two crises, especially the GFC (given that only two possible years could have been affected by the COVID-19 crisis were included in the analysis), have had a negative impact on the relative number of 'value-added HGFs'.

When analyzing the absolute number of HGFs for the period 2000-2021, exluding the period 2010-2013 due to unavailable data, a similar decrease in absolute number was observed for the 'employment HGFs' and 'value-added HGFs' in the period 2006-2009, suggesting that both types of HGFs were affected by the GFC. However, in the period 2014-2017, an increase in absolute number was observed for both HGF types and this continued to rise in the subsequent periods. Until 2017-2020, which included the thoughest year for Belgian firms due to the COVID-19, a significant decrease in the absolute number of 'employment HGFs' was observed. In contrast, the absolute number of 'value-added HGFs' did not decrease. In the subsequent period, 2018-2021, the absolute number of both HGF types increased, with a significant increase in the number of 'value-added HGFs'. This suggests that the COVID-19 crisis may have had short-lived impact and even contributed to a significant boost in 'value-added HGFs'. However, further research on the Flemish HGFs is needed to assess the long-term impact more comprehensively.

The persistence of the HGFs is another aspect that has been looked at, results show that it remains very hard to sustain high growth. 57% of all 'employment HGFs' were found to be 'one-shot HGFs'. So, it is difficult for more than half of the Flemish HGFs to sustain their high growth for more than one three-year period. Only, 3.44% could sustain their high employment growth for more than three three-year periods. The results are similar to findings of Dillen et al. (2014). There were also 57% of 'one-shot employment HGFs' observed and 4.36% of 'employment PHGFs' were found (Dillen, Y., et al. 2014). The two crises did not have a big impact on the persistence of the 'employment HGFs'.

However, more signifcant differences were found for 'value-added HGFs'. While 66% of all firms remained an HGF in only one period and 2.51% could be classified as PHGFs. Dillen et al. (2014) found a lower share of 'one-shot value-added HGFs' (i.e., 57%) and a higher share of 'value-added PHGFs' (i.e., 5.47%). This suggest that due to the two crises, 'value-added HGFs' are less persistent.

6.2 Profile characteristics of Flemish firms

The average firm age of the 'employment HGFs' was found to be between 17.9 and 19.3 years. Dillen, et al. (2014) also reported an average firm age around 17 years. This suggests that the impact of the crises had no significant impact on the average firm age. One possible explanation is that older firms, with their resources and experience, were better equipped to adapt and adjust during the

crises, allowing them to maintain their HGF status. Similarly, for the 'value-added HGFs', the impact on the average firm age was limited. Results showed an average age between 22.5 and 25 years, slightly higher than the average age of 20 years reported by Dillen et al. (2014). It is worth noting that in the period 2018-2021, the average firms' age was the highest for the two HGF groups. This can be attributed to the fact that younger firms, lacking the necessary resources, were more affected by the COVID-19 crisis and were unable to sustain their HGF status. Consequently, the average firm age is the highest after when including the post-crisis year.

Most HGFs are found in the lowest size class between 18 and 49 employees. 64.80% of the 'employment HGFs' and 80.49% of the 'value-added HGFs' were observed as small firms in the period 2018-2021. Dillen et al. (2020) came with nearly the same results for the period 2015-2018, with more small 'value-added HGFs' than 'employment HGFs'. The COVID-19 crisis did not impact the sizes, as the most HGFs are observed among small firms, also during a time of crisis.

The information and communication industry, the professional, scientific, and technical activities sector, and the administrative and support service activities industry are sectors where a clear overrepresentation is found for the 'employment HGFs' and 'value-added HGFs'. The manufacturing industry and the construction industry remain the two sectors where a clear underrepresentation is found for both HGF groups. These results are in line with the results found in Dillen et al. (2020).

It appears that East Flanders is the only province that is overrepresented in the two HGF groups. Antwerp is no longer overrepresented in both groups as in Dillen et al. (2020). Antwerp is slightly underrepresented for the 'value-added HGFs'. Thus, this suggests that due to the COVID-19 crisis, Antwerp is may have experienced a decrease in the representation of 'value-added HGFs', while East Flanders has shown an overrepresentation of both 'employment HGFs' and 'value-added HGFs'.

