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CONTENTS

Formal and Informal Institutions, and FDI Flows: A Review of the Empirical Literature and Propositions for Further Research

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ABSTRACT: *The aim of this paper is to firstly, summarize the empirical literature dealing with the relationship between formal and informal institutions on one side and foreign direct investment (FDI) on the other, and secondly, to propose a possible path for further progress in the field. The main proposition of the paper is that when formulating hypotheses, the empirical research on the institutions-FDI nexus should rely (to a greater extent) on the theories from institutional economics, more specifically on the theory of institutional stickiness (Boettke et al., 2008) and the hierarchy of institutions (Williamson, 2000), and the theory of coevolution of culture (informal institutions) and formal institutions (Bisin and Verdier, 2017). Within the framework of these theories, the paper provides four suggestions as regards the manner in which further progress in the empirical research on the institutions-FDI nexus can be achieved.*

1 INTRODUCTION

Both the theoretical and empirical analyses on the FDI flows have long been in the forefront of economics research. This lively interest is well justified by the enormous positive impact the incoming FDI exerts on the economic development of the host country, as documented in particular by Iamsiraroj (2016), who proves the existence of a virtuous cycle suggesting that FDI contributes to economic growth which in turn attracts more FDI.[2] In this spirit, attracting more FDI has become a crucial goal in the economic policy of many developing countries, meaning that the question of what factors lead to more FDI inflows has gained not only economic policy interest but significance as well.

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2 Note that a couple of empirical studies have provided mixed evidence on the growth effect of FDI; see Azman-Saini et al. (2010) for a brief review of the negative or zero effect.

Answers given to the above question are largely based on empirical investigations, mostly of a cross-country regression type, which report the importance of various "traditional" factors such as market size, growth prospects, macroeconomic stability, macroeconomic policies, tax regime, labor cost, level of the infrastructure, agglomeration economies, trade policy, exchange rate policy, etc.[3] However, the literature is not only extensive but controversial as well, which is evidenced in Chakrabarti's (2001) extreme bound analysis. According to the latter, only the "market size" variable survives a sensitivity analysis, while all the other variables, found to be determinants of FDI in previous studies, are proven to be sensitive to small changes in the conditioning information set.

With the aim of finding more solid factors attracting FDI, institutional explanations have recently been enjoying a period of growth. This line of research is primarily advocated, firstly, by the literature proving the positive impact of various "good" institutions on economic development (e.g. Acemoglu et al., 2001), and secondly, by the literature on the development-enhancing impact of culture[4] (e.g. Tabellini, 2010). From the perspective of this literature, FDI is one channel through which formal and informal institutions can promote development. What is more, different scholars provide evidence for the beneficial effect of different institutions.

The aim of this paper is to summarize the empirical literature dealing with the relationship between formal and informal institutions, and FDI, and to propose a possible path for further progress in the field. The main proposition is that when formulating hypotheses, the empirical research on the institutions-FDI nexus should rely, to a greater extent, on the theories from institutional economics, namely the theory of institutional stickiness (Boettke et al., 2008) and the hierarchy of institutions (Williamson, 2000), as well as the theory of coevolution of culture and institutions (Bisin and Verdier, 2017). Within the framework of these theories, the paper provides four suggestions as regards how to advance in empirically investigating the institutions-FDI nexus.

In my review, my focus is restricted to only those papers in which the dependent variable in the empirical analysis is a measure of FDI (inflow or stock), while at the same time admitting that both formal and informal institutions have an impact on other "characteristics" of multinational firms in a foreign country.[5]

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3 It is beyond the scope of this paper to summarize the vast literature on the "traditional" determinants of the FDI movements; a review can be found in Blonigen (2005).

4 When it comes to informal institutions included in empirical investigations, scholars use, almost exclusively, culture with an equivalent meaning. While admitting that the Northian conceptualization of informal institutions (North, 1991) cannot be fully equated with that of culture, which is part of informal institutions, the two concepts are used as synonyms in the paper, as they are in the literature in question too.

5 Amongst these "characteristics", the choice of entry modes between wholly-owned companies or joint ventures (shared ownership) in the host country is probably the most frequently researched (e.g. Kogut and Singh, 1988).

The rest of the paper is organized as follows. In Section 2, the literature analyzing the link between formal institutions and FDI is summarized. Section 3 deals with the empirical literature on how informal institutions (culture) affect the FDI flows. A critique of the literature together with my personal propositions on how to make further progress in the research are provided in Section 4, while Section 5 concludes the paper.

2   THE FORMAL INSTITUTIONS-FDI NEXUS

There are several reasons to think that high-quality institutions, e.g. low corruption, secure property rights, low political risk, low-level of bureaucracy etc., attract more FDI. The literature, except for some very rare cases, documents this by showing a significant positive impact of various "good" formal institutions on FDI.[6] The papers evidencing a significant impact of formal institutions seem to have been converging to show the importance of in particular the following institutions: (1) corruption, 2) governance and regulatory institutions, 3) political institutions (civil and political rights) and political risk. In what follows, I summarize the literature as centered on the above institutions. In each subsection, the studies are distinguished based on whether they address a *general* or a *specific* question about the impact of the particular formal institution. The general question refers to *whether* the individual institution has an impact on FDI, however, the specific question of the paper is about *how* this same institution exercises its effect.

2.1.   Corruption

Among formal institutions, corruption has frequently been proven to be an impediment to the inward FDI. Bearing in mind that the literature on corruption has provided us with the knowledge that corruption *does* affect investments in general (e.g. Lambsdorff, 2003), it is not a surprise that almost all investigations in the field look into a specific question about its impact on FDI, which contributes greatly to our understanding of this effect.

One obvious specific question that consequently arises is how corruption affects the composition of capital inflows, i.e. FDI versus borrowing from a foreign bank. Wei (2000) is an important paper addressing this issue. Relying on an econometric specification based on a simple optimization problem faced by multinational firms, his main finding is that corruption exercises an impact both on the volume and composition of capital inflows in the host country. In other words, on the one hand, corruption reduces the inward FDI, and on the other, it distorts the composition of capital inflows towards foreign bank loans. Focusing on a specific group of countries, namely transition economies, Smarzynska and Wei (2000), by using the EBRD firm-level data for the period 1989-1995, demonstrate a slightly different impact, namely corruption has a negative impact on the inward FDI,

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6 Amongst the rare cases not supporting the importance of formal institutions in attracting FDI, it is worth mentioning Wheeler and Mody (1992) who look at the US outward FDI location decisions in the 1980s. What the two scholars identify as affecting factors are the "traditional" variables and agglomeration benefits.

however, it shifts the ownership structure towards joint ventures, and the latter is exactly the opposite of Wei's (2000) finding.

Aizenman and Spiegel (2006) investigate the effect of corruption across various income categories. They use the index of corruption in a broader context to express institutional inefficiency on a sample of 97 countries, 28 of which are designated as low-income and 48 of which are designated as mid-income. Irrespective of the income category, the institutional variable (corruption) is always significant in the regressions, except for when investment cost is included.

Of course, various types of FDI may be influenced by corruption in different ways. In this spirit, Brouthers et al. (2008) distinguish three types, namely the market-seeking, labor-seeking and raw materials-seeking FDIs, and provide novel insights into corruption's role in the FDI flows. The results indicate that the negative effect of corruption is mitigated by the high attractiveness of the market when it comes to the market-seeking FDI, while in the case of the labor-seeking and raw materials-seeking FDIs, greater attractiveness on the contrary does not compensate for higher corruption.

Egger and Winner (2006) go further and provide a more nuanced picture on the corruption-FDI relationship by showing that the effects of corruption on FDI are different across countries of different sizes and levels of development, and over the course of time. More importantly, Egger and Winner (2006) argue that while the overall effect of corruption is negative, it at the same time matters for the intra-OECD FDI and does not matter for the extra-OECD FDI.

Focusing on the Japanese investments, Voyer and Beamish (2004) differentiate between groups of host countries, namely emerging and industrialized ones, and find differing evidence for the FDI-corruption link. In practice, for the sample of all the 59 countries the relationship is positive and significant, as it is for the emerging countries, however, the relationship does not prove to be significant for the industrialized countries. Although Voyer and Beamish (2004) rely only on the simple OLS regressions, a method which can be contested in many respects, the results are nevertheless worth mentioning because they indeed signal the heterogeneity of findings.

Habib and Zurawicki's (2002) study is novel in the sense that it includes a variable of corruption distance (calculated based on Kogut and Singh (1988) with Hofstede's (1980, 2001) scores) besides the host country's corruption level. By analyzing the bilateral FDI flows from 7 developed countries to 89 countries in OLS and probit regressions, both variables are found to exercise a significant negative effect on FDI.

By using a non-parametric analysis as well, Barassi and Zhou (2012) provide more nuanced results on the corruption-FDI nexus. More specifically, besides reaffirming the common

view that the effect of corruption is negative on the likelihood of FDI taking place, the two scholars stress and prove the view that the relationship between corruption and FDI is not homogenous for different quantiles of the FDI stock distribution. In particular, in the top percentile the effect of corruption is not negative after controlling for other factors.

By separating corruption into two types, Cuervo-Cazurra (2008) looks deeper into the question of how corruption affects FDI. His idea is that on the one hand, different types of corruption exert different effects, and on the other, these effects can differ depending on the characteristics of the economic system of the host country. In this spirit, Cuervo-Cazurra (2008) distinguishes between pervasive and arbitrary corruption, and compares the effects of these kinds of corruption in general with those in transition countries. Using a gravity framework[7] for 1999, he finds that while both types of corruption have a negative impact on FDI in general, pervasive corruption has a larger negative impact in transition countries than in other countries, while arbitrary corruption on the contrary has a smaller negative impact there than in other countries. The reason behind these findings is related to a more nuanced view on corruption, namely corruption is perceived as "sand in the wheels of commerce" as opposed to "grease in the wheels of commerce", implying that in quasi-market economies corruption can facilitate transactions (grease). This explains why transition economies "enjoy" relatively high FDI inflows while having a relatively high level of corruption at the same time.

Another paper to argue for the possible positive association between corruption and FDI is Egger and Winner (2005). As the authors argue, "in the presence of regulations and other administrative controls, corruption can act as a "helping hand" to foster FDI" (in ibid p. 933) since paying bribes may speed up bureaucratic processes and provide access to publicly financed projects. As a result, the "helping hand" influence of corruption may occur in the longer run as opposed to its short-run "grabbing hand" influence. Besides these theoretical considerations, Egger and Winner (2005) also think that the negative link found by previous studies is due to the cross-section type of the regression analysis and the negligence of the endogeneity of corruption.

Not satisfied with the somehow inconsistent results of previous studies, Bailey (2018) investigates very important specific questions in his meta-analytic regression analysis. As a result, he is able to reconfirm the negative link between corruption and FDI, but more importantly, his results suggest that the deterrent impact of corruption is much stronger in developing countries than in the developed ones, as well as in Asian countries rather than in Europe or North America.

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7 The gravity model framework was designed originally for an analysis of international bilateral trade, but has been extended later to that of FDI flows. The model is built upon the idea that bilateral FDI (trade) depends positively on the size of the two economies, and negatively on the distance between them. Typical additional variables included in a gravity specification are income per capita, openness of the host country, and dummies indicating whether the two countries have a common border, a common language, or a past colonial link.

In a unique paper (Pajunen, 2008), providing a fuzzy-set analysis, the author adds more nuances to our understanding of how corruption affects FDI. He determines which factors are a sufficient cause for a country to be classified as FDI-attractive or FDI-unattractive. Among less developed countries, the lack of corruption alone is found to be a sufficient cause for a country to be FDI-attractive, while this factor on the contrary is not as important for developed countries.

As can be concluded from the above review, while the majority of scholars find a negative relationship between corruption and FDI, the opposite link cannot be ruled out either. Of course, many factors can contribute to the lack of unanimity on the negative association, such as the use of different measures of corruption, or of different econometric models and different samples of countries, which underlines the need to find new routes in the research field, in order to be able to produce more solid results.

2.2. Governance and regulatory institutions

2.2.1. The "whether institutions matter" question

As mentioned in the introduction, the findings of the literature about the "traditional" variables to explain FDI have proven to be inconclusive, which has been a motivation for researchers to seek after other explanatory variables. Among them, various regulatory and governance institutions seem to be good candidates. Consequently not surprisingly, an important number of studies address the general question of whether these institutions have a significant impact on FDI flows.

Globerman and Shapiro (2002) are concerned with analyzing both the inward and outward FDIs on a large sample of countries for the second half of the 1990s. Their econometric model is rather *ad hoc*, in which the dependent variable is the FDI flow (inward or outward), while among the independent variables one can find indexes for human development and environmental sustainability besides an institutional index (first principal component of the WGI indices) and some control variables. The results indicate that both the inward and outward FDI flows are affected by the same factors, amongst them governance institutions which have a significant positive impact on both types of FDI.

In another paper, the two scholars (Globerman & Shapiro, 2003) look at whether governance institutions (measured by the WGI indices) are among the determinants of the United States (US) outward FDI. Their empirical analysis occurs in two steps. First, they estimate the probability that a country is a US FDI recipient, and find that this depends on whether the country meets a minimum threshold for institutions. In the second step, Globerman and Shapiro (2003) focus only on the recipient countries and examine the factors affecting the amount of FDI. According to their results, governance institutions prove to be among the strong determinants of FDI.

More recently, the impact of governance institutions on FDI has been analyzed within the framework of the gravity model, which allows for controlling for both countries' institutions. Daude and Stein (2007) is an important paper that takes advantage of the gravity model when it comes to robustness checks. This paper analyzes the impact of formal institutions on the FDI location decisions by using the WGI indices. Their baseline specification follows Carr et al. (2001)'s work, which is an empirical model built upon a theoretical model of location of multinational enterprises. Their cross-country setting for 2002 controls for the size of the host and source countries, the difference in their size, as well as relative factor endowments, trade cost and investment cost. The authors find that not all institutions are equally important for FDI, namely regulatory quality, government effectiveness, and political stability matter the most, which is reaffirmed by the IV estimations. Daude and Stein (2007) provide several robustness checks. First, they use a transformation of the dependent variable to deal with the problems of the zero FDI[8], secondly, they apply different models such as the gravity model, and thirdly, they in addition use different estimation techniques, including pooled OLS, random effect, and Poisson regression, and finally, they substitute the WGI data with different institutional measures. At the end of the day, the results have proven to be robust.

Bénassy-Quéré et al. (2007) is an ambitious paper in trying to provide further evidence as regards how formal institutions affect the FDI movements. By relying on the gravity model, the authors intend to take into account both the host and the source countries' institutions, and take advantage of the possibility of using the bilateral FDI stocks. In addition, they intend to tackle multi-collinearity and endogeneity problems. Besides the usual gravity variables, Bénassy-Quéré et al. (2007) include a measure for institutional quality for both countries and at the same time, a measure of institutional distance between the two countries, calculated from the Institutional Profiles database which contains data about public governance, market freedom, security of contracts and regulation. To deal with the potential endogeneity of institutions, they apply IV estimations. The gravity model reconfirms the findings of previous studies: all gravity variables are significant and the fitness of the model is high. The institutional variable is positive and significant in this model. The authors also run cross-country regressions, which is done in three steps to tackle the collinearity of GDP per capita and FDI. In this setting, Bénassy-Quéré et al. (2007) are able to show that institutions play an independent role in promoting FDI and that institutional distance reduces FDI.

Although the indices of economic freedom are among the most frequently used institutional measures in the institutional economics empirical literature, they are very much missing in the studies analyzing the FDI-formal institutions link. However, in a recent paper, although focusing on the FDI-growth nexus, Iamsiraroj (2016) uses this index to check whether good institutions attract more FDI. On a sample of 124 countries for the period 1971-2010, by using the simultaneous system of the equations approach

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8 The dependent variable is the logarithm of the FDI bilateral stock, which is problematic if FDI is zero. See Daude and Stein (2007) on how to tackle this problem.

he finds that economic freedom has a significant positive effect on the FDI flows, besides openness and human capital.

Examining the institutional determinants of FDI in Central and Eastern European transition countries has been a quite popular endeavor. For instance, Kinoshita and Campos (2003) look at 25 transition countries between 1990 and 1998. The paper distinguishes three categories of the FDI affecting factors: country-specific advantages (e.g. low-cost labor, skilled labor force, proximity to the Western European markets), formal institutions (rule of law and the quality of bureaucracy and governance), macroeconomic policies (e.g. inflation, budget deficit, trade liberalization), and agglomeration economies. Using fixed effects and GMM models, Kinoshita and Campos (2003) regress the per capita FDI stock on the above three broad categories of variables. The main finding is that the most important determinants of the FDI location are the formal institutions and agglomeration economies. The conclusion of Bevan et al. (2004) is very similar for this group of countries. However, to express governance and regulatory institutions, Bevan et al. (2004) use an index developed by the European Bank for Reconstruction and Development, namely the aggregate transition index, and its sub-indices.

When it comes to Asia and Latin America, Gani's (2007) panel estimates show that governance indicators are positively linked to FDI. Bengoa and Sanchez-Robles (2003) focus only on Latin America by using both fixed and random effect models. This paper documents the positive impact of institutions proxied by an index of economic freedom on the share of FDI within GDP. The Middle East and North Africa (MENA) countries form another group towards which FDI flows are worth investigating. As an example, Daniele and Marani (2007) examine the role of institutional quality (measured by WGI indices) on FDI, unfortunately using only the cross-country OLS technique. Their regression results indicate that institutions play an important role in the relative performances of countries in attracting FDI, and call attention to the need for institutional reforms in order to improve the attractiveness of MENA countries. On a sample of 15 Asian countries for the period 1996-2007, Mengistu and Adhikary's (2011) results confirm the positive significant impact of all variables of WGI, except for regulatory quality, voice and accountability.

2.2.2.   Specific questions about the impact of governance institutions

Having more evidence on the impact of governance and regulatory institutions on FDI, scholars are becoming concerned with more specific questions.

Among the few papers dealing with institutional distance, Cezar and Escobar (2015) look at the link between institutional distance and both the volume of FDI and the likelihood that a firm will invest in a foreign country. The empirical model is based on the idea that firms in the host country face adaptation costs which depend on the institutions of the host country. The institutional distance variable is calculated from a composite index of 13 indicators from Doing Business, mainly expressing the regulatory framework of a country.

The results from a gravity model indicate that a greater institutional distance reduces both the volume of FDI and the likelihood of the investment. In addition, Cezar and Escobar (2015) find that the results are similar for OECD and non-OECD countries, but different for inward and outward FDI.

The impact of institutional distance, together with that of the levels of institutions is also investigated in Kuncic and Jaklic (2014). One novelty of the analysis lies in the use of a new institutional dataset provided by Kuncic (2014), which distinguishes three types of institutions, namely legal, political and economic. Another novelty of the mentioned study is the inclusion of informal institutions–although their meaning is reduced to liberal or non-liberal public opinion–together with formal institutions in the regression analyses based on a gravity framework. For a sample of 34 OECD countries for the period 1990-2010 Kuncic and Jaklic (2014) evidence that except for economic institutions, institutions matter for FDI. On the one hand, legal institutions in the origin country exercise a positive, while on the contrary political institutions exercise a negative, impact on foreign investments. On the other hand, distances in these two institutions have a significant negative effect. When it comes to informal institutions–included together with formal institutions in the regressions–the two scholars find it is only non-liberal public opinion that matters.

Buchanan et al.'s (2006) paper is unique within the literature in the sense that besides the impact of the governance institutions on FDI, the authors also look at how institutions affect the volatility of FDI. Based on a panel of data for 164 countries from 1996 to 2006, they not only reconfirm the findings of other papers, namely the positive and significant impact of institutions (measured by the first principal component of the WGI indices) on the FDI levels, but also show a significant negative link between institutions and the FDI volatility.

It is very rare, if not unique, in the literature to look at whether either the impact of institutions is conditional on any other factor, or the impact of another factor is conditional on institutions. Okada (2013) is concerned with such an investigation, and looks at the interaction between the institutional quality and financial openness in a system GMM setting. His main finding is that while these two factors are not significant determinants of FDI when entering the regression individually, their interaction term is significant with a negative sign. This means that the partial effect of financial openness on FDI increases with the level of institutional quality, and the threshold level for institutions between negative and positive partial affects is a 30th percentile in the sample. On the other hand, the partial effect of institutions on FDI depends on financial openness, namely countries with higher financial openness benefit more from institutions.

In a recent paper, as opposed to the linear association of institutions and FDI prevalent in the literature, Kurul (2017) assumes a nonlinear relationship between these two. To control for this nonlinearity, he applies a dynamic panel threshold model, which allows him to determine whether a certain level of institutional quality–measured by the

principal component of the WGI indices–should be reached for a country to attract more FDI. His results on a sample of 126 developing countries over the period 2002-2012 provide evidence that the threshold exists. Furthermore, it is also demonstrated that when institutional quality is better than this threshold value, the FDI inflow measured by the net FDI inflow as a percentage of GDP is higher. Unfortunately, no information is given about the extent to which institutions have to be "good" to attract more FDI.

Besides reaffirming the view that institutions are robust determinants of FDI, Ali et al. (2010) provide additional insights as regards which institutions matter the most and which sectors are sensitive to institutional quality in attracting FDI. Their results from a random-effects panel analysis for 69 developing countries for the period between 1981 and 2005 evidence that institutional quality (as measured by the investment profile and law and order of the International Country Risk Guide (ICRG) dataset) does not matter equally for all sectors, namely it exerts a robust impact in manufacturing and services sectors, but not in the primary sector. What is more, the property rights security proves to be the most important determinant of FDI because once controlled for, other institutions lose their significance.

Sen and Sinha (2017) also ask a very specific question about how institutions affect FDI by taking into consideration sectorial differences in the relationship specificity of the investment. Their paper looks at the US outward FDI to 50 countries for the period 1984-2010, and applies the difference GMM estimator technique. The main finding is that the US multinationals are likely to invest more in the sectors in which the investment is relation-specific if the host country's property rights are well protected, otherwise they invest in the sectors with a low-level of relation-specificity.

A novel aspect of the analysis of the impact of institutions on FDI is explored by a very interesting paper by Aleksynska and Havrylchyk (2013). Their paper is motivated by the appearance of new global investors from emerging economies (South) such as China. In their regression analyses based on the gravity model, the two scholars look at whether investors from the South invest differently from their Northern counterparts, and whether the FDIs from the South and from the North are complements or substitutes. The results provide us with more nuanced insights into how institutional distance matters to investors. First, a greater institutional distance between the origin and the host countries deters investors from the North. Second, for investors from the South a greater institutional distance may have a heterogeneous effect, namely if a Southern country invests in a country with better institutions, larger distance stimulates FDI, however, if a Southern country invests in a country with worse institutions, i.e. the destination country is from the South as well, a greater institutional distance deters. At that point Aleksynska and Havrylchyk (2013) dig deeper and find that this deterring effect of worse institutions is counterbalanced by the greater attractiveness of investing in a Southern country (with worse institutions) arising from the abundance of natural resources. The authors also evidence that the FDI from the South tends to be complementary to the FDI from the North, so there is no competition

between them. All in all, this paper is the first to show that the FDI flows from developed and emerging countries are driven by different institutional factors.

