

ANALYSIS OF THE POTENTIAL OF CHEMICAL BUSINESS FOUNDATIONS IN GERMANY

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ABSTRACT

Background: This paper compares the theoretical start-up potential of the chemical industry sector with recently published numbers of the actual number of startups founded thereof. The theoretical potential was calculated by a method that was developed to calculate the start-up potential within the general public adopted to general students. The actual number of startups founded in said sector was derived from a hundred percent analysis (ZEW database) of all companies founded in Germany between 2016 and 2019. In this way, the paper wants to evaluate whether the actual start-up activity in the chemical industry sector is comparable to the theoretical startup activity of all students in Germany.

Methods: The theoretical number of start-ups per year is calculated. The calculation is made using the average Total Early-Stage Entrepreneurial Activity rate (TEA rate) for student activities applied to the number of chemistry graduates between 2016 and 2019. Subsequently, the theoretical start-ups are compared with the actual chemical industry start-ups founded between 2016 - 2019.

Key words: Technology Transfer, Entrepreneurship, Chemistry Foundation, Spin-offs from University, Chemical,

INTRODUCTION

In Germany, about 17,000 students study chemistry with about 1,000 professors every year (Statistisches Bundesamt (Destatis), 2022; Society of German Chemists, 2020). At the same time, only 175 - 249 business foundations are founded in the chemical industry each year. In order to check whether there is a potential for more business foundations, this paper uses the established method of the Total early-stage Entrepreneurial Activity (TEA rate) to calculate the theoretical number of start-ups.

GENERAL PART

Chemistry is part of almost every value chain and all physical products. As a result, the opportunities for chemical entrepreneurship and innovation are analogously available (Abigail, Jeslin, Vijayarangan, & Rakhi, 2022). Against this background, global challenges such as human health, crop production, energy production or storage, the security of water supply or climate

change can only be solved with chemical innovations (Confalone, 2014) (Sachse & Martinez, 2016).

Foundations for companies within the chemical industry amount to 175 - 249 companies in the period 2016 - 2019 (Haubold & Calhanoglu). An important source of business foundations is the creation of university spin-offs (Yamamoto, Miyata, & Kameyama, 2012). A university spin-offs (USO) is defined as a new company founded by faculty members based on intellectual property from their research. This allows university technologies to be disseminated and commercialized by academic entrepreneurs. By localizing knowledge, university spin-offs are described as a local phenomenon and thus offer a contribution to industry formation and economic dynamism (Hayter, 2013).

METHODS

The theoretical number of start-ups can be calculated based on the number of chemistry graduates from Germany for the period under consideration (statistics on chemistry degree programmes from the Society of German Chemists 2016-2019) multiplied by the averaged Total early-stage Entrepreneurial Activity (TEA rate) for student activities from the Global Entrepreneurship Monitor Reports (2016 - 2019) for Germany divided by onehundred. The TEA rate of Germany was 4.2 %. The calculation is analogous to formula 1.

$$\text{theoretical business foundation} = (\text{number of graduates (degree program/year)} * \text{TEA rate}) / (100\%)$$

Formula 1: Calculation of theoretical business foundations

RESULTS

The results for the actual number of start-ups in comparison to the theoretical number of startups calculated by the TEA rate for the chemical industry for the years under consideration can be found in Figure 1. In addition, Figure 2 provides a breakdown of theoretical start-ups by degree.

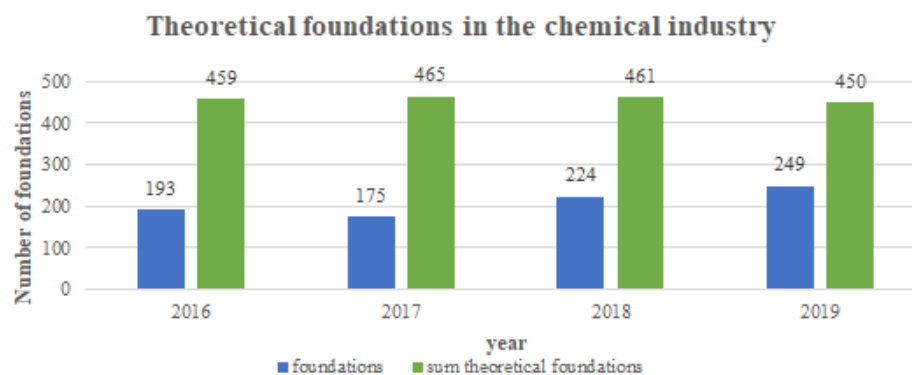


Figure 1

“FOUNDATIONS” = ACTUAL NUMBER OF START-UP DERIVED FROM THE ZEW-DATABASE, POTENTIAL FOR BUSINESS FOUNDATIONS IN GERMANY BASED ON THE STUDENT TEARATE AND CHEMISTRY STUDENTS ACCORDING TO THE GERMAN CHEMICAL SOCIETY (GDCH).