The average solvency of the 'employment HGFs' is found between 68.0% and 72.6%. The solvency declined each period. So, the HGFs are taking on less and less debt. The same trend is found for the 'value-added HGFs', only in the period 2015-2018 the solvency increased slightly. These ratios are found a bit lower between 64.4% and 67.9%. Dillen et al. (2014) found higher solvency ratios for both the 'employment HGFs' and the 'value-added HGFs'. It appears that the GFC and the COVID-19 crisis caused fewer debts to be taken on. This can be explained by the lack of access to finance due to the GFC and the uncertainty caused by the COVID-19 crisis. However, in the long term, this can present an opportunity for more high growth as there is more space for investment.

The average firm age of the 'one-shot employment HGFs' and the 'employment PHGFs' is found to be nearly the same. Furthermore, the average firm size is obviously much bigger for the PHGFs. The average solvency is approximately 72% for both 'one-shot employment HGFs' and 'employment PHGFs'. The differences for the 'value-added HGFs' are more severe. PHGFs are on average nearly six years younger than 'one-shot value-added HGFs'. The size is again much bigger. The solvency of the 'value-added PHGFs' is on average 3% higher than the 'one-shot value-added HGFs'.

7. Limitations and future research

As mentioned earlier, a limitation of this research is the unavailability of data for the period 2010-2013, which prevented from making a comprehensive analysis of the evolution of Flemish HGFs between 2000 and 2021. Furthermore, the fact that most Flemish firms are not required to publish their turnover figures, limited the ability to compare results with previous research, as those studies typically use turnover and employment as measures of growth according to the OECD definition, rather than the added value employed in this research to replace turnover as a growth measure.

Moreover, although this analysis extends to the year 2021, it is important to note that the overall impact of the COVID-19 crisis may not be fully reflected in this single year after the crisis included in the analysis. Therefore, future research on HGFs should be conducted over the next few years to examine the comprehensive impact of the COVID-19 crisis. Drawing definitive conclusions based solely on the findings from this single post-crisis year included in the analysis may be insufficient.

References

Acs, J.Z., Parsons, W., Tracy, S. (2008) High-Impact Firms: Gazelles Revisited.

Audretsch, D. (2012) Determinants of High-Growth Entrepreneurship. Report prepared for the OECD/DBA.

Bannò, M., Varum, C. A. (2021). Champions during Crises Scenarios: High Growth and Persistent High Growth Firms.

Bianchini, S., Bottazzi, G., Tamagni, F. (2014) What does (or does not) determine persistent corporate high-growth? LEM, Working paper series.

Burggraeve, K., De Sloover, F., Dresse, L. (2012) De Belgische bedrijfsinvesteringen in het licht van de crisis.

Brown, R., Lee, N., (2019) Strapped for cash? Funding for UK high growth SMEs since the global financial crisis. Journal of Business research, 99, 37-45.

Coad, A., Karlsson, J. (2022) A field guide for gazelle hunters: Small, old firms are unlikely to become high-growth firms.

Coad A., Moreno, F. (2015), High growth firms: stylized facts and conflicting results, SPRU Working paper series (SWPS), 2015-05.

COVID-19 and Your Health. (2020, February 11). Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/your-health/about-covid-19/basics-covid-19.html

De Federale Overheid. (z.d.). Economische impact van het coronavirus | FOD Economie. FOD Economie. https://economie.fgov.be/nl/themas/ondernemingen/coronavirus/economische-impact-van-het#:

De Mulder, J., Godefroid, H., Swartenbroekx C. (2017) Een portret van de snel groeiende jonge bedrijven in België. NBB Economisch Tijdschrift

Deloof, M., Laveren, E., Vermoesen, V. (2012) Long-term debt maturity and financing constraints of SMEs during the Global Financial Crisis.

Dillen, Y., Laveren, E., Martens, R., De Vocht, S,. Van Imschoot, E. (2014) Growth persistence and profile robustness of high-growth firms. Int. J. Entrepreneurial venturing, Vol. 6, No. 4.

Dillen, Y., Crijns, H., Standaert, T. (2020) Belgian High-Growth Monitor. Shedding light on Belgium's fastest growing firms.

Dillen, Y., Vandekerkhof, P. (2021) Does the sector matter? An analysis of high-growth firms and industry growth rates.

Duignan, B. (2023, March 17). Financial crisis of 2007–08 | Definition, Causes, Effects, & Facts. Encyclopedia Britannica. https://www.britannica.com/event/financial-crisis-of-2007-2008#ref342321

Eurostat – OECD (2007) Manual on Business Demography Statistics, December, European Communities/OECD, Paris, France.