As in the case of corruption, Bailey (2018) provides valuable new insights into the impact of institutional quality on FDI. While the positive association is confirmed, he documents the differences in the strength of this impact, on the one hand, between the developed and developing countries, with a stronger impact in the developed countries, and on the other hand, between the Asian and other countries, with a stronger impact in Asia.

In the same way, the analysis of Panjunen (2008), which also looks at the effects across different regions and developed versus developing countries, help us clarify why earlier studies produced heterogeneous results. His fuzzy-set analysis shows that the impact of regulatory institutions matters in all groups of countries, i.e. South American, Southeast Asian, Central and Eastern European, but they have to be combined with various other factors for a country to be seen as FDI-attractive. For instance, in the CEE countries regulatory institutions alone are not sufficient, as they only work together with democratic institutions and low corruption. However, in Southeast Asia they have to be combined with low taxation as well to make a country attractive to foreign investors.

2.3.   Political institutions

A number of papers deal with the question of whether foreign investors have a preference for countries with democratic political institutions. The findings of various studies converge to the view that democratic institutions are favorable for FDI, despite the fact that the studies use different measures of democracy or have different samples and econometric specifications.

By using both cross-section and panel settings for 114 countries, Jensen (2003) evidences that the democratic institutions in the 1980s affected FDI in the 1990s, which is perfectly in line with his theoretical reasons about why democratic governments are seen as more credible in the eyes of foreign investors[9]. Harms and Urpsrung's (2002) findings also support this result. They use the Freedom House's index of democratic and civil rights in both the cross-country and panel settings for 62 emerging and developing countries for the period between 1989 and 1997, and show that these rights have a significant positive effect on FDI. Busse (2004) is another study echoing the fact that FDI is attracted by countries where democratic and civil rights are protected. In fact, in the period 1972-2001, countries with improving democratic and civil rights attracted more FDI than would have been predicted on the basis of other country characteristics. Fukumi and Nishijima (2010) examine a panel of 19 countries in Latin America and the Caribbean by applying a simultaneous equation approach. They find that better political institutions measured

9 Jensen (2003) highlights two reasons. First, the presence of veto players contributes to the stability of the political decision-making system. The second is the "audience cost", meaning that democratic leaders may suffer from a loss of electoral support if they renege on their promises to foreign investors.

by the political rights index of the Freedom House attract more FDI, but at the same time, the FDI contributes to improving political rights as well. Tintin (2013) looks at the CEE transition countries and finds that political and civil rights, together with economic freedom and state fragility, affect FDI from various countries (EU-15, Japan, China, US) in a positive and significant way. However, he also reveals some differences in the institutional determinants of the FDI across the investor countries.

It is quite rare to look at the FDI flows into different sectors of the economy, although one can intuitively think that the FDI influencing factors may vary across different sectors. Kolstad and Willanger (2008) provide such an analysis for the service sector of 57 countries for the period 1989–2000. The results of the fixed effect estimation evidence that democracy, as measured by the ICRG index of democratic accountability, has a positive significant impact on FDI. Nevertheless, when it comes to the robustness of these results, it turns out that the above effect is not very robust to changes in the sample of countries and to different estimation techniques. When looking at particular service sectors, Kolstad and Willanger (2008) find conflicting evidence, more specifically, in the finance and transport sectors the role of democracy seems to be missing.

Besides the political and civil rights, political risk is another variable with regard to which the "whether" question is asked. Although a number of studies include a political risk measure in the regression analysis as a control variable[10], only a few studies deal explicitly with its effect. Busse and Hefeker (2007) focus on the role of political risk by using the ICRG data on the various aspects of political risk in the regression analysis on a sample of 83 developing countries covering the period from 1984 to 2003. By applying both cross-country and panel regressions, including fixed-effects and GMM estimators, they find that almost all components of the political risk measure are highly significant determinants of FDI. Some studies try to establish the link between FDI and political risk only for a particular group of countries. Asiedu (2002), for instance, focuses on sub-Saharan Africa and finds that neither the political risk nor the expropriation risk has a significant impact on FDI, implying that Africa is *different*.

Several papers go further by addressing specific questions about the impacts of political rights on FDI. For instance, Li and Resnick (2003) explore the channels through which political rights exert their impact on FDI, by providing many theoretical grounds for the link. Particularly, they highlight the role of one such channel in the empirical investigations, namely the protection of property rights. Their theory suggests that democratic political institutions may exert two conflicting impacts on FDI: a positive and a negative one. The

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10 An early attempt in the field is Gastanaga et al. (1998) who together with institutional variables such as contract enforcement and corruption include the nationalization risk in the regressions and find that it affects FDI negatively. Dutta and Roy (2011) examine the role of political risk implicitly by looking at its role in the association between financial development and FDI. The major finding is that for each level of political risk the inverted U-shaped curve depicting the relationship between financial development and FDI shifts upwards; accordingly, the threshold level beyond which the impact of financial development becomes negative corresponds to even higher levels.

positive effect works via property rights protection, namely an increase in democratic rights in developing countries yields better property rights thus encouraging FDI flows. But after controlling for democracy via property rights protection, democratic institutions reduce the FDI inflows, which is, as they put it, a kind of "reversal of fortune".[11] This view is contested by Jakobsen and de Soysa (2006), who report that the negative and significant association between democracy and FDI vanishes if they add more countries to the sample of Li and Resnick (2003). In addition, when using the logged value of the FDI inflows, the negative effect of democracy becomes positive and significant.

The conjecture that democratic institutions may discourage FDI, a thesis partly evidenced by Li and Resnick (2003), is further corroborated by Adam and Filippaios (2007). The two scholars look at the US FDI flows in 105 developing countries for the period 1989-1997 by assuming that democracy is not one-dimensional and that different dimensions may affect FDI in a different way. In this spirit, Adam and Filippaios (2007) examine the impact of civil and political rights separately. As for political rights, they reaffirm the results of the above studies, but when it comes to civil rights, their results are novel. They establish that there exists a threshold level for civil rights below which repression of civil liberties is associated with more FDI, meaning that the relationship between civil rights and FDI is non-linear.

Asiedu and Lien (2011) is an important paper which digs deeper in the analysis of how democracy (political institutions) affects FDI. The novelty of this study lies in asking the question of whether natural resources in the host country alter the effect of democracy documented by the above-mentioned studies. Asiedu and Lien (2011) reassess the link between democracy and FDI by taking into account the interaction between democracy and natural resources, and the possible reverse causality between FDI and democracy. Using the difference and system GMM estimators, the authors provide evidence for their suspicion, namely the effect of democracy on FDI depends on the importance of natural resources in the host country's exports, more precisely, democracy encourages FDI in those countries where the share of natural resources within exports is low and reduces FDI in the countries where exports are dominated by natural resources.

Complementing the results of the above studies, highlighting the role of political and civil rights as the determinants of FDI, Wisniewski and Pathan (2014) investigate more subtle differences in political institutions. In particular, they analyze whether foreign investors have a preference for leftist executives, presidential systems and for countries where the executive's party controls all houses of the parliament, and where the ruling party is in power for a longer period. The results add some new knowledge regarding the

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11 Oneal's (1994) analysis on the question of whether multinationals benefit materially from autocratic regimes is somewhat similar to the negative impact of democracy on FDI found by Li and Resnick (2003), because he found that US multinationals achieved higher rates of return in autocracies during the period 1950-1985, and that FDI is not significantly related to this regime type.

attractiveness of a country, namely continuous competition in the political arena together with democratic traditions makes a country more attractive for FDI.

Bailey's (2018) recent meta-analysis on the results of 97 previous studies nuances the conflicting results documented by other scholars such as Li and Resnick (2003). When distinguishing between developed and developing countries, Bailey (2018) finds that democratic institutions "behave" differently, i.e. they exercise a positive significant impact on the FDI in the developing countries, while their impact is negative, but not significant, in the developed countries. This finding clearly provides support for the claim that researchers have to ask very specific questions instead of general ones.

3.   HOW INFORMAL INSTITUTIONS AFFECT FDI

When it comes to the informal institutions-FDI link, the vast majority of papers center on culture (see footnote 3), which is taken into account in two ways, that is in terms of the "level" of culture and cultural distance.[12]

Several papers asking the "whether" question have not brought too much insight. For instance, Davidson (1980), relying on a very simple methodology of country-pair entry frequencies, argues that cultural similarity encourages direct investments, which is a somewhat everyday observation. By focusing on institutions, Habib and Zurawicki (2002) also include the cultural distance variable in the regression, however, the authors do not consider it important and leave it outside further investigations. Another simple analysis was done by Jones and Teegen (2001) who restricted their attention only to FDI in the field of research and development (R&D) from the perspective of US firms. The paper documents a limited role of culture in the R&D activities. Mac-Dermott and Mornah (2015) provide only a qualitative analysis of the GLOBE cultural data (House et al. 2004) on FDI by pairing high and/or low levels of various cultural dimensions between the host and source country that attract FDI. Grosse and Trevino (1996) explore the factors affecting the US inward FDI by country of origin, but they do not document the significant impact of cultural distance except for one specification. No significant association between cultural proximity and FDI is found by Voyer and Beamish (2004) for Japan. When analyzing trends in the US FDI location, Sethi et al. (2003) find that cultural distance as measured by Hofstede's scores exerts a significant negative impact on the FDI flows.

Nevertheless, a couple of studies provide us with more consolidated results by asking more specific questions. Bhardwaj et al. (2007) examine the impact of two cultural variables, that is the uncertainty avoidance (Hofstede 2001) and the trust from the World Values Survey (WVS), as well as their interaction effect on FDI. The results confirm their hypotheses, namely a higher level of uncertainty avoidance is associated with a lower inward FDI, and

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12 The most frequently used composite measure of cultural distance is introduced by Kogut and Singh (1988) based on Hofstede's (1980, 2001) cultural dimensions.

a higher level of trust is associated with a greater inward FDI. Furthermore, the authors report that the effect of trust is reduced as the country's uncertainty avoidance increases. Although the econometric methodology includes only cross-country OLS regressions and no robustness checks are provided, the merit of this paper lies in calling our attention to the complexity of the effects various cultural dimensions may have on FDI.

Unlike those scholars who have used a composite cultural distance measure, Tang (2012) assumes that the four dimensions of Hofstede (2001) might affect FDI activities differently. Accordingly, she investigates the effects of the dimensions separately. Her empirical strategy is based on a gravity model in which she includes the cultural distance variables for all four of Hofstede's dimensions, defined as the net difference between the source and host countries' scores. Besides including the usual gravity variables, Tang also controls for whether the host and source country have an agreement on the taxation of income and capital, the political environment of the host country, whether in the two countries the same language is spoken and whether they belong to the same trade agreement. According to the results, the Hofstede dimensions clearly exert different impacts on FDI. More specifically, FDI has a U-shaped relationship with the net difference in individualism[13] and an inverted U-shaped relationship with the net difference in power distance[14]. When it comes to the net difference in uncertainty avoidance and masculinity, the impact is negative.[15] Based on the results, Tang's final conclusion is that the "cultural difference does not always imply cultural conflicts" (in ibid p. 249).

To my knowledge, Siegel et al. (2012) provide the most scrupulous analysis on how cultural distance affects FDI. A distinctive feature of this paper is its strict reliance on theory when it comes to the conceptualization of culture itself, and its link with firm-level characteristics of the multinational firms' decisions about the FDI location. The conceptualization of culture comes from Schwartz's (1999) theory developed in cross-cultural psychology. As the authors argue, this theory offers a number of advantages vis-à-vis the other conceptualizations and measurements of culture, more particularly the theory of Hofstede (1980, 2001). As regards the mechanism via which cultural distance has an impact on FDI, Siegel et al. (2012) emphasize (uniquely) firm-level factors, most importantly the possible difficulty in interacting with stakeholders in the host country. Of Schwartz's three cultural dimensions, namely egalitarianism-hierarchy, embeddedness-autonomy and harmony-mastery, they associate only one dimension (egalitarianism-

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13 This implies that greater differences in absolute values have a positive impact on FDI, which shows a harmonious "marriage of difference" (p. 237). According to Tang (2012), this is caused, on the one hand, by the fact that when the FDI from a collectivist country goes to an individualistic country, the leadership style of the collectivist country can help accommodate the parent company in the local culture. And when the opposite direction of the FDI flow occurs, the host country's collectivist culture is favorable to mitigating the more individualistic (entrepreneurial) leadership style of the source country.

14 The reason behind this is related to the fact that the FDI flows from a low power distance country to a high power distance country can cause problems for the employees in the host country since they are accustomed to directives.

15 That is, FDI increases when it flows from a low to a high uncertainty avoidance (or masculine) country.

hierarchy) and one of its polars (egalitarianism) with the above firm-level factor. In this spirit, their main hypothesis is that the greater the distance in terms of egalitarianism between the source and the host country, the greater the adjustments the multinational firm has to make to engage effectively with its stakeholders.

The regression results based on gravity equations provide evidence for the significant negative link between cultural distance and FDI. The instrumental variable estimations, by using societal fractionalization, dominant religion, countries' 19th-century war history, and communist rule as instruments, reaffirm the main finding. Besides the significance of cultural distance, it has proven to be economically meaningful, namely a one-standard-deviation increase in egalitarianism leads to an 11.76% decrease in the log FDI. It is worth mentioning that cultural distance enters the regression in two forms, i.e. sheer (the square of the difference between the host and source country egalitarianism) and directional (with a positive or negative sign). Although Siegel et al.'s (2012) focus is on egalitarianism, as a robustness check the scholars also include embeddedness and harmony in the regressions and find they have a significant impact on FDI, together with egalitarianism. The results indicate that FDI moves from the low-embeddedness towards the high-embeddedness countries.

In a recent paper, on a panel of 29 source and 65 host countries for the period 1995-2009, Lucke and Eicher (2016) analyze the impact of a broad set of institutional and cultural determinants of FDI, but separately from one another. Besides including (institutional and) cultural distance between the source and host countries in the regressions, they also include the host country (institutions and) culture. Lucke and Eicher (2016) pay special attention to whether foreign investors invest differently in the developed versus developing and transition economies. Using the ethnic, linguistic and religious fractionalization of Alesina et al. (2003) to express cultural diversity, they find that investors prefer to invest in the developed countries with less or similar cultural diversity than their own, and are deterred by larger cultural distance. When it comes to developing countries as source countries, foreign investors tend to invest more in the less diverse countries than their own, and are attracted by large cultural distance.

Amongst the few papers including both culture and formal institutions at the same time in the analysis, Holmes et al. (2013), relying on the insight that culture shapes formal institutions, investigate the influence of culture on formal institutions, and then the effects of formal institutions on the FDI inflows. In-group collectivism and future orientation stand for the proxies for culture and data are taken from the GLOBE dataset (House et al. 2004), while to express the formal institutions they use four factors determined on the basis of a principal components analysis of 20 institutional variables from different institutional datasets. The results indicate that formal institutions affect both culture and FDI, however, there is no evidence that culture influences FDI.

Seyoum (2011) goes further into the issue of how culture and formal institutions affect the inward FDI by exploring both the direct and indirect impacts of culture on FDI, with the indirect impact mediated via formal institutions.[16] To measure trust and reputation, i.e. culture, Seyoum (2011) takes six indicators[17] from the World Economic Forum Global Competitiveness Report, and to measure institutions he uses the rule of law measure from World Governance Indicators. His cross-country regression results indicate on the one hand that trust and reputation have a significant and greater effect on FDI than formal institutions, and on the other, that informal institutions affect FDI in an indirect way as well, which is mediated by formal institutions. Although the very unusual proxy used for informal institutions (culture) and the lack of the robustness of the results may cast some doubts on the results, the merit of this paper lies in the fact that it looks at the impact of culture together with formal institutions.

Slangen and Beugelsdijk (2010) are unique in the literature in asking a very specific question and at the same time examining the impact of both the institutional and cultural hazards multinational companies face. The two scholars intend to look at the composition of FDI, more specifically, they ask the question of which hazard affects which type of FDI to a greater extent. The main result is that both hazards related to formal institutions such as high-level of bureaucracy and corruption, weak property rights protection or high political risk, and cultural distance exert a greater impact on the vertical FDI than on the horizontal FDI. Furthermore, the impact of institutions is greater for both types of FDI than that of the cultural distance.

To my knowledge, the only investigation addressing the issue of the interplay of institutions and cultural distance is Du et al. (2012). The paper analyzes how cultural distance from 6 countries affects their FDI in various Chinese mainland regions with different institutional quality. As the authors argue, cultural proximity may play an important role in mitigating the negative impact of poor institutions on FDI. Although the institutional variables do not come from well-established institutional databases but are instead calculated on the basis of private firms' answers in Chinese surveys, the results reveal a novelty within the relevant literature. More specifically, Du et al. (2012) are able to show that FDI coming from a country that is more culturally different from China exhibits higher sensitivity towards regional economic institutions in the FDI location choice.

Mondolo (2019) provides a meta-analysis of 20 empirical papers investigating the informal institutions-FDI link. She focuses on three types of informal institutions, namely

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16 Although he uses the term informal institutions and argues that culture and informal institutions are not the same, his understanding of informal institutions in terms of trust and reputation, in our opinion, makes him part of the culture-FDI literature since trust is clearly seen as (part of) culture in the literature (e.g. Tabellini, 2010).

17 These are as follows: ethical behavior of firms, importance of corporate social responsibility, strength of accounting and auditing standards, strength of corporate boards, firm dependence on professional management, and willingness to delegate authority within a firm.

corruption[18], trust and social network. Mondolo's (2019) findings from a meta probit model suggest that informal institutions do affect FDI, and their impact is especially relevant for developing countries. The author has also shown that the significance of informal institutions does not depend on whether studies use panel or cross-section data.

4   HOW TO PROGRESS FURTHER IN THE EMPIRICAL RESEARCH

As can be concluded from the summary in the previous chapter of the paper, the literature on the FDI-formal institutions nexus has provided us with much empirical evidence. The major finding of the studies is that "good" institutions such as low level of corruption, low level of expropriation risk, good governance etc. attract more FDI on their own. In addition, a number of specific questions which dig deeper into how these institutions matter for FDI have also been investigated.

And while the role of formal institutions in directing FDI has been analyzed to a considerable degree, it is however somewhat astonishing that an analysis of the role of culture or cultural distance in attracting the FDI flows is still in its early infancy. On the one hand, as can be seen from the above review, empirical examinations on the relationship between culture or cultural distance and the FDI flows are very limited in number, and on the other, several important aspects of how culture matters in attracting FDI have not yet been examined.

No doubt there is still a huge potential in (both formal and informal) institutions providing us with more knowledge about the attractiveness of different countries for FDI. In what follows I state what I think the main critique vis-à-vis the literature summarized above might be, which allows me to come up with four propositions as regards how to advance in empirically investigating the institutions-FDI nexus. In this spirit, I do not intend to criticize the literature from all possible angles, nor go into detail as regards all of its shortcomings. Instead, my aim is to identify the root problem the improvement of which can help us find fruitful ways forward in future research.[19]

My argument is that the root problem–from which many controversies apparent in the literature stem–is the weak link between the economic theory and empirical investigation. The research is driven by empiricism, and once a particular variable is found to exercise

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18 Note that Mondolo's (2019) procedure to consider corruption an informal institution goes against the view of the institutional economics literature in which corruption is primarily seen as a formal institution because it is "caused" by weak governmental institutions. For more details, see the papers reviewed in Section 2.

19 Of course, a number of general critiques can be stated, starting from the one that instead of the cross-country regressions which still dominate the investigations, panel techniques should have been used to a greater extent. In addition, the bilateral structure of the FDI flows would quite naturally require an empirical framework able to make use of this structure, i.e. the gravity framework. And when applying the gravity framework, an additional problem is that researchers consider a large set of variables, including those that are not justified by the gravity theory of international trade (FDI), thus making the empirical model inconsistent.

a significant impact on FDI, the results are explained *ex post*, which is like putting the cart before the horse. Instead, in my opinion research should be designed based on the principle of "theory first, empiricism after".

More particularly, empirical researchers should rely (to a greater extent) on institutional economics theories which can provide them with more solid (theoretical) grounds to formulate hypotheses about how both formal and informal institutions matter for FDI. In this respect, the theory of institutional stickiness (Boettke et al. 2008) and that of the hierarchy of institutions (Williamson 2000) are of particular importance, as both suggest that formal institutions are embedded in culture, or are in other words constrained by culture.[20] These two theories are closely connected to the theory of the coevolution of culture (informal institutions) and formal institutions (Bisin and Verdier 2017), which originates from the Hayekian theory and is generally accepted among economists. This theory sees formal institutions and culture as coevolving in an evolutionary process, mutually reinforcing one other. On the other hand, when designing empirical research we should rely to a greater extent on the ideas from the non-neoclassical approaches to culture, especially. In this respect, historical approaches to culture, such as are the insights of McCloskey (2015) or Mokyr (2017), are of key importance too. These theories are in line with the theory of the coevolution of culture and institutions. Accordingly, adopting this historical-evolutionary view of culture requires us, of course together with the institutional stickiness theory, to include both culture and institutions and their interaction term in the regressions, suggesting the following for the empirical strategy which should be adopted.

1. An analysis of the simultaneous role of formal institutions and culture

If we look at the literature, we observe that the impacts of culture and formal institutions are treated separately in explaining FDI movements, with the exception of very rare cases such as Du et al. 2012 or Kuncic and Jaklic 2014. However, when relying on the above theories, the question we should be asking is "How do formal institutions together with culture (in which they are embedded) attract more FDI?", instead of "How do formal institutions affect FDI?" and "How does culture affect FDI?". Besides the reliance on the existing theory, which is a merit in itself, the proposed procedure offers two additional advantages.

On the one hand, in the regressions the proposed procedure helps minimize the omitted variable bias which, unfortunately, characterizes many studies that include only a small number of explanatory variables, basically only those which the researchers' interest is focused on.[21] On the other hand, this procedure makes it possible to ask new specific

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20 As it is beyond the scope of this paper to go into details as regards these theories, see Boettke et al. (2008) and Williamson (2000) for details.

21 When applying the extreme bound analysis on previous studies, Chakrabarti (2001) also argues that leaving outside the variables that have been proven by other investigations to have a significant effect on FDI can cause serious biases.

questions about the effects of formal institutions and culture, which can enrich our understanding of what countries attract more FDI. One important question of this type can be whether there exists a complementary or substitution effect between formal institutions and culture in attracting FDI. Thus, within the framework of the institutional stickiness theory, *a priori* we can assume that culture can compensate for poor formal institutions, a question that has been partly raised in the literature (for instance in Du et al. 2012) but nevertheless not investigated in depth.

2. An analysis of the possible interaction of formal institutions and culture

Institutional economics has taught us a lot about the relationship between the formal institutions and culture insights which have converged into two lines of arguments. The first, suggested by the theory of institutional stickiness, argues that formal institutions are shaped and partly determined by culture. Accordingly, one might expect that the impact of culture on FDI is conditional on formal institutions. At the same time, we cannot rule out an effect in the opposite direction either, because, as argued by Williamson (2000), feedbacks from formal institutions towards culture are possible as well, meaning that the impact of formal institutions on FDI may be conditional on culture. The second line, in harmony with the first one, puts forth the view that institutions and culture evolve jointly in an endogenous process (e.g. Bisin & Verdier, 2017).