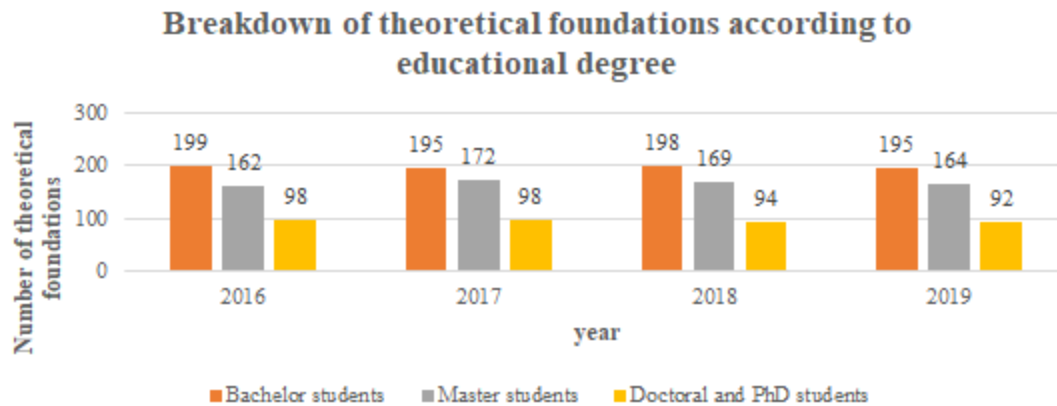


Figure 2

POTENTIAL FOR BUSINESS FOUNDATIONS IN GERMANY BASED ON THE STUDENT TEARATE AND CHEMISTRY STUDENTS ACCORDING TO THE GERMAN CHEMICAL SOCIETY (GDCH) BREAK DOWN BY DEGREES.

The results show a comparable number of theoretical business foundations for Bachelor & Master students in Germany for the period under consideration with practical foundations.

The sum for all students per year shows a clear potential for foundations within the chemical industry in Germany. The potential lies between 201 - 290 foundations, which leads to the conclusion that the number of foundations in the chemical industry in Germany is generally X% lower than it could be according to the GEM reports and the TEA rate for student activities. The results by degree show a declining potential for higher degrees, which can be explained by the lower student numbers, respectively. According to literature the reasons for the difference in theory and practice could be being demographic factors, contextual factors and personality traits (Teixeira, 2008). Contextual factors include cultural, social, economic and political environmental factors (Haase & Lautenschläger, 2011). The factors of personality traits are defined, for example, in the Theory of Planned Behaviour (TPB) (Ajzen, 1991). This model is composed of three predictors, attitude, subjective norm and perceived behavioural control. Attitude towards behaviour is defined as a personal conviction towards a certain behaviour and the evaluation of it. As the second predictor of the TPB, the subjective norm is defined as the social pressure that people in the close environment have an opinion about the behavioural performance. Perceived behavioural control as the third predictor is defined as personal perception of the feasibility of a behaviour. This predictor refers to non-motivating factors such as opportunity or resources (e.g. time, money, skills and support of others) that are available to an individual.

DISCUSSION

In Germany, chemistry students show a 54 % reduced interest in starting their own business than the average student. It remains unclear of why that is and what measures could be to improve the interest in starting something of their own amongst said group of students. In order to develop a strategy for more start-ups in the chemical sector, a survey of chemistry students asking about the motivators and inhibitors towards starting a business should be performed. Therefore the following hypotheses was formulated:

H1: Chemistry students show a 54 % reduced interest in starting a company than the average student in Germany.

H2: If the motivators and inhibitors of chemistry students towards starting their own business where known, measures could be developed to increase the number of chemistry start-ups in Germany.

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