Fasil, B., Del Rio, J. C., Dominick, C., Fako, P., Flachenecker, F., Gavigan, J. P., ... & Testa, G. (2021). High Growth Enterprises in the COVID-19 Crisis Context. JRC Technical Report.

Glossary | DataBank. (z.d.). https://databank.worldbank.org/metadataglossary/world-development-indicators/series/NV.IND.TOTL.ZS#:~:text=Gross%20domestic%20product%20(GDP)%20represents,of%20fixed%20capital%20in%20production.

Guillamón, C., Moral-Benito, E., Puente, S. (2017). High growth firms in employment and productivity: dynamic interactions and the role of financial constraints? Banco de España, Documento de Trabajo N. º 1718

Henrekson, M., Johansson, D. (2009). Gazelles as job creators: a survey and interpretation of the evidence.

Lioudis, N. (2023, March 10). The Collapse of Lehman Brothers: A Case Study. Investopedia. https://www.investopedia.com/articles/economics/09/lehman-brothers-collapse.asp

Loo, A. (2023, February 15). 2008-2009 Global Financial Crisis. Corporate Finance Institute. https://corporatefinanceinstitute.com/resources/economics/2008-2009-global-financial-crisis/

Lopez-Garcia, P. and S. Puente (2012) "What Makes a High-Growth Firm? A Dynamic Probit Analysis Using Spanish Firm-Level Data," Small Business Economics, 39, 1029–1041.

Mason, C. (2020). The coronavirus economic crisis: Its impact on venture capital and high growth enterprises. Publications Office of the European Union.

Mignon S. (2017), 'Wat kenmerkt Belgische high-growth firms ?', Trefpunt Economie, 12.

NBB, Dhyne, E., Duprez, C., (2021). Belgian firms and the COVID-19 crisis. https://www.nbb.be/nl/artikels/de-belgische-ondernemingen-tijdens-de-covid-19-crisis?language=nl

NBB, Coppens, B., Minne, G., Piton, C., Warisse, C. (2021) The Belgian economy in the wake of the COVID-19 shock.

NESTA (2011): "Vital Growth. The Importance of High-Growth Businesses to the Recovery." London: NESTA.

Peric, M., Vitezic, V. (2016) Impact of global economic crisis on firm growth. Small business economics, 46, 1-12

Santos, E. (2021) Linking Size and Productivity of High-Growth Firms.

Schepers, J., Vandekerkhof, P., & Dillen, Y. (2021). The impact of the COVID-19 crisis on growth-oriented SMEs: Building entrepreneurial resilience. Sustainability, 13(16), 9296

Schreyer, P. OECD Science, Technology and Industry Working Papers 2000/03. High-Growth Firms and Employment.

TNL/Belga. (2008). Ratinghuis Fitch somber over Belgische banken. De Standaard.

Volledige lijst van alle NACE-codes. (z.d.). NACEV2. https://nacev2.com/nl

WHO Coronavirus (COVID-19) Dashboard. (n.d.). https://covid19.who.int/?adgroupsurvey=%7badgroupsurvey%7d&gclid=Cj0KCQjwwtWgBhDhARIsAEMcxeCK1nDpf0VDicNYghWa7BidCwiSI6VnzKlZ1touF4qn3cW9-kPpC-oaAuDkEALw_wcB

World Health Organization: WHO. (2020, January 10). Coronavirus. https://www.who.int/health-topics/coronavirus#tab=tab_1

Appendix 1

Table A1: *NACE-BEL 2008 sections*

Excluded sections	**NACE-BEL 2008**
Section K	Financial and insurance activities
Section O	Public administration and defense; compulsatory social security
Section P	Education
Section Q	Human health and social work activities
Section T	Activities of households as employers
Section U	Activities of extraterritorial organizations and bodies
Included sections	**NACE-BEL 2008**
Section A	Agriculture, forestry and fishing
Section B	Mining and quarrying
Section C	Manufacturing
Section D	Electricity, gas, steam, and air conditioning supply
Section E	Water supply, sewerage, waste management, and remediation activities
Section F	Construction
Section G	Wholesale and retail trade; repair of motor vehicle and motorcycles
Section H	Transporting and storage
Section I	Accommodation and food service activities
Section J	Information and communication
Section L	Real estate activities
Section M	Professional, scientific and technical activities
Section N	Administrative and support service activities
Section R	Arts, entertainment and recreation
Section S	Other service activities