In the light of the coevolution of culture and formal institutions, when it comes to the question of how culture affects economic outcomes (income level or FDI), the right question to put forward is how culture in conjunction with formal institutions affects economic outcomes, a question which requires us to assess the interplay of culture and formal institutions in shaping economic outcomes. In Bisin and Verdier's (2017) formal model of this coevolution, culture and formal institutions are jointly and endogenously determined, and jointly affect economic outcomes. In this process of coevolution, both culture and institutions can reinforce the impact of the other by ending up either weakening or strengthening the equilibrium outcome. The two scholars emphasize that the joint evolution of culture and institutions is likely to be non-linear, which suggests that under some "conditions" culture and formal institutions may act as substitutes, and under different "conditions" as complements.

To check for the presence of the above effects, an interaction term of formal institutions and culture should be accounted for in the empirical investigations, which can also lead to further questions being raised about the details of the interplay of formal institutions and culture (e.g. threshold levels, marginal effects).

3. Instrumenting formal institutions and culture

The view suggested by the theory of the hierarchy of institutions (Williamson, 2000), namely that institutions (including even culture) can change, although slowly, and adapt to one other, calls for concerns about the possible endogeneity of institutions in economic development which is, at least partly, induced by the FDI flows. Accordingly, the suspicion arises that institutions are endogenous in the institutions-FDI nexus as well. In this light, the instrumental variable approach should be standard in future research rather than being exceptional, which has been the case up to present time. In turn, the instrumental variable estimation strategy poses challenges in finding valid and relevant instruments, and what is more, in coping with instrumenting more than one variable.

4. Distinguishing between the "distance" and the "level" effects

Previous studies differ in terms of whether they control for institutional distance or level. As can be seen from the summary under point 3, when it comes to formal institutions included in the regressions, researchers account almost exclusively for the level of formal institutions (see section 2). As regards culture, the practice is just the opposite, that is, we can hardly find regression investigations that include the level of culture as they most frequently include cultural distance only (see section 3).

This practice, however, is not fully justified by the mentioned theories (Boettke et al., 2008; Williamson, 2000) suggesting that both distance and level can matter for both formal institutions and culture. Why is this so? The answer is that the level of formal institutions indicates the degree of "quality" they should have to satisfy foreign investors, referring to the idea that "good" formal institutions reduce uncertainty, restrain opportunistic behavior and lower transaction costs (North, 1991). Nevertheless, the distance in formal institutions expressing institutional dissimilarity also matters because of its embeddedness. In other words, since formal institutions find their roots in culture, investors with their own institutional arrangements would not find it easy to work in a foreign institutional environment that was not in harmony with their culture. As far as culture is concerned, besides cultural distance, the culture of the host country also matters in attracting FDI. The latter is simply because some cultures are more favorable for investments (entrepreneurship).

As stems from the previous paragraph, since both the distance and the level of both culture and formal institutions can contribute to the attractiveness of a country simultaneously, we have to account for both in the regression analyses. However, including both the distance and the level terms in regressions lead to serious problems. On the one hand, if the origin country dummies, otherwise needed in general, are included together with the level term of the destination country, the distance term becomes determined, and accordingly, the inclusion of the distance together with the level proves meaningless. And what is more, even if it were included, it would be very difficult to see what the coefficient

of the distance variable means. On the other hand, including both terms would also lead to multi-collinearity.

The fact that the literature has not adequately distinguished between the distance and level effects is clearly shown by van Hoorn and Maseland (2014) in relation to culture, and by van Hoorn and Maseland (2016) in relation to institutions. When it comes to cultural distance, these authors argue that the cultural distance measures used in the literature cannot be meaningfully compared across countries because they correlate uniquely with the destination country culture for each origin country. In relation with institutions, they emphasize the risk of a strong correlation between the institutional distance and the institutional level. Based on their empirical results, they consequently propose using multiple reference points when calculating distance. All in all, the above suggests that researchers have to find a novel econometric method to control for both the distance and the level terms in future empirical investigations.[22]

5   CONCLUSIONS

In this paper I have summarized the empirical results on how both formal and informal institutions can contribute to the attractiveness of a country for FDI. When it comes to formal institutions, it has turned out that the literature has focused mainly on the role of three institutions, namely (1) corruption, (2) governance and regulatory institutions, and (3) political institutions. This branch of the literature has provided much evidence about the positive impact of the high quality of the above institutions, and in addition, has given much detail about *how* they do that. As for the informal institutions (culture), the results of the literature have not proven to be as convincing as in the case of formal institutions, leaving several important aspects of how culture matters in attracting FDI not yet examined.

I have argued that institutional explanations can contribute to further enriching our knowledge about the FDI flows if empirical investigations rely, to a greater extent, on institutional economics theories in their empirical design. In particular, the view that formal institutions are embedded in culture, and are stuck to it (Boettke et al., 2008; Williamson, 2000), together with the theory of the coevolution of formal institutions and culture (Bisin and Verdier, 2017) have led me to make four propositions regarding how to progress further in empirical research on the institutions-FDI nexus, although of course, I do not claim that the suggestions outlined in this paper represent the only way to progress further in the field.

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22 Kapás and Czeglédi (2020) propose a possible fruitful way of distinguishing the distance and level effects, and provide an econometric method to separate the level and the distance effects of culture, thus ensuring at the same time that the cultural distance does not depend on the origin country's culture. Since they include only the level term with the origin country dummies, but not the distance term, the multi-collinearity problem does not appear in their regression.

LITERATURE

Acemoglu, D., Johnson, S. & Robinson, J. A. (2001). The Colonial Origins of Comparative Development: *An Empirical Investigation. American Economic Review, 9*(5), 1369-401.

Adam, A. & Filippaios, F. (2007). Foreign Direct Investment and Civil Liberties: A New Perspective. *European Journal of Political Economy, 23*(4), 1038-1052.

Aizenman, J. & Spiegel, M. M. (2006). Institutional Efficiency, Monitoring Costs and the Investment Share of FDI. *Review of International Economics, 14*(4), 683–697.

Aleksynska. M. & Havrylchyk, O. (2013). FDI from the south: The role of institutional distance and natural resources. *European Journal of Political Economy, 29*, 38-53.

Ali, F., A. Fiess, N. & MacDonald, R. (2010). Do Institutions Matter for Foreign Direct Investment? *Open Economies Review, 21*(2), 201-219.

Asiedu, E. & Lien, D. (2011). Democracy, foreign direct investment and natural resources. *Journal of International Economics, 84*, 99-111.

Asiedu, E. (2002). On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different? *World Development, 30*(1), 107-119.

Azman-Saini, W. N. W., Baharumshah, A. Z. & Law, S. H. (2010). Foreign direct investment, economic freedom and economic growth: International evidence. *Economic Modelling, 27*(5), 1079-1089.

Bailey, N. (2018). Exploring the Relationship Between Institutional Factors and FDI Attractiveness: A meta-analytic Review. *International Business Review, 27*(1), 139-148.

Barassi, M. R. & Zhou, Y. (2012). The effect of corruption on FDI: A parametric and non-parametric analysis. *European Journal of Political Economy, 28*, 302-312.

Bénassy-Quéré, A., Coupet, M. & Mayer, T. (2007). Institutional Determinants of Foreign Direct Investment. *World Economy, 30*(5), 764-782.

Bengoa, M. & Sanchez-Robles, B. (2003). Foreign Direct Investment, Economic Freedom and Growth: New Evidence from Latin America. *European Journal of Political Economy, 19*(3), 529-545.

Bevan, A., Estrin, S. & Meyer, K. (2004). Foreign investment location and institutional development in transition economies. *International Business Review, 13*(1), 43-64.

Bhardwaj, A., Dietz, J. & Beamish, P. W. (2007). Host country cultural influences on foreign direct investment. *Management International Review, 47*(1), 29-50.

Bisin, A. & Verdier, T. (2017). *On the Joint Evolution of Culture and Institutions*. NBER Working Paper No. w23375.

Blonigen, B. A. (2005). A Review of the Empirical Literature on FDI Determinants. *Atlantic Economic Journal, 33*, 383-403.

Boettke, P. J., Coyne, C. J. & Leeson, P. T. (2008). Institutional Stickiness and the New Development Economics. *American Journal of Economics and Sociology, 67*(2), 331-358.

Brouthers, L. E., Gao, Y. & McNicol, J. P. (2008). Corruption and Market Attractiveness Influences on Different Types of FDI. *Strategic Management Journal, 29*(6), 673-68.

Buchanan, B. G., Le, Q. V. & Rishi, M. (2012). Foreign direct investment and institutional quality: Some empirical evidence. *International Review of Financial Analysis, 21*, 81-89.

Busse, M. & Hefeker, C. (2007). Political risk, institutions and foreign direct investment. *European Journal of Political Economy, 23*(2), 397-415.

Busse, M. (2004). Transnational Corporations and Repression of Political Rights and Civil Liberties: An Empirical Analysis. *Kyklos, 57*(1), 45-65.

Carr, D. L., Markusen J. R. & Maskus, K. E. (2001). Estimating the Knowledge-Capital Model of the Multinational Enterprise. *American Economic Review, 91*(3), 693-708.

Cezar, R. & Escobar, O. R. (2015). Institutional Distance and Foreign Direct Investment. *Review of World Economics, 151*, 713-733.

Chakrabarti, A. (2001). The Determinants of Foreign Direct Investments: Sensitivity Analyses of Cross-Country Regressions. *Kyklos, 54*(1), 89-114.

Cuervo-Cazurra, A. (2008). Better the devil you don't know: Types of corruption and FDI in transition economies. *Journal of International Management, 14*, 12-27.

Daniele, V. & Marani, U. (2007). Do institutions matter for FDI? A comparative analysis for the MENA countries. *MPRA Paper No. 2426*. Available at: http://mpra.ub.unimuenchen.de/2426.

Daude, C. & Stein, E. (2007). The Quality of Institutions and Foreign Direct Investment. *Economics and Politics, 19*(3), 317-344.

Davidson, W. H. (1980). The Location of Foreign Direct Investment Activity: Country Characteristics and Experience Effects. *Journal of International Business Studies, 11*(2), 9-22.

Du, J., Lu, Y. & Tao, Z. (2012). Institutions and FDI location choice: The role of cultural distances. *Journal of Asian Economics, 23*, 210-223.

Dutta, N. & Roy, S. (2011). Foreign Direct Investment, Financial Development and Political Risks. *The Journal of Developing Areas, 44*(2), 303-327.

Egger, P. & Winner, H. (2005). Evidence on Corruption as an Incentive for Foreign Direct Investment. *European Journal of Political Economy, 21*(4), 932-952.

Egger, P. & Winner, H. (2006). How Corruption Influences Foreign Direct Investment: A Panel Data Study. *Economic Development and Cultural Change, 54*(2), 459-486.

Fukumi, A. & Nishijima, S. (2010). Institutional quality and foreign direct investment in Latin America and the Caribbean. *Applied Economics, 42*(14), 1857-1864.

Gani, A. (2007). Governance and foreign direct investment links: evidence from panel data estimations. *Applied Economics Letters, 14*(10), 753-756.

Gastanaga, V. M., Nugent, J. B. & Pashamova, B. (1998). Host country reforms and FDI inflows: How much difference do they make? *World Development, 26*(7), 1299-1314.

Globerman, S. & Shapiro, D. (2002). Global Foreign Direct Investment Flows: The Role of Governance Infrastructure. *World Development, 30*(11), 1899-1919.

Globerman, S. & Shapiro, D. (2003). Governance Infrastructure and US Foreign Direct Investment. *Journal of International Business Studies, 34*(1), 19-39.

Grosse, R. & Trevino, L. J. (1996). Foreign Direct Investment in the United States: An Analysis by Country of Origin. *Journal of International Business Studies, 27*(1), 139-155.

Habib, M. & Zurawicki, L. (2002). Corruption and Foreign Direct Investment. *Journal of International Business Studies, 33*(2), 291-293.

Harms, Ph. & Ursprung, H. W. (2002). Do civil and political repression really boost foreign direct investments? *Economic Inquiry, 40*(4), 651-663.

Hofstede, G. (1980). *Culture's Consequences: International Differences in Work-Related Values*. Beverly Hills, CA: Sage Publications.

Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations*. Beverly Hills, CA: Sage Publications, Beverly Hills.

Holmes, R. M., Miller, T., Hitt, M. A. & Salmador, M. P. (2013). The Interrelationships Among Informal Institutions, Formal Institutions, and Inward Foreign Direct Investment. *Journal of Management, 39*, 531-566.

House, R. J., Hanges, P. J., Javidan, M., Dorfman, P. W. & Gupta, V. (2004). *Culture, Leadership and Organization: The Globe Study of 62 Societies*. Thousand Oaks, CA: SAGE Publications.

Iamsiraroj, S. (2016). The foreign direct investment–economic growth nexus. International *Review of Economics and Finance, 42*, 116-133.

Jakobsen, J. & de Soysa, I. (2006). Do Foreign Investors Punish Democracy? Theory and Empirics, 1984-2001. *Kyklos, 59*(3), 383-410.

Jensen, N. M. (2003). Democratic Governance and Multinational Corporations: Political Regimes and Inflows of Foreign Direct Investment. *International Organization, 57*(3), 587-616.

Jones, G. K. & Teegen, H. J. (2001). Global R&D Activity of U.S. MNCS: Does National Culture Affect Investment Decisions? *Multinational Business Review, 9,* 1-7.

Kapás, J. & Czeglédi, P. (2020). The Impact of Culture on FDI Disentangled: Separating the "Level" and the "Distance" Effects. *Economia Politica, 37*(1), 223-250.

Kinoshita, Y. & Campos, N. F. (2003). *Why does FDI go where it goes? New evidence from the transition economies*. Working Paper No. 573, William Davidson Institute, University of Michigan.

Kogut, B. & Singh, H. (1988).The Effect of National Culture on the Choice of Entry Mode. *Journal of International Business Studies, 19*(3), 411-432.

Kolstad, I. & Villanger, E. (2008). Determinants of Foreign Direct Investment in Services. *European Journal of Political Economy, 24*(2), 518-533.

Kuncic, A. & Jaklic, A. (2014). FDI and Institutions: Formal and Informal Institutions. In: Verbeke, A., van Tulder, R., Lundan, S. (eds.), Multinational Enterprises, Markets and Institutional Diversity. Progress in International Business Research, Volume 9. *Emerald Group Publishing Limited*, Bingley, UK. pp. 171-205.

Kuncic, A. (2014). Institutional Quality Dataset. *Journal of Institutional Economics, 10*, 135-161.

Kurul, Z. (2017). Nonlinear relationship between institutional factors and FDI flows: Dynamic panel threshold analysis. *International Review of Economics and Finance, 48*, 148-160.

Lambsdorff, J. G. (2003). How corruption affects persistent capital flows. *Economics of Governance, 4*, 229-243.

Li, Q. & Resnick, A. (2003). Reversal of Fortunes: Democratic Institutions and Foreign Direct Investment Inflows to Developing Countries. *International Organization, 57*(1), 175-211.

Lucke, N. & Eichler, S. (2016). Foreign Direct Investment: The Role of Institutional and Cultural Determinants. *Applied Economics, 48*(11), 935-956.

Mac-Dermott, R. & Mornah, D. (2015). The Role of Culture in Foreign Direct Investment and Trade: Expectations from the GLOBE Dimensions of Culture. *Open Journal of Business and Management, 3*, 63-74.

McCloskey, D. N. (2015). It was ideas and ideologies, not interests or institutions, which changed in Northwestern Europe, 1600–1848. *Journal of Evolutionary Economics, 25*(1), 57-68.

Mengistu, A. A. & Adhikary, B. K. (2011). Does Good Governance Matter for FDI Inflows? Evidence from Asian Economies. *Asia Pacific Business Review, 17*(3), 281-299.

Mokyr, J. (2017). *A Culture of Growth. The Origins of the Modern Economy*. Princeton and Oxford: Princeton University Press.

Mondolo, J. (2019). How Do Informal Institutions Influence Inward FDI? A Systematic Review. *Economia Politica, 36*, 167-204.

North, D. C. (1991). Institutions. *Journal of Economic Perspectives, 5,* 97-112.

Okada, K. (2013). The interaction effects of financial openness and institutions on international capital flows. *Journal of Macroeconomics, 35*, 131-143.

Oneal, J. R. (1994). The Affinity of Foreign Investors for Authoritarian Regimes. *Political Research Quarterly, 47*(3), 565-588.

Pajunen, K. (2008). Institutions and Inflows of Foreign Direct Investment: A Fuzzy-set Analysis. *Journal of International Business Studies, 39*, 652-669.

Schwartz, S. H. (1999). A Theory of Cultural Values and Some Implications for Work. *Applied Psychology: An International Review, 48*(1), 23-47.

Sen, K. & Sinha, C. (2017). The location choice of US foreign direct investment: how do institutions matter? *Journal of Institutional Economics, 13*(2), 401-420.

Sethi, D., Guisinger, S. E., Phelan S. E. & Berg D. M. (2003). Trends in Foreign Direct Investment Flows: A Theoretical and Empirical Analysis. *Journal of International Business Studies, 34*(4), 315-32.

Seyoum, B. (2011). Informal Institutions and Foreign Direct Investment. *Journal of Economic Issues XLV, 4*, 917-940.

Siegel, J. I., Licht, A. N. & Schwartz, S. H. (2012). Egalitarianism, Cultural Distance, and Foreign Direct Investment: A New Approach. *Organization Science, 24*(4), 1174-1194.

Slangen, A. H. L. & Beugelsdijk, S. (2010). The impact of institutional hazards on foreign multinational activity: A contingency perspective. *Journal of International Business Studies, 41*(6), 980-995.

Smarzynska, B. K. & Wei, S-J. (2000). Corruption and the Composition of Foreign Direct Investment: Firm-Level Evidence. *Policy Research Working Paper No. 2360.* World Bank, Washington, DC.

Tabellini, G. (2010). Culture and Institutions. Economic Development in the Regions of Europe. *Journal of the European Economic Association, 8*(4), 677-716.

Tang, L. (2012). The Direction of Cultural Distance on FDI: Attractiveness or Incongruity? *Cross Cultural Management: An International Journal, 19*(2), 233-256.

Tintin, C. (2013). The determinants of foreign direct investment inflows in the Central and Eastern European Countries: The importance of institutions. *Communist and Post-Communist Studies, 46*(2), 287-298.

van Hoorn, A. & Maseland, R. (2014). Is Distance the Same Across Cultures? A Measurement- Equivalence Perspective on the Cultural Distance Paradox. In: Verbeke, A., van Tulder, R., Lundan, S. (eds.), Multinational Enterprises, Markets and Institutional Diversity. Progress in International Business Research, Volume 9. *Emerald Group Publishing Limited*, Bingley, UK. pp. 207-227.

van Hoorn, A. & Maseland, R. (2016). How institutions matter for international business: Institutional distance effects vs institutional profile effects. *Journal of International Business Studies, 47*(3), 374-381.

Voyer, P. A. & Beamish, P. W. (2004). The Effect of Corruption on Japanese Foreign Direct Investment. *Journal of Business Ethics, 50*(3), 211-224.

Wei, S-J. (2000). Local Corruption and Global Capital Flows. *Brookings Papers on Economic Activity, 2*, 303-354.

Wheeler, D. & Mody, A. (1992). International investment location decisions. The case of U.S. firms. *Journal of International Economics, 33*, 57-76.

Williamson, O. E. (2000). The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature, 38*(3), 595-613.

Wisniewski, T. P. & Pathan, S. K. (2014). Political environment and foreign direct investment: Evidence from OECD countries. *European Journal of Political Economy, 36*, 13-23.

The Relationship Between Business Intelligence and Analytics Use and Organizational Absorptive Capacity: Applying the DeLone & McLean Information Systems Success Model

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ABSTRACT: *Building on the DeLone and McLean Information Systems (IS) success model and the knowledge-based theory of absorptive capacity, this paper examines the role of the business intelligence and analytics (BI&A) use for enhancing a firm's absorptive capacity for knowledge creation. We collected survey data from an online and mail-delivered survey questionnaire with 97 respondents at the organizational level in the Slovenian medium- and large-sized firms from several industries. The results from the partial least squares SEM showed that the BI&A use relates significantly to absorptive capacity enhancement, thus fostering knowledge creation. Moreover, information quality and system quality are positively linked with BI&A use at the organizational level.*

Key words: *Business intelligence and analytics use, DeLone and McLean IS success model, absorptive capacity, knowledge creation*

1   INTRODUCTION

The last decade has witnessed accelerated growth in investment in business intelligence and analytics (BI&A). Following the Chen, Chiang, and Storey (2012) definition, firms use BI&A techniques, technologies, systems, and applications to analyse business and market data and information to derive better and timely business decisions. BI&A encompasses many advanced analytics techniques, such as data mining, machine learning forecasting, semantic analysis, network analysis, and neural networks (Arnott & Pervan, 2014). Gartner's (2013) survey on IT spending found that BI&A continues to be one of the top priorities for the most successful firms, hence many authors have become interested in measuring the payoffs realized in terms of enhanced organizational performance and

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increased organizational value (Beath, Becerra-Fernandez, Ross, & Short, 2012; Côrte-Real, Oliveira, & Ruivo, 2017; Elbashir, Collier, Sutton, Davern, & Leech, 2013; Hsieh, Rai, & Xu, 2011). It is evident, however, that significant differences among studies exist regarding the measurement and examination of the technology's benefits and costs. Many organizational-level studies have observed positive organizational benefits from BI&A investments (Davenport, 2006; Elbashir et al., 2013; Trkman, McCormack, De Oliveira, & Ladeira, 2010), while a large body of research indicates that organizations have failed to reap organizational benefits from using BI&A or detects no significant advantage from using BI&A (Chen, Chen, & Bajwa, 2016; Ransbotham, Kiron, & Prentice, 2016; Torres, Sidorova, & Jones, 2018).

Despite the prominence of BI&A as a source that yields organizational benefits, very few studies have examined BI&A's value creation process (Fink, Yogev, & Even, 2016; Trieu, 2017; Vidgen, Shaw, & Grant, 2017). Existing research has examined BI&A's success predominantly from a technological point of view (Bose, 2009; Chaudhuri, Dayal, & Narasayya, 2011; Chen et al., 2012; Hackney, Dooley, Levvy, & Parrish, 2015). However, the success of some information systems is often indirectly influenced by different organizational, human, and environmental factors, making success measurement generally complex. Unsurprisingly, some authors have called for moving beyond traditional financial measures, such as return on investment (ROI), market share, profitability, and sales growth, to better understand and explore both the tangible and intangible benefits of BI&A use (Fink et al., 2016; Sharma, Mithas, & Kankanhalli, 2014; Trieu, 2017; Yeoh & Popovič, 2016). To date, nonetheless, little attention has been given to improving the understanding of the role of BI&A in creating intangible organizational benefits, such as knowledge, organizational capabilities, and customer relationship management (Elbashir et al., 2013; Fan, Lau, & Zhao, 2015; Işık, Jones, & Sidorova, 2013; Sangari & Razmi, 2015; Shollo & Galliers, 2016; Yeoh & Popovič, 2016).

Acknowledging the great need to understand the association of the BI&A use with the intangible organizational benefits, the following research questions were addressed: (1) What are the appropriate dimensions for evaluating the success of BI&A in knowledge creation at an organizational level? (2) What is the role of the BI&A use in enhancing a firm's absorptive capacity for knowledge creation? To provide a comprehensive answer to these questions, we developed a theoretical model that relies on the DeLone and McLean IS success model (DeLone & McLean, 1992, 2003) and the knowledge-based theory of absorptive capacity (Lane, Koka, & Pathak, 2006; Zahra & George, 2002), applied to the context of BI&A. This paper, therefore, offers a twofold contribution to the BI&A and IS management research areas. Firstly, to the best of our knowledge, this is the first time that the DeLone and McLean model has been combined with the theory of absorptive capacity to develop and test a BI&A success model focusing on enhancing knowledge creation. Secondly, this research examines BI&A use not only from a rate-recurrence view but also regarding the nature of its use for fully capturing the BI&A use dimension. Hence, according to Seddon (1997) discussion, we apply BI&A use as a proxy variable for the benefits from use. Instead of assuming a pure, positive relationship between the time spent

using BI&A and the benefits it provides, we considered the nature of the use to play an important role in providing benefits as well.

In what follows, the paper starts with the theoretical foundation of the presented conceptual model for the BI&A success. Next, a set of hypotheses is developed, examining the interplay between the dimensions of the presented model. Following this, the research methodology and data analysis using partial least squares SEM are presented. The paper concludes by discussing the theoretical contributions and practical implications of the research, in addition to addressing limitations and providing suggestions for future research.

2   THEORETICAL FOUNDATION

Much research has been done to explain what makes some BI&A systems successful. For instance, the technology acceptance model (TAM) (Davis, 1989) is often applied to explain the intention to use and the readiness to accept the systems (Foshay & Kuziemsky, 2014; Popovič, Coelho, & Jaklič, 2009). Acceptance, however, is not equivalent to usage and success, thus the unified theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003) is often used to supplement the behavioural intent to use with the usage behaviour (Grublješič & Jaklič, 2015b). Moreover, the task-technology fit theory (Goodhue & Thompson, 1995) and technology–organization–environment (TOE) framework (Depietro, Wiarda, & Fleischer, 1990) have been used to explain how certain organizational capabilities and the environment influence the acceptance and use of technology (Burnay, Jureta, Linden, & Faulkner, 2016; Grublješič & Jaklič, 2015a). Nevertheless, the DeLone and McLean IS success model (DeLone & McLean, 1992, 2003) has been widely applied in the existing literature to describe how system quality, information quality, and service quality affect individual or organizational performance, BI success, or decision-making processes (Hou, 2012; Kokin & Wang, 2014; Popovič et al., 2009; Popovič, Hackney, Coelho, & Jaklič, 2012; Wieder & Ossimitz, 2015).

In the current research, we focus on the organizational benefits of the BI&A use by applying the DeLone and McLean IS success model. This model has been found to be a useful framework for understanding, describing, and measuring the IS success and is one of the most often employed and cited models. The model identifies several variables of the IS success: information quality, system quality, service quality, use, user satisfaction, and net benefits. Although value (or net benefits) is the dependent success variable, system use is crucial for net benefits to occur. Moreover, the original D&M model (1992) demonstrated a good fit for measuring the IS success compared to other model re-specifications (Rai, Lang, & Welker, 2002; Sedera & Gable, 2004). Likewise, many meta-analyses have examined and validated different relationships in the D&M model (Bokhari, 2005; Mahmood, Hall, & Swanberg, 2001; Sabherwal, Jeyaraj, & Chowa, 2006). Respectively, the DeLone & McLean IS success model has often been used as the theoretical basis with which to evaluate the BI&A success. Hence, a diverse application can be found. For instance, the model has been extensively applied for investigating the relationship between the end-user satisfaction,

BI&A use, and financial performance (Hou, 2012; Kokin & Wang, 2014), further, for investigating the relationship between the information, system, and service quality on one hand and the user satisfaction and use on the other (Daradkeh & Moh'd Al-Dwairi, 2018; Gaardboe, Nyvang, & Sandalgaard, 2017; Gonzales, Wareham, & Serida, 2015), and lastly, for the investigation of the relationship between the managerial-decision making quality, user-satisfaction, and organizational performance (Wieder, Ossimitz, & Chamoni, 2012). Since some variables of the IS success have demonstrated unstable relations with the other variables included in the DeLone and McLean IS success model, such as the user satisfaction with use and further use with individual impact, D&M was applied as a guiding framework and other organizational factors included in the model. Moreover, service quality was not incorporated as a success dimension, since it was not part of the original model and has often been criticized as irrelevant (Seddon, 1997). Therefore, the conceptual framework of this research is presented in Figure 2 1.

Figure 2-1. *Proposed conceptual model: Adapted DeLone and McLean BI&A success model*
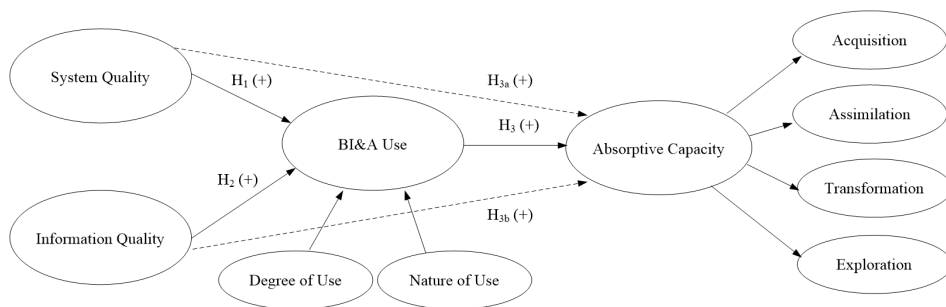
Note: Dotted lines represent hypotheses regarding mediation (indirect) effects via BI&A use

2.1   Business intelligence and analytics use

In line with the existing IS literature, we define the BI&A use as the degree to and the manner in which BI&A is utilized by organizations (Petter, DeLone, & McLean, 2008). Empirical studies have adopted multiple long-standing measures of use, including the frequency of use, extent of use, amount of use, appropriateness of use, and self-reported use. However, many authors have criticized the use of the self-reported, rate recurrence-based measures of use and called for measures that integrate different aspects of usage and are more contextualized, complete, and valid (Burton-Jones & Straub Jr, 2006; Petter, DeLone, & McLean, 2013). The system use represents an appropriate measure of success however only when properly capturing the relationship between the use and expected outcomes. Measuring the frequency and intensity of use without considering and capturing the nature of the use is deficient (Doll & Torkzadeh, 1998). For this reason, we measured the BI&A use as the use of information from the BI&A system regarding the extent, frequency, and

nature of use (DeLone & McLean, 2003, Burton-Jones & Straub, 2006). Since the expected outcome is enhanced knowledge creation, the BI&A system should allow organizations to monitor the market, competition, and consumers, easily track the sources of internal and external knowledge, search for, generate and store knowledge, and easily retrieve and use the stored knowledge (Gold, Malhotra, & Segars, 2001; Shollo & Galliers, 2016).

Nevertheless, following Burton-Jones and Gallivan (2007), we examined use from a higher-level perspective, that is at the organizational level. As Doll and Torkzadeh (1998) suggested, we used the BI&A use as the central construct in the system-to-value chain that links the system use antecedents with the organizational impact of information technology. BI&A is therefore a mediating variable leading to downstream impact on benefit organizations (DeLone & McLean, 1992; Goodhue, 1995). Following the DeLone and McLean (1992) model, we considered the information quality and system quality to be antecedent constructs to the BI&A use. Both prove to be equally important since even a high-quality system can produce worthless results if the generated information is of low quality (inadequate or wrong). In addition, we view success not simply as the system being used but rather as its contribution to knowledge creation.

2.2   System quality and BI&A use

System quality is defined as the desirable characteristics of an information system. The perceived ease of use has often been implemented as a measure of system quality within the TAM-related research (Davis, 1989), although it does not fully capture the system quality construct. As a response researchers have developed measurement instruments that capture diverse system quality dimensions, such as reliability, effectiveness, maintainability, ease of learning, intuitiveness, sophistication, flexibility, response time, accessibility, and integration (Nelson, Todd, & Wixom, 2005; Petter et al., 2008; Rivard, Poirier, Raymond, & Bergeron, 1997). We conceptualized system quality as a construct measured by dimensions of reliability, flexibility, accessibility, response time, and integration (DeLone & McLean, 2016; Petter et al., 2008; Wixom et al., 2014; Wixom & Watson, 2001). Hence, reliability is the degree to which a system is trustworthy and performs consistently well, while flexibility refers to the ability to adapt and customize the system to users' changing demands. Further, accessibility refers to the ease with which information can be accessed, integration refers to the degree to which the system allows integration with various data sources, and response time refers to the length of time a system needs to respond to a request for action or information.

The relationship between the system quality and the IS system use has been differently described in the existing literature (Nguyen, Nguyen, & Cao, 2015; Urbach & Müller, 2012). For instance, Fitzgerald and Russo (2005) and Caldeira and Ward (2002) found support for it, while Gill (1995) found this relationship to be insignificant, and Weill and Vitale (1999) with Premkumar and King (1994) found that the system quality can negatively

affect the system use when the information system is complex and incompatible with the existing hardware and software.

Organizations should ensure good system quality to reap the full benefits of the BI&A use. This includes upgrading and customizing the existing BI&A infrastructures and architectures to fit the changing data requirements (Chen et al., 2012). Examples include upgrading traditional data warehouses and data marts to Hadoop database technology and customizing advanced analytics tools, such as data mining and natural language processing. In addition, the system should allow integration with a variety of data sources, especially with the new developments in the "big data" era (Chen & Zhang, 2014). Long response time could be an important obstacle that leads to the BI&A underuse (Gandomi & Haider, 2015). Nonetheless, the system should allow easy access to relevant information to anyone who needs them, regardless of their training (Boyd & Crawford, 2012). Accordingly, the first hypothesis is as follows:

H_1: System quality is positively associated with BI&A use.

2.3   Information quality and BI&A use

Information quality is on the other hand about the system output's desirable characteristics. However, information quality is often not distinguished as a unique construct and is measured as a dimension of user satisfaction (Doll, Xia, & Torkzadeh, 1994; McKinney, Yoon, & Zahedi, 2002; Rai et al., 2002). Accordingly, many authors have developed scales via their review of the information quality literature relevant to the type of the IS under study (Fraser & Salter, 1995; Gable, Sedera, & Chan, 2003; Wixom & Watson, 2001). Hence, dimensions such as relevance, completeness, conciseness, accuracy, timeliness, usability, and understandability are often used to describe information quality (DeLone & McLean, 2016; Lee, Strong, Kahn, & Wang, 2002; Nelson et al., 2005; Wixom et al., 2014). Following Nelson et al. (2005), we shaped information quality by using four dimensions: completeness, accuracy, format and currency. Accordingly, completeness represents the degree to which all possible elements are represented in the stored information, further, accuracy is the degree to which the user recognizes that same information as correct and unambiguous, while format represents the degree to which information is presented in an understandable and interpretable manner to the user, and currency represent the user's perception of the degree to which the information is up-to-date.

The existing literature has found mixed support for the relationship between the information quality and system use (Petter et al., 2013). For example, some authors found support for information quality in that it is an important antecedent of the system use or intention to use (Fitzgerald & Russo, 2005; Halawi, McCarthy, & Aronson, 2008; Kositanurit, Ngwenyama, & Osei-Bryson, 2006). On the other hand, Goodhue and Thompson (1995) found some of the characteristics of information quality to be significantly related to usage, but also some

that are not. Furthermore, certain studies have found an insignificant relationship between the information quality and intention to use (Iivari, 2005; McGill, Hobbs, & Klobas, 2003).

BI&A systems are increasingly being used to provide decision-makers with a real-time, rich market and consumer data for better decision-making and action-taking (Kowalczyk & Buxmann, 2014; Lavalle, Lesser, Shockley, Hopkins, & Kruschwitz, 2011). However, BI&A analyses can often provide very limited scope and quality, namely, the information must have good predictive power along with high degrees of completeness and accuracy, leading to confident acting upon the information (Dhar, 2013). Moreover, decision-makers need real-time information that will allow them to adjust their actions on a continuous basis, especially in a high-velocity market (Eisenhardt & Martin, 2000). Thus, as discussed by Kowalczyk and Buxmann (2015), the information insufficiency regarding incompleteness, inconsistency, inaccuracy, irrelevance, and unreliability can limit the decision-making ability, affecting the success of BI&A use. Moreover, decision-makers can revert to intuitive decision-making (Matzler, Bailom, & Mooradian, 2007; Ransbotham et al., 2016). Nonetheless, presenting the information in the form of visualizations and graphs facilitates the interpretation of new information and the further use of the system (Lavalle et al., 2011; Yeoh & Popovič, 2016). As such, our second hypothesis is:

H_2: Information quality is positively associated with BI&A use.

2.4   BI&A use and absorptive capacity

In the literature, the BI&A use has been reported to yield different organizational benefits. Therefore, a variety of measures of organizational impact can be observed, such as improved organizational performance and overall success (Boyd & Crawford, 2012; Davenport, Barth, & Bean, 2012; Elbashir, Collier, & Davern, 2008; Kiron & Shockley, 2011; McAfee, Brynjolfsson, Davenport, Patil, & Barton, 2012; Shuradze & Wagner, 2016), business process change (Arnold, 2006), innovation of new business models, products, and services (Bughin, Livingston, & Marwaha, 2011; Fisher, DeLine, Czerwinski, & Drucker, 2012; Lavalle et al., 2011; Manyika et al., 2011), support and enhancement of collaboration and decision-making (Chen et al., 2012; Kowalczyk & Buxmann, 2014; Kowalczyk, Buxmann, & Besier, 2013), and also knowledge creation and learning (Holsapple, Lee-Post, & Pakath, 2014; Shollo & Galliers, 2016; Siemens & Long, 2011). Although this body of research has theoretically advanced the understanding of the BI&A's success, it nevertheless offers a limited understanding of the knowledge-creation process that delivers value, which calls for further research. Hence, we propose that the BI&A use facilitates absorptive capacity processes and enhances knowledge creation (Roberts, Galluch, Dinger, & Grover, 2012).

In their research on innovation, Cohen and Levinthal (1990, p. 128) conceptualized a firm's absorptive capacity as "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to a commercial end." It all depends on the prior related knowledge which helps firms to better evaluate the signals for technological

advances and development. Absorptive capacity, therefore, allows an organization to identify new outside knowledge and to assimilate and integrate that knowledge with the existing knowledge internally (Kogut & Zander, 1992). Prior studies have shown the underlying absorptive capacity's capabilities of external knowledge acquisition and assimilation (potential absorptive capacity), as well as further transformation to new knowledge and exploitation (realized absorptive capacity) to be an important component of dynamic capabilities (George, 2005; Malhotra, Gosain, & El Sawy, 2005; Verona & Ravasi, 2003; Wang & Ahmed, 2007; Zahra & George, 2002). On that account, knowledge acquisition refers to the organization's ability to identify and obtain information through external sources, while knowledge assimilation is the organization's ability to analyze, interpret and understand the acquired information. Further, knowledge transformation is about facilitating the combination of existing knowledge with the new knowledge as well as its internalization, whereas knowledge exploitation is the application of the transformed knowledge to commercial ends (Flatten, Engelen, Zahra, & Brettel, 2011). Accordingly, absorptive capacity in itself is captured by capabilities that reflect dynamic processes (Flatten et al., 2011; Lane et al., 2006). Moreover, absorptive capacity not merely connects the underlying knowledge capabilities, but combines and integrates them, creating synergistic outcomes, hence, it might be observed as a second-order dynamic capability where absorptive capacity is more than the sum of the underlying knowledge capabilities (Grant, 1996; Lichtenthaler, 2009; Raisch & Birkinshaw, 2008). In this way, absorptive capacity plays an important role in improving firm ability to develop dynamic capabilities and prevent core capabilities from becoming core rigidities (Kang & Snell, 2009; Leonard-Barton, 1995; Teece, Pisano, & Shuen, 1997).

BI&A is predominantly viewed as an information processing tool that provides knowledge infrastructure and knowledge process capabilities, such as acquisition, transformation, application of knowledge, which enhance an organization's existing knowledge base, and in turn increases organizational absorptive capacity (Gold et al., 2001; Srivardhana & Pawlowski, 2007). Moreover, BI&A use facilitates knowledge acquisition through identification, collection, and analysis of external data and information. Hence, the quality of information provided by the BI&A system is an important driver of the use behaviour. Unsatisfactory information quality could arouse doubts about the reliability of the BI&A, which in turn could harm the use behavior and vice versa. Next, the knowledge-acquisition process is enhanced by an advanced analysis of the vast amount of data and information collected in the previous process. In addition, the interpretation of information is assisted through different visualization techniques (Minelli, Chambers, & Dhiraj, 2012). BI&A supports the combination of new, assimilated knowledge with the prior knowledge based on advanced database technologies and parallel, distributed algorithms (McAfee et al., 2012). It is important, however, to ensure sufficient system quality, leading to increased trust in the ability of the system to assist knowledge creation and ultimately to a willingness to use (Saeed, Hwang, & Mun, 2003). Also, BI&A supports the dissemination of, search for, and reuse of the transformed knowledge to aid further improvement of business processes, products, and services (Kowalczyk & Buxmann, 2015). Therefore, we hypothesized the following:

H$_3$: The BI&A use is positively associated with organizational absorptive capacity.

H$_{3a}$: The positive association of system quality with organizational absorptive capacity is mediated by the BI&A use.

H$_{3b}$: The positive association of information quality with organizational absorptive capacity is mediated by the BI&A use.

3 RESEARCH METHODOLOGY

3.1 Sampling, data collection, and sample properties

To test the model and the related hypotheses, we surveyed Slovenian organizations from several industries. As recommended by Moore and Benbasat (1991), the survey instruments drew upon a comprehensive literature review, and all of the constructs were operationalized through an existing measurement scale that has been validated in the extant literature. To ensure content validity, we asked five academic IS and management researchers to review and assess the content, scope, and purpose of the survey (Lawshe, 1975; Lynn, 1986). We modified some of the questionnaire items to properly tap into the study's specific context and simplify interpretation. The questionnaire was developed and disseminated in English to ensure identical meanings.

The data for this research were acquired from a web-based and mail surveying tool in 2018. Two screening criteria were used to guarantee the quality of the data: (1) the respondent had deep knowledge of the organization's management, and (2) the respondent had more than three years of experience in the BI&A initiatives and held a management, executive, or IT position in the firm. The Strategic Research Innovation Partnership (SRIP) MOBILITY ACS+ and Purchasing Association of Slovenia provided us with access to their internal mailing databases. The data were supplemented by the database of the top 101 most successful Slovenian firms in 2016. Hence, the initial sample of 500 firm representatives from the mailing list received an e-mail invitation to participate in the web-based survey.

We received 36 valid responses in the first round. To increase the response rate, we sent follow-up e-mails and offered to send them the survey by mail. During the following month, we received 61 additional valid responses, totalling in 97 usable responses (overall response rate of 19.4%). Table 1 shows the sample's descriptives. The final sample consisted mostly of medium (53.6%) and large organizations (38.1%), according to the current EU guidelines (European Commission, 2005). The latter sample comprises different industry sectors in line with the NACE classification, of which almost 70% were from the manufacturing, wholesale and retail trade, transport, storage, and communication sectors. Regarding the respondents' positions, IT and business executives were almost equally represented.

3.1.1   Outliers and bias examination

We examined the collected data for missing data, suspicious response patterns, and outliers (Hair, Hult, Ringle, & Sarstedt, 2017). First, we removed three observations in which straight-lining or a high proportion of missing data (>15%) was detected. After excluding the problematic observations, we used a dataset of 97 responses in all of our analyses. Since the amount of the missing data per indicator was less than 5%, we applied a mean value replacement to handle the missing data. We used the IBM SPSS Statistics to test for outliers. Using box plots and stem-and-leaf plots, few outliers were found, however, since there was no clear explanation for the exceptional values, we retained them for further analysis (Sarstedt & Mooi, 2014). Further, following the Hair, Hult, et al. (2017) recommendation, we examined the data distribution regarding skewness and kurtosis. Although most of the data per indicator were normally distributed, some data exhibited skewness and kurtosis greater than +1, thus indicating non-normal distribution.

We assessed a potential non-response bias by using a wave analysis, in which the respondents were grouped into early- and late-respondent groups, and their sample distributions compared with the Kolmogorov-Smirnov test (Armstrong & Overton, 1977). Our analysis showed no significant differences (5% significance level, $p > .05$) between the early- and late-respondent groups regarding organizational attributes such as firm size (χ^2test, $p = 2.255$) and return on investment (χ^2test, $p = .427$). Thus, no evidence of response bias was found.

Table 1. *Sample descriptives*

Sample characteristics (n = 97)	Obs.	(%)
Respondent position		
IT executive		45.4
Chief information officer (CIO)	8	8.2
IT manager	30	30.9
BI manager	6	6.2
Business executive		54.6
Chief executive officer (CEO)	27	27.8
Chief financial officer (CFO)	2	2.1
Other business executives	24	24.7
No. of employees		
<50	8	8.2
50–250	52	53.6
>250	37	38.1

Sample characteristics (n = 97)	Obs.	(%)
Industry		
Agriculture, forestry, hunting	2	2.1
Manufacturing	33	34.0
Electricity, gas, water supply	8	8.2
Construction	1	1.0
Wholesale and retail trade	18	18.6
Hotels and restaurants	1	1.0
Transport, storage, and communication	16	16.5
Financial intermediation	4	4.1
Real estate, renting and business activities	6	6.2
Education	1	1.0
Health and social work	1	1.0
Other	6	6.2

Moreover, as within the study a single-respondent research design was used and the responses were self-reported, we assessed the common method variance (CMV) biases for the sake of validity (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In order to diagnose and control for CMV biases, three approaches were employed. First, we used the Harman's *ex-post* single-factor analysis. The factorial analysis showed that no single factor accounted for the majority of the covariance among the measures, with the first extracted factor accounting for 35.743% of the variance. Hence, the common method bias is unlikely to be an issue in this study. Second, we applied the Rönkkö and Ylitalo (2011) six-step marker variable approach to control for CMV in PLS. Since the factor structure of the marker items is not important in itself as long as the marker constructs are mostly uncorrelated with the rest of the study constructs (Rönkkö & Ylitalo, 2011), the marker indicators were a combination of two partial scales of environmental dynamism (Dill, 1958; Volberda & Van Bruggen, 1997) and environmental competitiveness (Birkinshaw, Hood, & Jonsson, 1998; Jaworski & Kohli, 1993). The results presented in Table 8 (Appendix B) show no remarkable differences between the baseline model and the model with the marker variable, while all paths maintained their level of statistical significance, indicating no method variance problem. Also, we adopted the full collinearity assessment approach (Kock, 2015) and found that all factor-level VIF values ranged from 1.277 to 2.051, i.e. all below the recommended threshold of 3.3. (Diamantopoulos & Siguaw, 2006). Thus, the traditional single-factor test, the marker variable test, and the full collinearity assessment approach provided support in that the common method bias was not a significant threat to the validity of our study.

3.2 Structural equation modelling approach

Two methods are available to researchers for estimating structural equation models by means of empirical data: (1) covariance-based SEM techniques (CB-SEM) (Jöreskog, 1978; Jöreskog & Sörbom, 1982) and (2) variance-based partial least squares (PLS-SEM) (Chin, 1998; Hair, Hult, et al., 2017; Lohmoller, 1988). Following the Hair, Sarstedt, Ringle, and Mena (2012) and Ringle, Sarstedt, and Straub (2012) arguments for selecting an appropriate method for the SEM estimation, our study relies on the PLS-SEM method. The model includes complex second-order latent variables as well as mediation, for which adopting the PLS-SEM approach is considered to be a better choice (Hair et al., 2012). Moreover, the PLS-SEM approach is particularly suitable when a combination of reflectively and formatively measured latent variables are part of the structural model. Furthermore, not all of our indicator variables met the requirement for normal data distribution. Our analysis showed that some of our data variables were non-normal but not excessively non-normally distributed, providing an additional rationale for adopting PLS-SEM (Gefen, Straub, & Boudreau, 2000). Nonetheless, PLS-SEM has been established as particularly useful when analysing relatively small sample sizes in medium and high-complexity model setups (Reinartz, Haenlein, & Henseler, 2009). However, following Ringle, Wende, and Becker (2015) and Hair, Hult, et al. (2017), we determined the required sample size using power analyses. In our model, the maximum number of arrows pointing at a construct is five. Assuming the commonly used level of statistical power of 80%, we therefore needed at least 45 (or 58 in *G*Power* analysis) data sets to detect the R^2 values of at least 0.25 (with a 5% probability of error). Hence, the acquired 97 data sets met the data sample size requirements and were used to assess the proposed model in the SmartPLS 3 software (Ringle et al., 2015).

3.3 Operationalization of the constructs

In this study, two types of latent variables, namely reflective and formative, are employed. We used the information quality and system quality success variables as desirable characteristics and important antecedents of the BI&A use (DeLone & McLean, 2003, 2016). As discussed in section 2.2, system quality focuses on the impact of the system quality dimensions on the BI&A use and is measured by the dimensions of reliability, flexibility, accessibility, response time, and integration (DeLone & McLean, 2016; Petter et al., 2008; Wixom et al., 2014; Wixom & Watson, 2001). On the other hand, information quality focuses on the quality of the BI&A output and is frequently conceptualized as a multi-dimensional concept measured by various dimensions, such as completeness, accuracy, format, and currency (DeLone & McLean, 2016; Lee et al., 2002; Nelson et al., 2005; Wixom et al., 2014). Therefore, to measure the system quality and information quality, we adopted a measurement scale developed and tested by Nelson et al. (2005) and deemed valid and reliable. Both system and information quality were operationalized as formatively measured latent variables since all of the indicators capture a specific aspect of the constructs' domain and cause the constructs themselves, of which both were explored at the organizational level. Table 4 represents all items adapted from the literature used.

For the purpose of measuring the BI&A use, we applied hierarchical component models (HCMs). The link between the lower-order components (LOCs) and higher-order components (HOCs) was characterized as a reflective-formative type relationship, which allowed for a more parsimonious PLS model. Since the latent variable of the BI&A use was operated at the organizational level, we employed the intensity, frequency, and nature/ purpose of use to measure the degree and manner in which organizations utilize BI&A, as discussed by Petter et al. (2013). The degree of use was reflectively measured by the frequency and intensity measures adapted from Venkatesh, Brown, Maruping, and Bala (2008). Frequency was measured on a 7-point scale ranging from "does not use" to "almost always," while the intensity of use was also measured on a 7-point scale ranging from "not at all" to "a very great extent." Regarding the nature/purpose of use, we adapted a measurement scale developed and tested by Gold et al. (2001). Hence, the nature of use was operationalized as a reflectively measured latent variable. All items were measured using a 7-point scale ranging from "strongly disagree" to "strongly agree."

Following the Gao, Yeoh, Wong, and Scheepers (2017) research findings, we used absorptive capacity as a dependent variable, since the aim of the research involved knowledge-creation and sharing. To measure absorptive capacity, we adopted a measurement scale developed and tested by Flatten et al. (2011), which relies on the absorptive capacity definition of Zahra and George (2002). Once again, we used a hierarchical component model to measure the latent variable of absorptive capacity. Knowledge acquisition, assimilation, transformation, and exploitation were applied as lower-order components. Hence, a reflective-reflective type of HOC with the mode A approach was applied, reducing the level of collinearity among the indicators and increasing the model's parsimony. All of the items were measured on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree."

4   RESULTS

4.1   Measurement model

We modelled the constructs of assimilation (ASS), acquisition (ASQ), transformation (TRF), exploitation (EXP), degree of use (DEGUSE), and nature of use (NATUSE) as measured reflective constructs. Further, we modelled the information quality (INFQ) and system quality (SYSQ) as formatively measured constructs since they are not interchangeable and are not expected to co-vary within the same latent construct (Petter, Straub, & Rai, 2007). In addition, we modelled the absorptive capacity (ACAP) as a reflective-reflective second-order construct, with ASS, ASQ, TRF, and EXP as lower-order constructs (Flatten et al., 2011), and used the repeated indicator approach with mode A on the higher-order construct, following the Becker, Klein, and Wetzels (2012) recommendation. Moreover, we modelled the business intelligence and analytics use (BIA_USE) as a reflective-formative, second-order construct, with NATUSE and DEGUSE as lower-order constructs. Hence, for BIA_USE, we followed the Becker et al. (2012) recommendation and used the repeated indicator approach with mode B on the higher-order construct and an inner path

weighting scheme, since this specification was found to be the most appropriate for an unequal number of items among the first-order reflective constructs. Detailed procedures and the results of the measurement validation are presented in the continuation.

4.1.1 Reflective measurement

The PLS-SEM model assessment initially focuses on the evaluation of the reliability and validity of the construct measures (Gefen & Straub, 2005; Ringle et al., 2012). Our reflectively measured constructs were tested for the indicators of reliability, construct reliability, convergent validity, and discriminant validity (Ringle et al., 2012). Based on our assessment of the indicator reliability, we removed three items (TI1, TI3, TI5) which increased the average variance extracted to above the threshold (Hair, Hult, et al., 2017). As Table 5 reveals, the indicators in the reflective measurement models reached satisfactory indicator reliability, since all of the reflective indicators had an outer loading of above 0.708, and two indicators exhibited slightly lower loadings of 0.694 and 0.691. Also, the reflective measurement model achieved a composite reliability of 0.791 or higher, suggesting reliability of the construct measures' internal consistency. To test the convergent validity, we used the average variance extracted (AVE) and found acceptable values of 0.5 or higher, as the construct explains more than half of the variance in its indicators (Fornell & Larcker, 1981; Henseler, Ringle, & Sinkovics, 2009). For the higher-order reflective-reflective construct of absorptive capacity (ACAP), we calculated the AVE and composite reliability manually, following Hair, Hult, et al. (2017) guidelines. Finally, we used two measures to assess the constructs' discriminant validity. First, according to the Fornell and Lacker (1981) criterion, the square root of each construct's AVE was to be higher than the correlations with other latent variables. Second, we examined the indicators' cross-loadings, which were supposed to not reveal any indicators with higher loading on another construct (Chin, 1998). Both analyses indicated that the constructs exhibit discriminant validity. Finally, we applied the heterotrait-monotrait ratio (HTMT) criterion and found that all of the values were lower than the conservative threshold value of 0.85 (Hair, Hult, et al., 2017), thus indicating the establishment of discriminant validity. In addition, we ran bootstrapping to test whether the HTMT values were significantly different from 1, clearly favouring the discriminant validity of the constructs. However, the discriminant validity between the higher- and lower-order constructs of absorptive capacity could not be established, which is expected because the measurement model of the higher-order construct repeats the indicators of the lower-order constructs. Based on the above findings, it is concluded that all of the reflective construct measures were valid and reliable.

4.1.2 Formative measurement

For our model two first-order formative constructs were proposed, namely information quality (INFQ) and system quality (SYSQ). To evaluate the formative measurement models, we started by assessing the outer collinearity. In formative measurement, excessive multicollinearity between the constructs is undesirable because it can destabilize the

model and lead to redundant items (Diamantopoulos & Winklhofer, 2001). Therefore, we examined the variance inflation factor (VIF) scores for the formative measures and found values that were uniformly below the threshold value of 3.3 (Diamantopoulos & Siguaw, 2006), indicating that multicollinearity is not an issue for the estimation of the PLS path model. Next, we assessed the relevance and significance of the indicators' weights. Looking at the significance level of the outer weights, we found that all of the formative indicators were significant at the 5% level, except for INFQ2, INFQ3, SYSQ3, SYSQ4, and SYSQ5. However, following the Hair, Hult, et al. (2017) recommendations, we retained all indicators of the formative constructs, since all of the outer loadings were significant at a 5% level. Moreover, prior research and theory also support the relevance of these indicators in capturing information quality and system quality dimensions (Gorla, Somers, & Wong, 2010; Nelson et al., 2005; Saeed & Abdinnour-Helm, 2008). We report the bias-corrected bootstrap confidence interval for additional information on the stability of the coefficient estimates. Moreover, we used the Cadogan and Lee (2013) and Hair, Sarstedt, Ringle, and Gudergan (2017) guidelines to assess the effect of the antecedent constructs (information quality and system quality) on the formative second-order construct of BIA_USE through its lower-order constructs (DEGUSE and NATUSE). We observed that among the two lower-order constructs, NATUSE had a stronger effect on business intelligence and analytics use (0.781 for NATUSE and 0.364 for DEGUSE) and thus greater relevance for forming BIA_USE. Among the BIA_USE's antecedents, INFQ (0.436) had a stronger effect than SYSQ (0.333). Moreover, at the second-order construct level, first-order constructs act as indicators for the second-order constructs. Therefore, their weights and significance (Table 10) were examined and the weights of both first-order constructs established to be higher than 0.10. In addition, their signs were consistent with the underlying theory (Andreev, Heart, Maoz, & Pliskin, 2009). Although the DEGUSE weight was not significant, the indicator was retained because theory strongly supports the relevance of this indicator in capturing the BI&A use (Popovič, Hackney, Coelho, & Jaklič, 2014; Trieu, 2017). The results suggest all of the formative measures demonstrated a satisfactory construct validity and also no significant multicollinearity. Considering that the results from the reflective and formative constructs exhibited satisfactory levels of quality, we proceeded with the evaluation of the structured model.

4.2 Structural model

To evaluate the structural model, we followed the Hair, Hult, et al. (2017) six-step procedure , namely the collinearity assessment, structural path coefficients, the coefficient of determination R^2, effect size f^2, predictive relevance Q^2, and the effect size q^2. We ran the PLS-SEM algorithm in SmartPLS 3, using the path weighting scheme and a stop criterion set at 10^{-7}, with 5,000 iterations of re-sampling and the *no sign change* option. The VIF values of all combinations of endogenous constructs and corresponding exogenous constructs were below the threshold of 3.3 (the highest VIF among the explanatory variables was 1.575). Thus, collinearity among the predictor constructs did not prove to be a critical issue in the structural model. To avoid bias toward complex models, we considered the adjusted R^2 values according to the number of exogenous constructs relative to the sample size

(Hair, Hult, et al., 2017). All of the dependent variables presented reasonable values. The f^2 values were calculated to evaluate whether an omitted construct had a substantive impact on the endogenous constructs, where only small and moderate effects were found present. For all reflective endogenous constructs we calculated the Stone–Geisser's predictive relevance Q^2, using the blindfolding procedure with an omission distance of 7 (Hair, Hult, et al., 2017). The values of all of the endogenous constructs were above zero, thus providing support for the model's predictive relevance regarding the endogenous latent variables. Also, we manually calculated the effect sizes, q^2 (relative impact of predictive relevance), and found small and moderate effects present. The path coefficients, R^2 and Q^2, are presented in Figure 4 1. Table 2 shows the results of the hypothesized relationships, *t*-values, standard errors, and effect sizes.

Table 2. *Results of the structural model path coefficients*

Structural path	Path coefficient (β)	Effect size (f^2)	Effect size (q^2)	Standard deviation	*t*-value	Bias-corrected 95% confidence interval	Conclusion
SYSQ →BIA_USE	0.333**	N/A	N/A	0.102	3.274	[0.092; 0.504]	H1 supported
SYSQ →DEGUSE	0.299**	0.092	0.062	0.106	2.823	[0.064; 0.480]	
SYSQ →NATUSE	0.287*	0.063	0.030	0.115	2.506	[0.027; 0.477]	
INFQ →BIA_USE	0.436**	N/A	N/A	0.105	4.161	[0.194; 0.596]	H2 supported
INFQ →DEGUSE	0.443**	0.210	0.164	0.090	4.899	[0.236; 0.599]	
INFQ →NATUSE	0.351**	0.105	0.047	0.111	3.171	[0.098; 0.538]	
BIA_USE → ACAP	0.568**	0.229	0.056	0.079	7.206	[0.275; 0.667]	H3 supported

Note: *Significant at the .05 level; **Significant at the .01 level

Figure 4-1. *Estimated model*
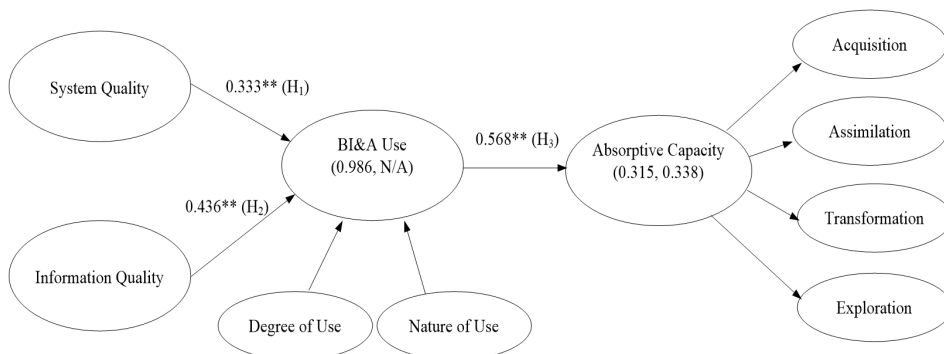
Note: *Significant at the .05 level; **Significant at the .01 level; (R^2 adjusted, Q^2) given for endogenous constructs

The results presented in Figure 2 1 show that the conceptual model explained 31.5% of the variation in firm absorptive capacity. Both the system quality ($\beta = 0.436$, $p < .01$) and information quality ($\beta = 0.333$, $p < .01$) proved statistically significant in explaining the BI&A use. This way, both H_1 and H_2 are confirmed. Moreover, the BI&A use ($\beta = 0.568$, $p < 0.01$) was statistically significant in explaining absorptive capacity, thus supporting H_3 as well.

4.2.1   Mediation analysis

Our model hypothesized that the BI&A use would mediate relationships between system quality and absorptive capacity on one hand and between information quality and absorptive capacity on the other. We tested further for mediation following the approach outlined by Hair, Hult, et al. (2017). Consequently, to evaluate mediation bootstrapping was used instead of the Sobel test. We found that both indirect effects were significant since neither of the 95% confidence intervals included zero. Furthermore, we assessed the direct effects and found that both direct effects were statistically non-significant ($t = 0.377$; $p = .706$, and $t = 0.184$; $p = .854$). It was therefore concluded that the BI&A use mediated fully the SYSQ-to-ACAP and INFQ-to-ACAP relationships, thus supporting H_{3a} and H_{3b}.

Table 3. *Mediation bootstrapping test: Significance analysis of the direct and indirect effects*

	Direct effect	95% confidence interval of the direct effect	*t*-value	Indirect effect	95% confidence interval of the indirect effect	*t*-value	Conclusion
SYSQ →ACAP	0.050	[−0.207; 0.320]	0.377	0.190**	[0.046; 0.323]	2.617	H_{3a} supported
INFQ →ACAP	−0.025	[−0.280; 0.234]	0.184	0.235**	[0.070; 0.389]	2.849	H_{3b} supported

Note: **Significant at .01 level

5   DISCUSSION AND CONLCUSION

Many organizations have heavily invested in BI&A to enhance organizational performance and increase organizational value. This has led to an increase in the scholarly attention to understanding the mechanisms through which the BI&A use yields organizational benefits. While the extant research provides a relatively rich description of the possible net benefits/ impacts of the BI&A use regarding financial benefits, we know correspondingly little about the role of the BI&A use in creating intangible organizational benefits, such as knowledge creation. In the present study, we sought to understand the relatively unexplored aspect of knowledge creation from the BI&A use, answering the Gao et al. (2017)'s call for a deeper investigation of this scarcely researched issue. We created a conceptual model that draws and integrates the DeLone and McLean IS success theory with the absorptive capacity theory for knowledge creation in order to understand the relatively unexplored aspect of knowledge creation as a result of the BI&A use.

5.1   Theoretical contributions

Prior studies of BI&A have already been built upon the DeLone, and McLean IS success theory for the purposes of evaluating the BI&A success (Gaardboe et al., 2017; Hou, 2012; Kokin & Wang, 2014). Although these studies include the idea of value creation through an intensive BI&A use, much less attention has been focused on another important aspect, namely how knowledge is created through the BI&A use. To understand this aspect, we hypothesized that the intangible organizational benefit of knowledge creation happens through the facilitation of absorptive capacity processes. Specifically, we argued that BI&A provide the technological infrastructure and knowledge-procession capabilities to complement the existing knowledge base which in turn enhances organizational absorptive capacity. Unlike the prior research that views the benefits of BI&A predominantly from a technological perspective (Hou, 2012; Kokin & Wang, 2014), through quantifiable financial measures (Davenport et al., 2012; Elbashir et al., 2008) our study instead sheds light on the specific role of BI&A to initiate knowledge creation. This is not to say the previous BI&A success models are not important simply because they do not, or at least not directly, lead to knowledge creation. While such knowledge is beneficial in the context of system adoption, organizational readiness evaluation, and assessment of the BI&A fit, it is less useful in the context of organizational knowing. Overall, our findings are consistent with the existing anecdotal evidence (Eom, 2014; Shollo & Galliers, 2016), but also extend the research by emphasizing how knowledge is created through the processes of knowledge acquisition, assimilation, transformation and exploration, as well as the active role of BI&A in these processes.

Further, the IS success scholars have often assumed a positive effect between the intensity of the BI&A use, as measured by the rate-recurrence measures, and the organizational benefits, but at the same time generally taking for granted that more use yields benefits itself, neglecting the nature of the use. Considering the criticism on this incompleteness of capturing the BI&A use dimension by the degree of use (Petter et al., 2008; Petter et

al., 2013), within our research the nature of the use is considered as well in order to fully capture the BI&A use dimension. By doing so, we provided an enrichment of the prior work on the topic and highlighted the need for including the nature of use as an important dimension explaining the BI&A use.

Apart from the role of BI&A in fostering knowledge creation, the BI&A system and information quality are significant determinants of organizational absorptive capacity through their intermediate effect on the BI&A use. The results of our research suggest that by providing greater reliability, flexibility, accessibility, response time, and easy integration with the existing systems, system quality can be an important catalyst of the process of knowledge creation (Boyd & Crawford, 2012; Chen & Zhang, 2014). Scholars suggest mixed support for the relationship between system quality and use (Fitzgerald & Russo, 2005; Gill, 1995; Nguyen et al., 2015), and within this research we established a positive association between system quality and the BI&A use, suggesting that organizations should ensure good system quality, especially with the new developments in the "big data" era, in which BI&A technologies, techniques, and applications need to be adjusted to the changing data requirements (Chen et al., 2012). Moreover, in highly dynamic markets, a flexible and fast response system positively impacts the perceived ease of use, thus preventing the BI&A underuse. Hence, easy access contributes to a more frequent and extended use of BI&A (Boyd & Crawford, 2012). However, the mediation analysis showed that high-quality systems should be aligned with the nature of use, as otherwise firms may be unsuccessful at reaping the full benefits from their investments. Moreover, the BI&A system should assure that on the one hand, the generated insights and knowledge are adequate, and that on the other hand, the system reduces the additional effort required for use and distributes the assimilated knowledge across the organization. This is in line with a part of the existing research in which organizations overemphasize the importance of instantaneously buying and installing high-quality BI&A systems without ensuring beforehand that the systems fit the nature of use and that their users are ready to use the system extensively (Ransbotham et al., 2016).

In addition, our study implies that information quality plays another important role in transforming insights into organizational knowledge that can further serve in decision-making. In the beginning, the current study hypothesized that information quality influences the knowledge creation processes of absorptive capacity through the degree and nature of the BI&A use. In the extant work on the BI&A success, it is exactly this association that has been understudied. Namely, we found that complete and accurate information presented in an understandable format can provide decision-makers with good grounds for action-taking and decision-making, which is in line with a part of the existing research (Kowalczyk & Buxmann, 2014; Lavalle et al., 2011). Nevertheless, more information is not necessarily beneficial for an organization, since an organization's information- and knowledge-processing capacity is limited (Simsek, 2009), and what is more, can be counterproductive when organizations face information overload (Koka & Prescott, 2002; Wales, Parida, & Patel, 2013). The results of the current study extend this line of inquiry by revealing that the good-quality information and insights provided from

BI&A in combination with the rich prior knowledge base may improve the process of identification of useful external information and their incorporation into further actions. In contrast, low-quality information distracts organizations, leading them to additional search and processing, consequently affecting negatively the knowledge creation processes.

5.2   Practical implications

Support for the BI&A use having a positive impact on organizational absorptive capacity was established within our research. This is why it is important for practitioners (IT managers and executives) to understand that investment into a high-quality BI&A system is a necessary but not at all a sufficient condition to ensure organizational benefits (Ransbotham et al., 2016). Instead, they should pay attention to the nature of use considering it as a very important determinant of the BI&A use and reconcile the nature of the use with the intended organizational benefits.

Second, the mediation role of the BI&A use supports the notion that managers should carefully opt for both high system quality and information quality of the installed BI&A systems. High information quality raises trust in BI&A and prevents managers from reverting to intuitive decision-making and the underuse of BI&A (Erevelles, Fukawa, & Swayne, 2016; Matzler et al., 2007). Accordingly, the system quality of the selected BI&A solution should be high, so that organizations can cope with the increased amounts of data and information they are faced with in their everyday operations (Kiron & Shockley, 2011). Hence, the BI&A systems should be reliable, fast-responding, real-time systems that adapt easily to the organizational employees' needs, even the less-skilled ones. Nonetheless, despite the excitement about the possibilities that BI&A has to offer, firms should also be aware that delivering organizational benefits represents a challenging and time-consuming process.

5.3   Limitations and future research

Several limitations of this study are worth noting. First, although we employed multiple measures of the BI&A use, including the frequency, extent, and nature of use, they were all nevertheless self-reported. Self-reported usage may induce biases in the participants' perception on the actual usage, resulting in differences regarding either the underestimation or overestimation of use. However, since the research was done at an organizational level, and different organizations have different BI&A systems, measuring the actual usage of BI&A would be very difficult, as it would be hard to apply the same proxies for the degree of use. Yet, we welcome the measurement of the actual use in future research across organizations using the same or similar BI&A systems, for which proxies for the actual use can be applied.

Next, since a single-respondent research design was used, we consciously risked common method variance biases. Nevertheless, several remedies were taken to reduce such problems. First, we addressed the CMV during the procedural stage by not informing the respondents about what we were measuring and by separating the measurement of the predictor from those of the criterion variables. The latter was done by introducing in between new items that were not used in this study, with the purpose of achieving a psychological separation. In this step of the research, respondent anonymity was properly ensured. Second, we addressed the CMV bias in the statistical stage by using Harman's, marker variable analyses, and the full collinearity assessment approach. The results in this second step suggested no serious CMV in our study.

The sampling strategy applied in the paper included a sampling of the impact of the BI&A use on organizational benefits during the same time period. Hence, a longitudinal, sequential design with resampling can serve as a good starting point for more insights into the causality between the BI&A use and the process of creating organizational benefits, as well as shed more light on how this process changes over time. The strong theoretical foundations of the hypothesized relationships do provide confidence about the directions of the identified associations.

Nevertheless, this paper also shows that a large-sample analysis of the BI&A use at multiple levels is called for to examine the BI&A's successes in detail, for greater generalization across firms, industries, and countries. In addition, future research may draw on other theories, such as the resource-based view, dynamic capabilities perspective, and information processing view, with the aim of exploring the effects of other factors.

APPENDIX A

Table 4. *Measurement scales and items*

Items	Literature
Degree of use	Venkatesh, Brown, Maruping, and Bala (2008)
Please indicate the extent to which you are currently using the BI&A. (EXT)	
Please indicate how often does your organization use BI&A. (FRQ)	
Nature of use	Gold, Malhotra, and Segars (2001)
My firm has clear rules for formatting or categorizing process knowledge. (TI1)*	
My firm uses Business Intelligence and Analytics technology that allows...	
….it to monitor its competition and business partners. (TI2)	
... employees to collaborate with other persons inside the organization. (TI3)*	
... people in multiple locations to learn as a group from a single source or at a single point in time. (TI4)	
... people in multiple locations to learn as a group from multiple sources or at multiple points in time. (TI5)*	
... it to search for new knowledge. (TI6)	
... it to map the location of specific types of knowledge. (TI7)	
... it to retrieve and use knowledge about its products and processes. (TI8)	
... it to retrieve and use knowledge about its markets and competition. (TI9)	
... generate and store new knowledge about its customers, partners, employees, or suppliers. (TI10)	
Acquisition (ASQ)	Flatten, Engelen, Zahra, and Brettel (2011)
The search for relevant information concerning our industry is an every-day business in our firm. (ASQ1)	
Our management motivates the employees to use information sources within our industry. (ASQ2)	

Items	Literature
Our management expects that the employees deal with information beyond our industry. (ASQ3)	

Assimilation (ASS)

In our firm ideas and concepts are communicated cross-departmental. (ASS1)

Our management emphasizes cross-departmental support to solve problems. (ASS2)

In our company, there is a quick information flow, e.g., if a business unit obtains the important information it communicates this information promptly to all other business units or departments. (ASS3)

Our management demands periodic cross-departmental meetings to interchange new developments, problems, and achievements. (ASS4)

Transformation (TRF)

Our employees have the ability to structure and use collected knowledge. (TRF1)

Our employees are used to absorb new knowledge as well as to prepare it for further purposes and to make it available. (TRF2)

Our employees successfully link existing knowledge with new insights. (TRF3)

Our employees are able to apply new knowledge in their practical work. (TRF4)

Exploitation (EXP)

Our management supports the development of prototypes. (EXP1)

Our firm regularly reconsiders technologies and adapts them accordant to new knowledge. (EXP2)

Our company has the ability to work more effective by adopting new technologies. (EXP3)

Information quality (INFQ)	Nelson, Todd, and Wixom (2005); B. H. Wixom and Watson (2001)

BI&A produces comprehensive information. (INFQ1)

Items	Literature
The information provided by BI&A is well formatted and clearly presented. (INFQ2)	
The information provided by BI&A is accurate. (INFQ3)	
BI&A provides me with the most recent information. (INFQ4)	
System quality (SYSQ)	Nelson, Todd, and Wixom (2005); B. H. Wixom and Watson (2001)
BI&A operates and performs reliably. (SYSQ1)	
BI&A makes information easy to access. (SYSQ2)	
BI&A can flexibly adjust to new demands or conditions. (SYSQ3)	
BI&A effectively integrates data from different areas of the company. (SYSQ4)	
It takes too long for BI&A to respond to requests. (SYSQ5) **	
Marker variable (MARKER)	Birkinshaw, Hood, & Jonsson (1998); Jaworski & Kohli (1993); Dill (1958); Volberda & Van Bruggen (1997)
Competition in our local market is intense. (C1)	
Price competition is a hallmark of our local market. (C4)	
Our clients regularly ask for new products and services. (D2)	
In a year, nothing has changed in our market. (D4) **	

Notes: *items eliminated due to low loading; **reverse scale item

APPENDIX B

Table 5. *Loadings and cross-loading for the reflective measurement model*

Construct		Item	ASQ	ASS	TRF	EXP	DEGUSE	NATUSE
Absorptive capacity	Acquisition	ASQ1	**0.731**	0.273	0.401	0.198	0.205	0.283
		ASQ2	**0.775**	0.369	0.491	0.323	0.245	0.334
		ASQ3	**0.734**	0.331	0.322	0.325	0.056	0.274
	Assimilation	ASS1	0.361	**0.863**	0.430	0.486	0.309	0.320
		ASS2	0.318	**0.761**	0.315	0.346	0.115	0.165
		ASS3	0.234	**0.694**	0.375	0.237	0.188	0.295
		ASS4	0.433	**0.811**	0.560	0.387	0.350	0.409
	Transformation	TRF1	0.440	0.450	**0.823**	0.223	0.325	0.456
		TRF2	0.433	0.475	**0.827**	0.178	0.284	0.498
		TRF3	0.473	0.401	**0.847**	0.180	0.120	0.415
		TRF4	0.463	0.473	**0.811**	0.417	0.261	0.357
	Exploitation	EXP1	0.259	0.371	0.227	**0.856**	0.179	0.098
		EXP2	0.432	0.356	0.304	**0.842**	0.144	0.207
		EXP3	0.256	0.464	0.234	**0.815**	0.441	0.155
Degree of use		EXT	0.243	0.324	0.287	0.282	**0.944**	0.389
		FRQ	0.198	0.285	0.284	0.293	**0.957**	0.431
Nature of use		TI2	0.344	0.398	0.482	0.267	0.265	**0.762**
		TI4	0.238	0.303	0.217	0.150	0.502	**0.691**
		TI6	0.267	0.222	0.407	0.163	0.397	**0.803**
		TI7	0.367	0.317	0.442	0.085	0.247	**0.742**
		TI8	0.310	0.259	0.448	0.105	0.379	**0.793**
		TI9	0.343	0.292	0.429	0.117	0.272	**0.796**
		TI10	0.263	0.265	0.350	0.080	0.175	**0.714**

Table 6. *Internal consistency, convergent validity, and discriminant validity for reflective constructs*

Latent construct	Composite reliability	AVE	Fornell-Lacker criterion								
			ACAP	ASQ	ASS	TRF	EXP	DEGUSE	NATUSE	INFQ	SYSQ
Absorptive capacity (ACAP)	0.848	0.584	**0.764**								
Acquisition (ASQ)	0.791	0.558	0.729 [a]	**0.747**							
Assimilation (ASS)	0.864	0.616	0.828 [a]	0.438	**0.785**						
Transformation (TRF)	0.897	0.684	0.832 [a]	0.547	0.545	**0.827**					
Exploitation (EXP)	0.876	0.702	0.654 [a]	0.381	0.474	0.306	**0.838**				
Degree of use (DEGUSE)	0.950	0.904	0.380	0.231	0.319	0.300	0.303	**0.951**			
Nature of use (NATUSE)	0.904	0.575	0.506	0.400	0.387	0.520	0.185	0.433	**0.758**		
Information quality (INFQ)	[b]	[b]	0.346	0.209	0.327	0.261	0.249	0.624	0.529	[b]	
System quality (SYSQ)	[b]	[b]	0.356	0.250	0.315	0.281	0.233	0.568	0.500	0.604	[b]

Note: Square roots of AVE on the diagonal (in bold font) and correlations among the latent constructs on the off-diagonal positions
[a] Lower-order component of the higher-order construct of absorptive capacity
[b] Not reported for formative constructs

Table 7. *Discriminant validity assessment using the heterotrait-monotrait ratio (HTMT) criterion*

	ASQ	ASS	TRF	EXP	DEGUSE	NATUSE	ACAP
Acquisition (ASQ)							
Assimilation (ASS)	0.615 [0.342;0.849]						
Transformation (TRF)	0.754 [0.575;0.903]	0.654 [0.378;0.825]					
Exploitation (EXP)	0.539 [0.301;0.801]	0.589 [0.354;0.755]	0.367 [0.171;0.612]				
Degree of use (DEGUSE)	0.308 [0.093;0.545]	0.367 [0.145;0.608]	0.344 [0.118;0.578]	0.362 [0.180;0.584]			
Nature of use (NATUSE)	0.548 [0.321;0.721]	0.457 [0.240;0.638]	0.609 [0.415;0.715]	0.216 [0.106;0.356]	0.475 [0.280;0.637]		
Absorptive capacity (ACAP)	1.009 [0.889;1.183]	0.986 [0.916;1.051]	0.942 [0.860;0.992]	0.814 [0.706;0.915]	0.426 [0.207;0.649]	0.569 [0.383;0.693]	

Note: The values in the brackets represent the 95% bias-corrected and accelerated confidence interval of the HTMT values obtained by running the bootstrapping routine with 5,000 samples in SmartPLS.

Table 8. *Comparison of the baseline model and the model with the marker variable*

Path	Baseline model			Model with marker MARKER		
	Est.	S.E	Sig.	Est.	S.E	Sig.
BIA_USE → ACAP	0.568	0.079	0.000	0.543	0.098	0.000
INFQ → DEGUSE	0.443	0.090	0.000	0.441	0.093	0.000
INFQ → NATUSE	0.351	0.111	0.002	0.347	0.113	0.002
SYSQ → DEGUSE	0.299	0.106	0.005	0.294	0.115	0.010
SYSQ → NATUSE	0.287	0.115	0.012	0.270	0.125	0.032
MARKER → ACAP				0.088	0.126	0.488
MARKER → DEGUSE				0.017	0.108	0.875
MARKER → NATUSE				0.055	0.111	0.625

Table 9. Standardized outer weights for formative measure items

Construct	Items	Outer Weights	*t*-value	95% BCa Confidence Interval	Outer Loadings	VIF
Information quality (INFQ)	INFQ1	0.598**	4.239	[0.754;0.974]	0.874**	1.489
	INFQ2	0.095	0.710	[0.341;0.823]	0.604**	1.474
	INFQ3	0.017	0.089	[0.087;0.879]	0.525*	1.364
	INFQ4	0.495**	3.199	[0.662;0.937]	0.832**	1.687
System quality (SYSQ)	SYSQ1	0.541**	3.394	[0.665;0.954]	0.851**	1.453
	SYSQ2	0.387**	3.453	[0.478;0.871]	0.665**	1.154
	SYSQ3	0.147	1.039	[0.142;0.766]	0.448**	1.144
	SYSQ4	0.165	1.207	[0.411;0.795]	0.614**	1.357
	SYSQ5	0.232	1.781	[0.219;0.732]	0.495**	1.112

Note: *Significant at .05 level; **Significant at .01 level

Table 10. *Weights of the first-order constructs on the second-order construct*

2nd Order Construct	1st Order Constructs	Weight	*t*-value
Business intelligence and analytics use (BIA_USE)	Degree of use (DEGUSE)	0.364	1.501
	Nature of use (NATUSE)***	0.781	4.096

Note: ***Significant at .001 level based on 5,000 bootstraps.

REFERENCES

Andreev, P., Heart, T., Maoz, H., & Pliskin, N. (2009). Validating formative partial least squares (PLS) models: methodological review and empirical illustration. I*CIS 2009 Proceedings*, 193.

Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of marketing research*, 396-402.

Arnold, V. (2006). Behavioral research opportunities: Understanding the impact of enterprise systems. *International Journal of Accounting Information Systems, 7*(1), 7-17.

Arnott, D., & Pervan, G. (2014). A critical analysis of decision support systems research revisited: the rise of design science. *Journal of Information Technology, 29*(4), 269-293.

Beath, C., Becerra-Fernandez, I., Ross, J., & Short, J. (2012). Finding value in the information explosion. *MIT Sloan management review, 53*(4), 18.

Becker, J.-M., Klein, K., & Wetzels, M. (2012). Hierarchical latent variable models in PLS-SEM: guidelines for using reflective-formative type models. *Long range planning, 45*(5-6), 359-394.

Birkinshaw, J., Hood, N., & Jonsson, S. (1998). Building firm-specific advantages in multinational corporations: the role of subsidiary initiative. *Strategic Management Journal, 19*(3), 221-242.

Bokhari, R. H. (2005). The relationship between system usage and user satisfaction: a meta-analysis. *Journal of Enterprise Information Management, 18*(2), 211-234.

Bose, R. (2009). Advanced analytics: opportunities and challenges. *Industrial Management & Data Systems, 109*(2), 155-172.

Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, communication & society, 15*(5), 662-679.

Bughin, J., Livingston, J., & Marwaha, S. (2011). Seizing the potential of 'big data'. *McKinsey Quarterly, 4*, 103-109.

Burnay, C., Jureta, I. J., Linden, I., & Faulkner, S. (2016). A framework for the operationalization of monitoring in business intelligence requirements engineering. *Software & Systems Modeling, 15*(2), 531-552.

Burton-Jones, A., & Gallivan, M. J. (2007). Toward a deeper understanding of system usage in organizations: a multilevel perspective. *MIS quarterly*, 657-679.

Burton-Jones, A., & Straub Jr, D. W. (2006). Reconceptualizing system usage: An approach and empirical test. *Information Systems Research, 17*(3), 228-246.

Cadogan, J. W., & Lee, N. (2013). Improper use of endogenous formative variables. *Journal of Business Research, 66*(2), 233-241.

Caldeira, M. M., & Ward, J. M. (2002). Understanding the successful adoption and use of IS/IT in SMEs: an explanation from Portuguese manufacturing industries. *Information Systems Journal, 12*(2), 121-152.

Chaudhuri, S., Dayal, U., & Narasayya, V. (2011). An overview of business intelligence technology. *Communications of the ACM, 54*(8), 88-98.

Chen, C. P., & Zhang, C.-Y. (2014). Data-intensive applications, challenges, techniques and technologies: A survey on Big Data. *Information Sciences, 275*, 314-347.

Chen, H. C., Chiang, R. H. L., & Storey, V. C. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. *MIS quarterly, 36*(4), 1165-1188.

Chen, X., Chen, L., & Bajwa, D. (2016). *Organizational Readiness for Business Intelligence and Analytics Systems Success.* Paper presented at the Twenty-second American conference on information systems, San Diego.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern methods for business research, 295*(2), 295-336.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive-capacity - a new perspective on learning and innovation. *Administrative science quarterly, 35*(1), 128-152. doi: 10.2307/2393553

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of Big Data Analytics in European firms. *Journal of Business Research, 70*, 379-390.

Daradkeh, M., & Moh'd Al-Dwairi, R. (2018). Self-Service Business Intelligence Adoption in Business Enterprises: The Effects of Information Quality, System Quality, and Analysis Quality *Operations and Service Management: Concepts, Methodologies, Tools, and Applications* (pp. 1096-1118): IGI Global.

Davenport, T. H. (2006). Competing on analytics. *Harvard business review, 84*(1), 98.

Davenport, T. H., Barth, P., & Bean, R. (2012). How 'Big Data' Is Different. *MIT Sloan management review, 54*(1), 22-24.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60-95.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

DeLone, W. H., & McLean, E. R. (2016). Information systems success measurement. *Foundations and Trends® in Information Systems, 2*(1), 1-116.

Depietro, R., Wiarda, E., & Fleischer, M. (1990). The context for change: Organization, technology and environment. *The processes of technological innovation, 199*(0), 151-175.

Dhar, V. (2013). Data science and prediction. *Communications of the ACM, 56*(12), 64-73.

Diamantopoulos, A., & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration. *British Journal of Management, 17*(4), 263-282.

Diamantopoulos, A., & Winklhofer, H. M. (2001). Index construction with formative indicators: An alternative to scale development. *Journal of marketing research, 38*(2), 269-277.

Dill, W. R. (1958). Environment as an influence on managerial autonomy. *Administrative science quarterly*, 409-443.

Doll, W. J., & Torkzadeh, G. (1998). Developing a multidimensional measure of system-use in an organizational context. *Information & Management, 33*(4), 171-185.

Doll, W. J., Xia, W., & Torkzadeh, G. (1994). A confirmatory factor analysis of the end-user computing satisfaction instrument. *MIS quarterly*, 453-461.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal, 21*(10-11), 1105-1121.

Elbashir, M. Z., Collier, P. A., & Davern, M. J. (2008). Measuring the effects of business intelligence systems: The relationship between business process and organizational performance. *International Journal of Accounting Information Systems, 9*(3), 135-153.

Elbashir, M. Z., Collier, P. A., Sutton, S. G., Davern, M. J., & Leech, S. A. (2013). Enhancing the business value of business intelligence: The role of shared knowledge and assimilation. *Journal of Information Systems, 27*(2), 87-105.

Eom, S. (2014). Knowledge Management And Data Mining: Emerging Business Intelligence Research Subspecialties. *DSS, 2*, 353-362.

Erevelles, S., Fukawa, N., & Swayne, L. (2016). Big Data consumer analytics and the transformation of marketing. *Journal of Business Research, 69*(2), 897-904.

European Commission. (2005). *The new SME definition: User guide and model declaration:* European Comm., Publication Office.

Fan, S., Lau, R. Y., & Zhao, J. L. (2015). Demystifying big data analytics for business intelligence through the lens of marketing mix. *Big Data Research, 2*(1), 28-32.

Fink, L., Yogev, N., & Even, A. (2016). Business Intelligence and Organizational Learning: An Empirical Investigation of Value Creation Processes. *Information & Management.*

Fisher, D., DeLine, R., Czerwinski, M., & Drucker, S. (2012). *Interactions with big data analytics. interactions, 19*(3), 50-59.

Fitzgerald, G., & Russo, N. L. (2005). The turnaround of the London ambulance service computer-aided despatch system (LASCAD). *European Journal of Information Systems, 14*(3), 244-257.

Flatten, T. C., Engelen, A., Zahra, S. A., & Brettel, M. (2011). A measure of absorptive capacity: Scale development and validation. *European Management Journal, 29*(2), 98-116.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 39-50.

Foshay, N., & Kuziemsky, C. (2014). Towards an implementation framework for business intelligence in healthcare. *International Journal of Information Management, 34*(1), 20-27.

Fraser, S., & Salter, G. (1995). *A motivational view of information systems success: a reinterpretation of Delone and McLean's model:* Department of Accounting and Finance, University of Melbourne.

Gaardboe, R., Nyvang, T., & Sandalgaard, N. (2017). Business intelligence success applied to healthcare information systems. *Procedia Computer Science, 121*, 483-490.

Gable, G., Sedera, D., & Chan, T. (2003). Enterprise systems success: a measurement model. *ICIS 2003 Proceedings*, 48.

Gandomi, A., & Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International Journal of Information Management, 35*(2), 137-144.

Gao, S., Yeoh, W., Wong, S. F., & Scheepers, R. (2017). A literature analysis of the use of Absorptive Capacity construct in IS research. *International Journal of Information Management, 37*(2), 36-42.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information Systems, 16*(1), 5.

Gefen, D., Straub, D., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems, 4*(1), 7.

George, G. (2005). Learning to be capable: patenting and licensing at the Wisconsin Alumni Research Foundation 1925–2002. *Industrial and corporate change, 14*(1), 119-151.

Gill, T. G. (1995). Early expert systems: Where are they now? *MIS quarterly*, 51-81.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems, 18*(1), 185-214.

Gonzales, R., Wareham, J., & Serida, J. (2015). Measuring the Impact of Data Warehouse and Business Intelligence on Enterprise Performance in Peru: A Developing Country. *Journal of Global Information Technology Management, 18*(3), 162-187.

Goodhue, D. L. (1995). Understanding user evaluations of information systems. *Management science, 41*(12), 1827-1844.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS quarterly*, 213-236.

Gorla, N., Somers, T. M., & Wong, B. (2010). Organizational impact of system quality, information quality, and service quality. T*he Journal of Strategic Information Systems, 19*(3), 207-228.

Grant, R. M. (1996). Prospering in dynamically-competitive environments: Organizational capability as knowledge integration. *Organization science, 7*(4), 375-387.

Grublješič, T., & Jaklič, J. (2015a). Business intelligence acceptance: The prominence of organizational factors. *Information Systems Management, 32*(4), 299-315.

Grublješič, T., & Jaklič, J. (2015b). Conceptualization of the business intelligence extended use model. *Journal of computer information systems, 55*(3), 72-82.

Hackney, R., Dooley, P., Levvy, Y., & Parrish, J. (2015). Critical value factors in business intelligence systems implementation success: An empirical analysis of system and information quality.

Hair, J., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science, 40*(3), 414-433.

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage Publications.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). A*dvanced Issues in Partial Least Squares Structural Equation Modeling*: SAGE Publications.

Halawi, L. A., McCarthy, R. V., & Aronson, J. E. (2008). An empirical investigation of knowledge management systems' success. *Journal of computer information systems, 48*(2), 121-135.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing *New challenges to international marketing* (pp. 277-319): Emerald Group Publishing Limited.

Holsapple, C., Lee-Post, A., & Pakath, R. (2014). A unified foundation for business analytics. *Decision Support Systems, 64*, 130-141.

Hou, C.-K. (2012). Examining the effect of user satisfaction on system usage and individual performance with business intelligence systems: An empirical study of Taiwan's electronics industry. *International Journal of Information Management, 32*(6), 560-573.

Hsieh, J. P.-A., Rai, A., & Xu, S. X. (2011). Extracting business value from IT: A sensemaking perspective of post-adoptive use. *Management science, 57*(11), 2018-2039.

Iivari, J. (2005). An empirical test of the DeLone-McLean model of information system success. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems, 36*(2), 8-27.

Işık, Ö., Jones, M. C., & Sidorova, A. (2013). Business intelligence success: The roles of BI capabilities and decision environments. *Information & Management, 50*(1), 13-23.

Jaworski, B. J., & Kohli, A. K. (1993). Market orientation: antecedents and consequences. *The Journal of marketing*, 53-70.

Jöreskog, K. G. (1978). Structural analysis of covariance and correlation matrices. *Psychometrika, 43*(4), 443-477.

Jöreskog, K. G., & Sörbom, D. (1982). Recent developments in structural equation modeling. *Journal of marketing research*, 404-416.

Kang, S. C., & Snell, S. A. (2009). Intellectual capital architectures and ambidextrous learning: a framework for human resource management. *Journal of Management Studies, 46*(1), 65-92.

Kiron, D., & Shockley, R. (2011). Creating business value with analytics. *MIT Sloan management review, 53*(1), 57.

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (IJeC), 11*(4), 1-10.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization science, 3*(3), 383-397.

Koka, B. R., & Prescott, J. E. (2002). Strategic alliances as social capital: A multidimensional view. *Strategic Management Journal, 23*(9), 795-816.

Kokin, S., & Wang, T. A. (2014). *Empirical Research on Business Intelligence Success.* Paper presented at the Advanced Materials Research, Vol. 842, pp. 754-758, 2014.

Kositanurit, B., Ngwenyama, O., & Osei-Bryson, K.-M. (2006). An exploration of factors that impact individual performance in an ERP environment: an analysis using multiple analytical techniques. *European Journal of Information Systems, 15*(6), 556-568.

Kowalczyk, M., & Buxmann, P. (2014). Big Data and information processing in organizational decision processes. *Business & Information Systems Engineering, 6*(5), 267-278.

Kowalczyk, M., & Buxmann, P. (2015). An ambidextrous perspective on business intelligence and analytics support in decision processes: Insights from a multiple case study. *Decision Support Systems, 80*, 1-13.

Kowalczyk, M., Buxmann, P., & Besier, J. (2013). Investigating Business Intelligence and Analytics from a Decision Process Perspective: A Structured Literature Review: Darmstadt Technical University, Department of Business Administration, Economics and Law, Institute for Business Studies (BWL).

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The reification of absorptive capacity: A critical review and rejuvenation of the construct. *Academy of management review, 31*(4), 833-863. doi: 10.5465/amr.2006.22527456

Lavalle, S., Lesser, E., Shockley, R., Hopkins, M. S., & Kruschwitz, N. (2011). Big Data, Analytics and the Path From Insights to Value. *MIT Sloan management review, 52*(2), 21-32.

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel psychology, 28*(4), 563-575.

Lee, Y. W., Strong, D. M., Kahn, B. K., & Wang, R. Y. (2002). AIMQ: a methodology for information quality assessment. *Information & Management, 40*(2), 133-146.

Leonard-Barton, D. (1995). Wellsprings of knowledge: Building and sustaining the sources of innovation. *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.*

Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence, and the complementarity of organizational learning processes. *Academy of management journal, 52*(4), 822-846.

Lohmoller, J.-B. (1988). The PLS program system: Latent variables path analysis with partial least squares estimation. *Multivariate Behavioral Research, 23*(1), 125-127.

Lynn, M. R. (1986). Determination and Quantification Of Content Validity. *Nursing research, 35*(6), 382-386.

Mahmood, M. A., Hall, L., & Swanberg, D. L. (2001). Factors affecting information technology usage: A meta-analysis of the empirical literature. *Journal of Organizational Computing and Electronic Commerce, 11*(2), 107-130.

Malhotra, A., Gosain, S., & El Sawy, O. A. (2005). Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation. *MIS quarterly, 29*(1), 145-187.

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., & Byers, A. H. (2011). Big data: The next frontier for innovation, competition, and productivity. *McKinsey Global Institute (http://www.mckinsey.com/insights/mgi/research/technology_and_innovation/big_ data_the_next_frontier_for_innovation).*

Matzler, K., Bailom, F., & Mooradian, T. A. (2007). Intuitive decision making. *MIT Sloan management review, 49*(1), 13.

McAfee, A., Brynjolfsson, E., Davenport, T. H., Patil, D., & Barton, D. (2012). Big data: The management revolution. *Harvard business review, 90*(10), 60-68.

McGill, T., Hobbs, V., & Klobas, J. (2003). User developed applications and information systems success: A test of DeLone and McLean's model. *Information Resources Management Journal (IRMJ), 16*(1), 24-45.

McKinney, V., Yoon, K., & Zahedi, F. M. (2002). The measurement of web-customer satisfaction: An expectation and disconfirmation approach. *Information Systems Research, 13*(3), 296-315.

Minelli, M., Chambers, M., & Dhiraj, A. (2012). *Big data, big analytics: emerging business intelligence and analytic trends for today's businesses:* John Wiley & Sons.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222.

Nelson, R. R., Todd, P. A., & Wixom, B. H. (2005). Antecedents of information and system quality: an empirical examination within the context of data warehousing. *Journal of Management Information Systems, 21*(4), 199-235.

Nguyen, T. D., Nguyen, T. M., & Cao, T. H. (2015). Information Systems Success: A Literature Review. In T. K. Dang, R. Wagner, J. Küng, N. Thoai, M. Takizawa, & E. Neuhold (Series Eds.), Future Data and Security Engineering (pp. 242-256). Cham: Springer International Publishing.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17*(3), 236-263.

Petter, S., DeLone, W., & McLean, E. R. (2013). Information Systems Success: The Quest for the Independent Variables. *Journal of Management Information Systems, 29*(4), 7-62. doi: 10.2753/MIS0742-1222290401

Petter, S., Straub, D., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS quarterly,* 623-656.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879.

Popovič, A., Coelho, P. S., & Jaklič, J. (2009). The impact of business intelligence system maturity on information quality. *Information research, 14*(4).

Popovič, A., Hackney, R., Coelho, P. S., & Jaklič, J. (2012). Towards business intelligence systems success: Effects of maturity and culture on analytical decision making. *Decision Support Systems, 54*(1), 729-739.

Popovič, A., Hackney, R., Coelho, P. S., & Jaklič, J. (2014). How information-sharing values influence the use of information systems: An investigation in the business intelligence systems context. *The Journal of Strategic Information Systems, 23*(4), 270-283.

Premkumar, G., & King, W. R. (1994). Organizational characteristics and information systems planning: An empirical study. *Information Systems Research, 5*(2), 75-109.

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research, 13*(1), 50-69.

Raisch, S., & Birkinshaw, J. (2008). Organizational ambidexterity: Antecedents, outcomes, and moderators. *Journal of management, 34*(3), 375-409. doi: 10.1177/0149206308316058

Ransbotham, S., Kiron, D., & Prentice, P. K. (2016). Beyond the Hype: The Hard Work Behind Analytics Success. *MIT Sloan management review, 57*(3).

Reinartz, W., Haenlein, M., & Henseler, J. (2009). An empirical comparison of the efficacy of covariance-based and variance-based SEM. *International Journal of Research in Marketing, 26*(4), 332-344.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). Editor's Comments: A Critical Look at the Use of PLS-SEM in" MIS Quarterly". *MIS quarterly*, iii-xiv.

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). SmartPLS 3. *Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.*

Rivard, S., Poirier, G., Raymond, L., & Bergeron, F. (1997). Development of a measure to assess the quality of user-developed applications. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems, 28*(3), 44-58.

Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research. *MIS quarterly, 36*(2), 625-648.

Rönkkö, M., & Ylitalo, J. (2011). *PLS marker variable approach to diagnosing and controlling for method variance.* Paper presented at the ICIS 2011 Proceedings. 8.

Sabherwal, R., Jeyaraj, A., & Chowa, C. (2006). Information system success: Individual and organizational determinants. *Management science, 52*(12), 1849-1864.

Saeed, K. A., & Abdinnour-Helm, S. (2008). Examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems. *Information & Management, 45*(6), 376-386.

Saeed, K. A., Hwang, Y., & Mun, Y. Y. (2003). Toward an integrative framework for online consumer behavior research: a meta-analysis approach. *Journal of Organizational and End User Computing (JOEUC), 15*(4), 1-26.

Sangari, M. S., & Razmi, J. (2015). Business intelligence competence, agile capabilities, and agile performance in supply chain: An empirical study. *The International Journal of Logistics Management, 26*(2), 356-380.

Sarstedt, M., & Mooi, E. (2014). Cluster analysis *A concise guide to market research* (pp. 273-324): Springer.

Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research, 8*(3), 240-253.

Sedera, D., & Gable, G. (2004). *A factor and structural equation analysis of the enterprise systems success measurement model.* Paper presented at the ICIS 2004 Proceedings, 36.

Sharma, R., Mithas, S., & Kankanhalli, A. (2014). Transforming decision-making processes: a research agenda for understanding the impact of business analytics on organisations. *European Journal of Information Systems, 23*(4), 433-441.

Shollo, A., & Galliers, R. D. (2016). Towards an understanding of the role of business intelligence systems in organisational knowing. *Information Systems Journal, 26*(4), 339-367. doi: 10.1111/isj.12071

Shuradze, G., & Wagner, H.-T. (2016). *Towards a Conceptualization of Data Analytics Capabilities.* Paper presented at the 2016 49th Hawaii International Conference on System Sciences (HICSS).

Siemens, G., & Long, P. (2011). Penetrating the fog: Analytics in learning and education. *EDUCAUSE review, 46*(5), 30.

Simsek, Z. (2009). Organizational ambidexterity: Towards a multilevel understanding. *Journal of Management Studies, 46*(4), 597-624.

Srivardhana, T., & Pawlowski, S. D. (2007). ERP systems as an enabler of sustained business process innovation: A knowledge-based view. *The Journal of Strategic Information Systems, 16*(1), 51-69.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509-533.

Torres, R., Sidorova, A., & Jones, M. C. (2018). Enabling firm performance through business intelligence and analytics: A dynamic capabilities perspective. *Information & Management.*

Trieu, V.-H. (2017). Getting value from Business Intelligence systems: A review and research agenda. *Decision Support Systems, 93*, 111-124. doi: https://doi.org/10.1016/j.dss.2016.09.019

Trkman, P., McCormack, K., De Oliveira, M. P. V., & Ladeira, M. B. (2010). The impact of business analytics on supply chain performance. *Decision Support Systems, 49*(3), 318-327.

Urbach, N., & Müller, B. (2012). The updated DeLone and McLean model of information systems success *Information systems theory* (pp. 1-18): Springer.

Venkatesh, V., Brown, S. A., Maruping, L. M., & Bala, H. (2008). Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. *MIS quarterly*, 483-502.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Verona, G., & Ravasi, D. (2003). Unbundling dynamic capabilities: an exploratory study of continuous product innovation. *Industrial and corporate change, 12*(3), 577-606.

Vidgen, R., Shaw, S., & Grant, D. B. (2017). Management challenges in creating value from business analytics. *European Journal of Operational Research, 261*(2), 626-639.

Volberda, H., & Van Bruggen, G. (1997). Environmental turbulence: A look into its dimensionality (Dynamiek in Bedrijfsvoering. NOBO ed.). Enschede, The Netherlands: M. T. A. Bemelmans.

Wales, W. J., Parida, V., & Patel, P. C. (2013). Too much of a good thing? Absorptive capacity, firm performance, and the moderating role of entrepreneurial orientation. *Strategic Management Journal, 34*(5), 622-633.

Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. *International journal of management reviews, 9*(1), 31-51.

Weill, P., & Vitale, M. (1999). Assessing the health of an information systems applications portfolio: An example from process manufacturing. *MIS quarterly,* 601-624.

Wieder, B., & Ossimitz, M.-L. (2015). The impact of Business Intelligence on the quality of decision making–a mediation model. *Procedia Computer Science, 64*, 1163-1171.

Wieder, B., Ossimitz, M.-L., & Chamoni, P. (2012). The Impact of Business Intelligence Tools on Performance: A User Satisfaction Paradox? *International Journal of Economic Sciences & Applied Research, 5*(3), 7-32.

Wixom, B., Ariyachandra, T., Douglas, D. E., Goul, M., Gupta, B., Iyer, L. S., . . . Turetken, O. (2014). The current state of business intelligence in academia: The arrival of big data. *CAIS, 34*, 1.

Wixom, B. H., & Watson, H. J. (2001). An empirical investigation of the factors affecting data warehousing success. *MIS quarterly*, 17-41.

Yeoh, W., & Popovič, A. (2016). Extending the understanding of critical success factors for implementing business intelligence systems. *Journal of the Association for Information Science and Technology, 67*(1), 134-147.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of management review, 27*(2), 185-203. doi: 10.5465/amr.2002.6587995

The Spatial Dimension of Entrepreneurship: Stylized Facts for the Case of Austria

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ABSTRACT: *Austria and other European countries are striving to increase the level of entrepreneurial activities to create jobs and income in the aftermath of the Great Recession. The aim of this contribution is to establish stylized empirical facts about regional entrepreneurial activities in Austria. The methodology rests upon a spatial data analysis, the main results of which demonstrate a decline in entrepreneurial activities in the last decade, with a stable pattern of spatial distribution of new ventures and high-growth firms. Overall, our empirical findings point to a number of stylized facts questioning whether entrepreneurship is able to deliver all the proposed miracles policy-makers hope for. In line with the literature in regional economics and entrepreneurship research, our findings suggest persistent interregional differences between the intensity of regional entrepreneurial activities, a higher prevalence of entrepreneurial activity among core regions and a higher concentration of venture capital investments, as compared to innovation and entrepreneurial activities in general.*

1   INTRODUCTION

Entrepreneurial activities are regarded as an important causal factor of economic growth performance. According to Audretsch (2007), the causal mechanism behind this positive relationship is driven by entrepreneurs who transform investments in knowledge into output growth by facilitating the spillover of new knowledge throughout the economy. Indeed, societies that inhibit entrepreneurs to engage in productive, wealth creating activities may suffer from low levels of innovation and productivity growth (Baumol, 1990; Baumol & Strom, 2007). The agenda of many European countries to speed up entrepreneurial processes relies upon these lines of reasoning. Due to the recent Great Recession, European economies have suffered from a protracted period of sluggish

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economic growth and resulting high unemployment rates. For instance, the Austrian unemployment rate began to rise in the years after the Great Recession and plateaued at 8.3% in 2016, which is the second highest value after the end of World War II. Even though entrepreneurship was already on the agenda of economic policy-makers before the Great Recession, the dire economic circumstances increased its importance as a promising way to foster economic renewal.

Economic policy strategies, such as "Going for Growth" (OECD, 2015) or the "Annual Growth Surveys" (European Commission, 2018), typically include references to the need to increase start-up activities and entrepreneurship in general. Indeed, Austria strives to become the location with the best framework conditions for entrepreneurs in Europe ("Gründerfreundlichstes Land Europas") (BMWFW, 2015). However, an international comparison reveals a rather low level of entrepreneurial activity in Austria with respect to entry rates of new firms and the share of high-growth enterprises (OECD, 2016; Hölzl, 2010). Below the EU-average venture capital investments and a relatively high degree of risk aversion as a result of deep rooted fears of failure lead to a rather inefficient "national system of entrepreneurship" (European Union, 2018; Kiendl, D., Schmalzer, T., Wenzel, R. & Penz, E. 2017; Acs et al., 2016).

The aim of this contribution is to test and establish stylized empirical facts about regional entrepreneurial activities in Austria. By doing this, we contribute to the emerging literature on the link between entrepreneurship and regional development (Eriksson & Rataj, 2019). The spatial economic research focus is relevant and increasingly popular because entrepreneurial activities are primarily 'regional events' (Feldman, 2001). Our research questions address the dynamics, structures and effects of regional entrepreneurship in Austria. Dynamics refer to the temporal development of entrepreneurial activities, structures allude to the spatial dimension of entrepreneurship and effects concern the probable effect of entrepreneurship on unemployment rates.

Therefore, the paper addresses the following questions: (a) What was the impact of the Great Recession on regional entrepreneurship in Austria? (b) Are there systemic differences in entrepreneurship between Austrian regions and what factors may determine such differences? (c) Is it possible to group the Austrian regions into different types of entrepreneurial regimes? (d) Where are venture-capital(VC)-funded start-ups located and what are the potential consequences of these locational choices? (e) What is the statistical relationship between entrepreneurial activity and unemployment? Drawing on theoretical and empirical research in the field of entrepreneurship, the following section deduces five hypotheses from the research questions.

This paper contributes to the current debate on the importance of entrepreneurship in Austria and Europe as it investigates the spatial structures and temporal dynamics of regional entrepreneurship in Austria. Currently, we are not aware of a similar study covering the situation in Austria. It furthermore deepens the understanding of spatial

dimensions of entrepreneurship and raises the issue of national efficiency versus spatial equity in entrepreneurship research. Furthermore, the paper contributes to the current debate by evaluating the optimistic perception of entrepreneurship in the political sphere.

The paper is organized as follows: in the following chapter the existing literature is reviewed, a brief theoretical introduction to this topic provided and the hypotheses presented. In Chapter 3 the methodology and the source of the data are reviewed. Chapters 4 to 7 include a presentation of the analysis of the data and the regional dynamics of entrepreneurship, with Chapter 5 focusing on the spatial structures of entrepreneurship and Chapter 6 introducing VC-firms and the spatial concentration of entrepreneurial activities, while Chapter 7 pays attention to entrepreneurial activities and unemployment dynamics. Finally, conclusions are discussed in Chapter 8.

2   LITERATURE REVIEW

The literature defines entrepreneurship as either the creation of new economic activity (e.g. Shane & Venkataraman, 2000), which often results in the creation of new venture (e.g. Schumpeter, 1934; Gartner, 1989), or the pursuit of innovation (Schumpeter, 1934). We follow Plummer and Pe'er (2010, p. 522) and refer to entrepreneurship as a "competitive process by which perceived profitable opportunities are discovered and exploited by alert individuals and the new organizations that emerge, grow, prosper, or fail as a result." Schumpeter (1934) introduced the idea that changes in technology leading to business opportunities deployed by entrepreneurs contribute to economic development through a process of creative destruction. Hence, new ventures as well as growth processes of firms are considered important outcomes of entrepreneurial activities. In the continuation, these two characteristics of entrepreneurship are analysed by considering the statistics on firm formation and high-growth firms. Both the creation of new ventures and the quality of their growth are consistently seen by academics but also by politicians and decision-makers as essential drivers of regional economic development (Scarpetta, 2003). Birch (1981) explored and demonstrated the link between entrepreneurship and economic growth from an empirical point of view through a longitudinal study and found that small and medium-sized enterprises (SMEs) were the main driver of job creation within the United States (US). Birch's initiation was followed by not only academic but also institutional studies, which confirmed his findings and in addition extended and developed this field of research. However, as entrepreneurial activities are to some degree dependant on the status of the overall economy, recessions might have a negative effect on the creation of new businesses and the survival and development of the existing ventures (Fairlie, 2013). What is more, recessions limit the availability of resources, including access to (venture) capital and local demand (Latham & Braun, 2011). Thus, from the discussion above, we derive the following hypothesis:

- Hypothesis 1: The Great Recession had a negative effect on entrepreneurship in Austria (see section 4).

The relationship between entrepreneurial activities and the region as a subnational spatial entity is illustrated in Figure 1. Focusing on the regional level can be justified by two reasons. Firstly, most entrepreneurial processes operate predominantly on a regional level (Feldman, 2001). Explanations for this regional concentration of entrepreneurial activities can be found in reduced transaction costs, such as lower transportation and communication costs (Leamer, 2007), but also reduced search costs when using local networks as spatial proximity supporting relationship formation, information exchange and knowledge diffusion (Krugman, 1991a; Porter, 2000b). Secondly, countries are characterized by substantial variations in regional economic structures which lead to a vast variation of entrepreneurial contexts (Sternberg, 2009). Figure 1 proposes a circular relationship between the entrepreneurial process on the individual level and the region. The idea of circular processes in space is one of the basic propositions of regional economics and is also recognized in the entrepreneurship literature (McCann, 2013; Eriksson & Rataj, 2019). A region may be characterized by variables such as economic structure and human capital endowment, the presence of financial institutions such as banks or venture capital funds, and social norms or regional public policies. Fink et al. (2012, p. 16) review entrepreneurship policies in the Austrian regions and conclude that "(…) location matters when setting up a company in Austria, because between the (nine Austrian) states entrepreneurship policy measures differ not only in focus and intensity but also regarding the instruments employed and the phases of the start-up process in which support can be received."

Figure 1: *The nexus between regional economic context and entrepreneurship*

Source: authors' own draft

Recent research has summarized and conceptualized the variables describing the regional context by the notion of an "entrepreneurial ecosystem" (Spiegel & Harrison, 2018; Mack & Mayer, 2016). On the one hand, new ventures may trigger a process of creative destruction within the region and thereby change the regional economic and social context. On the other hand, new ventures may generate spillovers, increase entrepreneurial knowledge and initiate a reinforcing process of circular and cumulative causation via positive feedback loops that reshapes the regional economic context (Frisch, 2013). In addition, other variables, such as the business cycle or trade policy, will also influence entrepreneurial activities in a certain region. The ideas of a circular process of spatial development and the importance of the regional economic context are elaborated for example in Porter (2000a) and Krugman (1991). Plummer and Pe'er (2010) discuss the different theoretical approaches in detail and

conclude with a proposition to merge entrepreneurship theories and regional economics into an integrated framework that conceptualizes entrepreneurship as an inherent spatial process. Fritsch and Wyrwich (2014) show that these spatial processes display a high degree of persistence. Based on our research questions, the discussion of theory, and public policy of regional entrepreneurship, we develop the following hypotheses:

- Hypothesis 2: There are persistent differences between the intensity of regional entrepreneurial activities in Austria (see section 5).

- Hypothesis 3: Entrepreneurship is more prevalent among core regions with high levels of economic development, thereby exacerbating spatial disparities between core and peripheral regions within a country (see section 5).

- Hypothesis 4: Regional entrepreneurial activities lower regional unemployment rates (see section 7).

In the field of regional entrepreneurial development, venture capitalists have gained some interest as they expand their influence in determining who receives funding for their entrepreneurial venture. From a regional point of view, venture capital funding might consequently affect the economic performance of regions (Sorenson & Stuart, 2001). Specialised resources of regional entrepreneurial ecosystems–such as a venture capital provider–supporting entrepreneurial activities tend to be regionally concentrated (Autio et al., 2018). In addition, a high spatial concentration of the venture capital provider might increase the effective coordination amongst investors which could impact their incentives. This geographic dimension of venture capitalists can be supported by a high concentration of high-growth potential start-ups (Adler et al., 2019). In conclusion, we derive the following hypothesis:

- Hypothesis 5: Venture capital investments display higher spatial concentrations than innovation and entrepreneurial activities in general (see section 6).

Hence, hypothesis 1 is about short-term developments of regional entrepreneurship in Austria. Hypotheses 2, 3 and 5 address the question of spatial structures of regional entrepreneurship in Austria, whereas hypothesis 4 is about possible effects of regional entrepreneurship on regional unemployment rates. On the whole, the hypotheses are connected by the overall theme of this paper, namely the relationship between entrepreneurship and regional development.

The aim of this paper is to test the above presented hypotheses on stylized facts of entrepreneurship in Austria. The contribution of this paper is twofold, namely on the one hand, we aim to enrich the information for political decision-makers by investigating the empirical regularities and to inform the public debate on the role and relevance of

entrepreneurship in economic policy. On the other hand, we intend to add further empirical evidence to the literature on entrepreneurship and regional development. As pointed out recently by Eriksson and Rataj (2019), the missing puzzle to explain the relationship between entrepreneurship and regional development is the geographic dimension. This paper strives to contribute to this ongoing strand of empirical and theoretical research.

3   METHODOLOGY AND DATA

The applied methodology rests upon descriptive and inferential statistics of secondary and primary data. In particular, the methods of the bivariate regression, correlation analysis, spatial statistics, concentration analysis and hierarchical cluster analysis respectively are applied. Regarding the spatial analysis, patterns of spatial autocorrelation are analysed by calculating Moran's I. The Herfindahl Index is used to estimate the concentration of economic variables at the level of Austrian NUTS2 regions. Since different methods are applied throughout the paper, we describe the methods in detail at the beginning of each empirical chapter.

Variables that are utilized include entrepreneurship variables, regional unemployment rates, regional gross domestic product (GDP) and sectoral growth rates of the total factor productivity (TFP). In this paper we use four entrepreneurship variables, namely (i) birth rates of new ventures, (ii) death rates of firms, (iii) share of high growth firms, and (iv) the number of start-ups with funding from a venture capital fund. All variables are available for either the NUTS 2 or the NUTS 3 level. Regarding the time dimension, the data is from 2004 or 2008 to 2012 or 2014.

Secondary data are from (i) Statistics Austria, (ii) Eurostat and (iii) EU-KLEMS. The variables birth rates of new ventures, death rates of firms and the share of high growth firms are taken from Statistik Austria. We use the data sets "Unternehmensdemografie (bis 2014)" (enterprise demography) and "Schnellwachsende Unternehmen (bis 2014)" (high-growth enterprises). The statistics on birth and death of firms (enterprise churn) comprises only firms whose revenue is greater than €10,000 or firms that have at least one employee. The birth rate (death rate) is defined as the number of new firms (exiting firms) as a percentage of the existing firms (Eurostat 2012). A high-growth enterprise (growth by 10% or more) is defined as an enterprise with an average annualised growth in the number of employees greater than 10% per year over a three-year period (t – 3 to t) and having at least 10 employees in the beginning of the growth (t – 3). The share of growth firms refers to the number of high-growth firms divided by all firms with more than ten employees. The TFP-numbers are from EU-KLEMS; Koszerek, Havik, McMorrow, Röger and Schönborn (2007) describe the growth accounting framework behind the estimation of the sectoral and national TFP growth rates used in the EU-KLEMS framework.

For the fourth entrepreneurship variable, i.e. the number of start-ups with funding from a venture capital fund, we collected primary data based on the identification of the major VC funds operating in Austria. The data represent the stock of investments in the year 2015. Even though this procedure does not consider all VC-funded firms, based on the literature and anecdotal evidence it is reasonable to assume that the locational pattern of the non-included VC-funded firms is similar to the pattern observed in our sample (Peneder & Schwarz 2008).

4   REGIONAL DYNAMICS OF ENTREPRENEURSHIP

Entrepreneurship is affected by and affects the business cycle. The aim of this section is to analyse the development of birth and death rates of businesses before and during the financial crisis of 2008-2009, also referred to as the "Great Recession". A comparison with other countries as well as efficiency issues pertaining to regional enterprise dynamics during the Great Recession are discussed based on the data at the level of Austrian NUTS2 regions. The aim is to test hypothesis 1: The "Great Recession" had a negative effect on entrepreneurship in Austria.

Figure 2 shows the entry and death rates at the NUTS2 level, i.e. for the nine Austrian federal states ("Bundesländer") and for Austria. Regarding birth rates (left panel), a clear downward trend can be observed which already began before the "Great Recession". The share of new ventures declined from about 7.5% in 2005 to somewhat below 6% in 2012. In absolute numbers, new ventures in Austria declined from about 28,500 at the peak in 2005 to around 24,000 in 2012, which amounts to approximately 4500 fewer new firms per year.

This negative trend captures all new ventures without considering the differences of the new ventures in terms of their innovation performance. According to the Austrian innovation strategy "Becoming an Innovation Leader", the number of new knowledge-intensive firms is supposed to increase by 3% per year (Republic of Austria, 2011). However, the data on the new knowledge-intensive firms in services and manufacturing reveal an actual decline between 2010 and 2014 (RFTE, 2017). As a result, the decline rate in new firm formation also holds true for high-innovative ventures. This pattern of an overall reduction in entrepreneurial dynamism is of course not unique for Austria, as the time series data for Germany (Metzger, 2016) and the United States (Hathaway & Litan, 2014) reveal quite a similar negative trend.

Figure 2: *Enterprise birth rates (left panel) and death rates (right panel), 2004-2012*
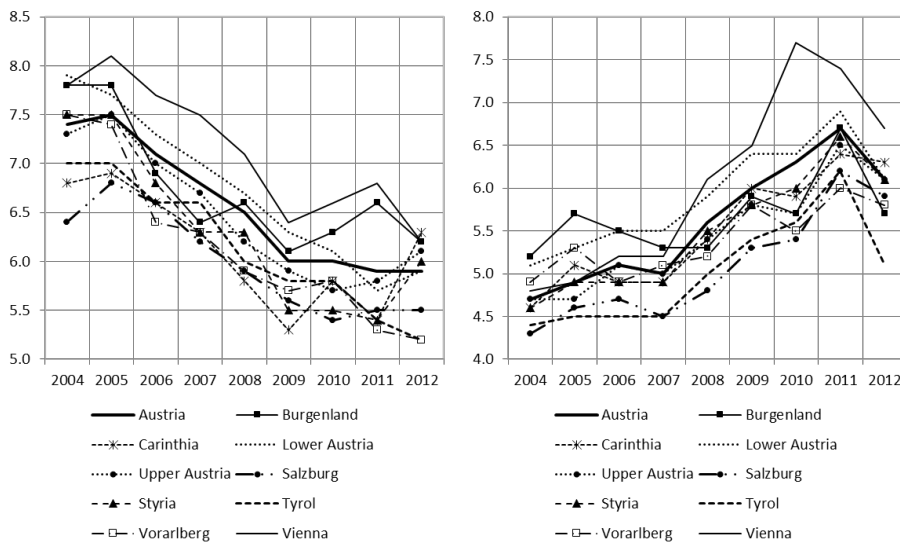
Source: Statistik Austria (2018)

Death rates of firms are displayed in the right panel of Figure 2. In addition to the declining birth rates, death rates increase over time. In 2011, a change of this trend seems to have taken place, showing a drop of death rates in all regions. Yet, the overall death rates at the national level surged from 4.7% in 2004 to 6.1% in 2012. This may indicate an increasingly challenging business environment or changing opportunity costs of entrepreneurship due to labour market developments making dependent employment more attractive. Because of these contrarian trends of birth and death rates, the enterprise churn rates have remained constant at about 12% while the net business population growth has declined.

These results may of course not be in line with the vision of policy-makers as outlined in entrepreneurship policy strategy papers (BMWFW, 2015). From a welfare economics point of view, however, the results ask for a more elaborate interpretation. Popular views on entrepreneurship assume that higher levels of entrepreneurial activities translate into welfare gains. A more nuanced view would take into account also the business models of the firms which enter or exit the market. For instance, high entry and exit rates of firms with an outdated, non-innovative business model may be considered a waste of resources and more common in less developed economies (Hölzl, 2010; Fritsch, 2008). Hence, the declining enterprise churn in Austria may point to a declining welfare due to a lower level of entrepreneurial experimentation. But if the decline is the result of a reduction of entrepreneurial activities of firms with an outdated, non-innovative business model, the welfare implications may be quite different. Since the decline of new firm formation also

applies to knowledge-intensive firms (see above), the pessimistic view, i.e. a loss in social and economic welfare, seems to offer the more appropriate interpretation.

In addition to this general trend, a persistent pattern of regional disparities in entrepreneurial activities exists between the nine Austrian regions. While Vienna and Lower Austria constantly display a higher birth rate than the national total, Salzburg and Carinthia perform below the national level. The lines are parallel, which suggests that the differences remain stable even under changing conditions during the business cycle. The range between the region with the highest and the lowest entry rate is about 1.5 percentage points. Similar observations hold true for death rates apart from Vienna, which experienced a much more pronounced rise in its death rate after 2007 compared to the other regions. Further analysis reveals that regions with above average birth rates also have above average death rates, suggesting different spatial regimes of enterprise churn. The correlation coefficient between the two rates at the regional level for the years 2004-2012 is 0.68 on average.

The onset of the Great Recession in 2008 and its deepening in the following years because of the Euro crisis may be discerned in the development of birth rates, switching from a declining trend with the minimum in 2009 to stagnation or an increase in the next years, at least in some regions. This may be interpreted as a recession-push effect which leads to higher rates of new firm formation because of lower chances to find dependent employment. Firm death rates, on the other hand, started to rise shortly before the economic crisis and began to decline in 2010 and 2011. At any rate, the increase of the death rate between 2008 and 2011 can be interpreted as a result of a more difficult economic environment characterized by low demand and high uncertainty.

The welfare implications of the dynamics during the crisis depend upon whether or not a "cleansing effect" occurs (Dias & Robalo Marques 2018). This effect works through firms that were not as productive as their peers before a recession and become even more unproductive during a downturn or even exit the market. Of course, this phenomenon is discussed differently within the theoretical literature and empirical studies. The theoretical literature suggests a pro-cyclical behaviour of firm entry and job creation, i.e. more firms enter during booms than in recessions and create a higher number of jobs while less-productive firms vanish from markets during difficult economic times (Moscarini & Postel-Vinay, 2012). This process resembles what Schumpeter described as "creative destruction" (Schumpeter, 1939), i.e. sluggish, incumbent firms have to exit the market when a new wave of technological innovations driven by innovators changes the competitive environment. Yet, empirical studies, such as by Lee & Mukoyama (2012) and Gomis & Khatiwada (2016), cannot support the existence of such a cleansing effect. In fact, Lee & Mukoyama (2012) point out that firms that are founded during booms are 25 per cent smaller and 10-20 per cent less productive than counterparts that enter during recessions. Given the focus of the paper, a similar, methodologically advanced exercise for the case of Austria is out of scope. However, a simple descriptive analysis based on aggregated data at the sectional level of the ÖNACE-classification (17 industries) reveals

no statistically significant relationship between the efficiency of an industry (measured by its TFP-growth between 1996 and 2008, data from EU-KLEMS) and its difference between the average enterprise birth and death rates (2009-2012). The two industries with the highest efficiency (financial activities and manufacturing) experienced a difference between birth and death rates of the size of -1.7 and -0.4 percentage points, with -0.4 being the median difference over all industries. On the whole, however, the pattern remains inconclusive at least for this level of analysis, and the question whether or not a "cleansing effect" occurred during the "Great Recession" in Austria remains open.

Our conclusions regarding hypothesis 1, i.e. the Great Recession had a negative effect on entrepreneurship in Austria, are that the empirical analysis provides mixed evidence. There is some indication of a rise in enterprise death rates between 2008 and 2011 whereas the birth rates had already followed a negative trend since 2005, i.e. before the crisis set in. In addition, there is also no unambiguous answer to whether or not there was a "cleansing effect" at work during the "Great Recession" in Austria.

5   SPATIAL STRUCTURES OF ENTREPRENEURSHIP

In this section, hypotheses 2 and 3 are tested, positing a spatial persistency and a core-periphery structure of entrepreneurial activities.

Core and periphery

Economic geography presumes that there are persistent differences in economic activity between core regions and peripheral regions (Krugman, 1991). The former are characterized by high productivity levels and net gains in terms of factor mobility, while the latter suffer from stagnation and lower standards of living. The question arises whether it is possible to establish such a core and periphery pattern also for entrepreneurial activities.

We consider the spatial disparities of entry rates and share of high growth firms at the level of the 35 Austrian NUTS3 regions. Both indicators are from Statistik Austria (see above). Therefore, the average value for the five years 2008-2012 for each region is calculated and the regions ordered according to their average value. The five regions at the top and the bottom of this distribution are identified and their performance during the years 2008-2012 is compared with the median value for each year. In the final step, we investigate whether top regions fall below the median and whether bottom regions perform above the median in any given year. This method enables us to analyse whether regional disparities are persistent. In addition, we calculate correlation coefficients and test their significance to substantiate the results from the descriptive statistics and consider all regions together. A strong positive and significant correlation suggests the persistence of regions with permanently high and low levels of entrepreneurship respectively. The main limitation of this methodology stems from the short period of observations, which may be considered being too short for making judgements about persistent spatial disparities.

Table 1 displays the entry rates for the 5 regions with the highest and the lowest entry rates respectively. Whereas the region of Nordburgenland had on average 7% of new firms relative to the existing firms, the number for Lienz was only 4.8%. Again, the spatial disparities are characterized by a high degree of persistence. Regions with a high entry rate constantly perform above the median of all 35 regions and vice versa. There is not a single year in which a leading or a laggard region performed below or above the median. This stable pattern is also reflected in a high positive temporal auto-correlation between the years from 2008 to 2012. The coefficients range between 0.6 and 0.8 and are highly significant at the 1% level if a two-sided hypothesis test is applied. The development of the entry rates over time suggests that there is no clear sign of convergence between the two groups of regions in Table 1. Indeed, the standard deviation for the 35 regions with respect to the entry rate increases from 0.62 (2008) to 0.65 (2012). Fritsch & Wyrwich (2014) corroborate the finding of persistent spatial differences in entrepreneurship activities for Germany for the period 1925-2005. They find that persistency tends to exist for about eight years despite substantial changes in the institutional context. Their explanation rests upon the existence of cultures of regional entrepreneurship exhibiting characteristics of inertia.

Table 1: *The 5 regions with highest and lowest entry rates, percentages 2008-2012*

NUTS 3 Region	2008	2009	2010	2011	2012	Average	Difference in percentage points, 2012-2008
AT112 Nordburgenland	7.5	6.7	6.5	7.4	6.7	7.0	-0.8
AT130 Wien (Vienna)	7.1	6.4	6.6	6.8	6.2	6.6	-0.9
AT126 Wiener Umland/ Nordteil	7.3	6.6	6.5	6.1	6.6	6.6	-0.7
AT122 Niederoesterreich-Sued	7.3	6.9	6.9	5.7	5.9	6.5	-1.4
AT127 Wiener Umland/Suedteil	6.8	6.5	6.2	5.9	6.4	6.4	-0.4
Median	*6.2*	*5.8*	*5.5*	*5.6*	*5.7*	*5.8*	*-0.5*
AT333 Osttirol	5.8	5.8	5.0	4.7	4.4	5.1	-1.4
AT212 Oberkaernten	4.9	4.4	5.3	5.3	5.2	5.0	0.3
AT334 Tiroler Oberland	5.6	5.0	5.1	4.7	4.7	5.0	-0.9
AT341 Bludenz-Bregenzer Wald	4.9	4.9	5.3	4.6	4.9	4.9	0
AT222 Liezen	5.6	4.4	4.4	4.4	5.0	4.8	-0.6

Source: Own empirical research, Statistik Austria.

The regional disparities of high growth firm activities are somewhat less persistent. Table 2 shows the 5 regions with the highest and the lowest shares of fast-growing firms from 2008 to 2013. While it is still true that there are substantial and stable differences between the two regional groups, laggard regions may occasionally perform above the median value and the leading regions below the median value, which can perhaps be ascribed to the

regression-to-the-mean effects. The respective cells are coloured in grey. The differences in the last column show that the share of high-growth firms is also characterized by a negative trend. The correlation coefficient between the years ranges from about 0.4 and 0.6, hence being lower than in the case of entry rates. As a result, only three out of four correlation coefficients are statistically significant at the 1% level, with the exception in the correlation between 2010 and 2012 which shows a p-value of 0.17.

Table 2: *The 5 regions with the highest and lowest share of fast growing enterprises, percentages 2008-2013*

UTS 3 Region	2008	2009	2010	2012	2013	Average	Difference in percentage points, 2013-2008
AT13 Wien (Vienna)	10.6	7.7	6.9	8.1	9	8.46	-1.6
AT221 Graz	9	6.5	7	8.4	8.7	7.92	-0.3
AT112 Nordburgenland	8.3	6.3	7	8.1	8.3	7.6	0
AT123 Sankt Poelten	8.5	6.4	6.7	8.3	7.8	7.54	-0.7
AT225 West- und Suedsteiermark	9.2	8.6	6.4	6	6.9	7.42	-2.3
Median	*8.65*	*5.75*	*5.3*	*6.4*	*6.85*	*6.59*	*-1.8*
AT125 Weinviertel	8.7	4.4	4.1	2.5	5.8	5.1	-2.9
AT226 Westliche Obersteiermark	7.7	2.8	2.8	6.1	5.5	5.0	-2.2
AT335 Tiroler Unterland	6.2	3.9	4.1	4.3	5.6	4.8	-0.6
AT111 Mittelburgenland	4.9	2.0	3.4	7.1	3.8	4.2	-1.1
AT331 Ausserfern	6.7	3.1	3.0	1.8	5.1	3.9	-1.6

Source: Own empirical research, Statistik Austria, data for 2011 is not available.

Spatial autocorrelation

The spatial structure of entrepreneurship is not characterized only by significant regional differences but also by the fact that regions with high and low levels of entrepreneurial activities are not randomly distributed (Plummer & Peèr, 2010). There is a high probability that regions with a high entrepreneurial performance have neighbouring regions with similar characteristics, perhaps indicating the existence of regional spillovers.

To measure the pattern of the spatial co-location of regions with similar attributes, we calculated the metric of Moran's I, which is basically a correlation coefficient for spatial data. The spatial structure must therefore be modelled in the form of a spatial weight matrix. The analysis is based on the basic concept binary weights, with 0 indicating the absence of a common border between regions and 1 the presence of it. This choice for the

spatial weight matrix can be justified by the spatial geometry of NUTS 3 regions around regional capital cities (they are circumscribed by up to five regions) and the regional nature of entrepreneurial activity, which makes it rather unlikely that spatial spillovers are relevant over very large distances. Moran's I is calculated as follows:

$$I = \frac{n \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} \sum_{i=1}^{n}(x_i - \bar{x})^2},$$

where indices i and j refer to regions i and j, w_{ij} denotes the element in the spatial weight matrix that represents the relationship between region i and j, while x_i and x_j are the values of the variable of interest in region i and j respectively. A positive (negative) value of I indicates that neighbouring regions display a similar (dissimilar) level of entrepreneurial activity. A significance test of I can be based upon the normality or the randomisation assumption. Following the recommendation from literature, the randomisation assumption is chosen (Burt, Barber & Rigby 2009). In this case, the deviations between the observed spatial pattern and a simulated random pattern are used to construct a standard, normally distributed test-statistic. The R-Package spdep from Roger Bivand et al. (2019) is used for the calculation of Moran's I. The method is limited by the usage of a simple contiguity spatial weight matrix and a global correlation coefficient. Alternatively, distance based metrics may reveal additional insights while local indicators of spatial association (LISA) could provide a more detailed picture of spatial autocorrelation.

The analysis of spatial autocorrelation is undertaken for the firm entry and exit rates and the share of high growth firms. The calculation of the Moran's I for the entry and exit rates of firms for the NUTS3 regions gives a positive and significant spatial correlation for both variables. In the case of entry rates Moran's I equals 0.27 (p-value: 0.01), and for exit rates Moran's I equals 0.31 (p-value 0.003). In contrast to the entry and exit rate, the share of high-growth firms shows a weak negative and non-significant Moran's I (Moran's I: -0.05, p-value: 0.847). This result fits with the discussion in the previous paragraph, where it is argued that the regional disparities of high-growth firm activities are somewhat less persistent than the exit rates. An explanation for the differences in spatial disparities between the entry and exit rates on the one hand and high-growth firms on the other hand may be provided by the more stochastic nature of firm growth episodes. In a current survey of the literature, Moreno and Coad (2015) point out that gazelles are represented in all sectors and enterprise size classes. Furthermore, growth episodes are–as the name says– episodes with almost no inter-temporal spillovers from one period to another. Both factors arguably contribute to the disconnection between the spatial incidence of high growth firms and the economic structure, an important variable that describes the regional and economic context.

Hypothesis 2 states that there are persistent differences between the intensity of regional entrepreneurial activities in Austria. This hypothesis is clearly supported by the data and in line with research results for other countries (Eriksson & Rataj, 2019; Fritsch & Wyrwich, 2014). Interestingly, birth and death rates show a higher degree of spatial persistence than the share of high growth enterprises. Considering the high importance of "Gazelles" in public policy discussions, this result warrants further explanation in future studies.

Clusters of entrepreneurship

The analysis of spatial disparities and spatial correlation suggests that there are stable and significant differences between regions in terms of their entrepreneurial performance. To gain a better understanding of the differences between regions, we performed a hierarchical cluster analysis utilizing the Euclidean distance to measure the dissimilarities between observations and the average linkage method as a clustering method (Maechler, 2018). Hence, we put forward the question on whether it is possible to group the Austrian regions into different types of entrepreneurial regimes based on different indicators of entrepreneurship.

We apply the 35 NUTS 3 regions and the two entrepreneurial variables "entry rate" and "share of high growth firms". To control for yearly fluctuations, the average of the variables between 2008 and 2012/13 is used for the cluster analysis. The agglomerative coefficient is at 0.81 suggesting that the data are well suited for a cluster analysis. The main results of the analysis are displayed in Table 3. While there is always a subjective element in deciding how many clusters to extract, it turned out that 5 clusters are a practical solution.

Table 3: *Regions with similar entrepreneurial dynamics*

Cluster	Entry rates (average)	Share high-growth firms (average)	NUTS 3 Region	Weighted average regional productivity (in Euros)
1	6.80	8.05	AT112 Nordburgenland, AT130 Wien	71,361
2	6.50	6.17	AT122 Niederoesterreich-Sued, AT126 Wiener Umland/Nordteil, AT127 Wiener Umland/ Suedteil	65,820
3	5.88	7.12	AT113 Suedburgenland, AT123 Sankt Poelten, AT221 Graz, AT211 Klagenfurt-Villach, AT223 oestliche Obersteiermark, AT224 Oststeiermark, AT225 West- und Suedsteiermark, AT311 Innviertel, AT312 Linz-Wels, AT314 Steyr-Kirchdorf, AT315 Traunviertel, AT323 Salzburg und Umgebung, AT332 Innsbruck, AT342 Rheintal-Bodenseegebiet,	62,025
4	5.62	4.60	AT111 Mittelburgenland, AT125 Weinviertel, AT226 Westliche Obersteiermark, AT331 Außerfern, AT335 Tiroler Unterland	60,866
5	5.24	6.05	AT121 Mostviertel-Eisenwurzen, AT124 Waldviertel, AT212 Oberkaernten, AT213 Unterkaernten, AT222 Liezen, AT313 Muehlviertel, AT321 Lungau, AT322 Pinzgau-Pongau, AT333 Osttirol, AT334 Tiroler Oberland, AT341 Bludenz-Bregenzer Wald	56,174

Source: Own empirical research, Statistik Austria. Notes: Regional productivity is measured as output per person employed in Euros, average 2011-2013, weights: share of persons employed in 2013

The big picture of the cluster analysis reveals substantial differences between the core and peripheral regions, namely higher levels of regional entrepreneurial activities are inversely related to the median regional productivity level. Whereas the former show high levels of entrepreneurial activity, the latter have low levels of entry rates and low shares of high growth firms. In that sense, entrepreneurship may not be a force that induces catching-up processes of lagging regions. The high intensity of entrepreneurial activities in Vienna (and Nordburgenland) testifies to the importance of agglomeration economies in entrepreneurship.

The clusters in Table 3 show clear differences and are relatively simple to interpret. Cluster 1 consists of the capital city Vienna and one neighbouring region. The second cluster is made up of the suburban regions which surround Vienna. Essentially, clusters 1 and 2 can be thought of as the economic functional region of Vienna as opposed to the administrative region. Austria's core industrial regions and their respective six regional capital cities are grouped together in cluster 3, which may point to the importance of the regional economic

structure in understanding the differences in the regional entrepreneurship performance. Further, the fourth cluster represents a group of regions that cannot be easily interpreted, as there are no important economic centres in these regions found and the economic base is dominated by service activities. Finally, cluster 5 represents regions that can be considered as peripheral regions, where low levels of entrepreneurial activity and an inferior productivity level are indicative of this appraisal.

Hypothesis 3 stipulates a higher prevalence of entrepreneurial activities within the core regions with high levels of economic development. The cluster analysis reveals substantial differences between the core and peripheral regions in Austria, with higher levels of regional entrepreneurial activities being inversely related to the median regional productivity level. Hence, hypothesis 3, a finding which is in line with the empirical literature, is confirmed (Bosma & Schutjens, 2011; Isaksen, 2015).
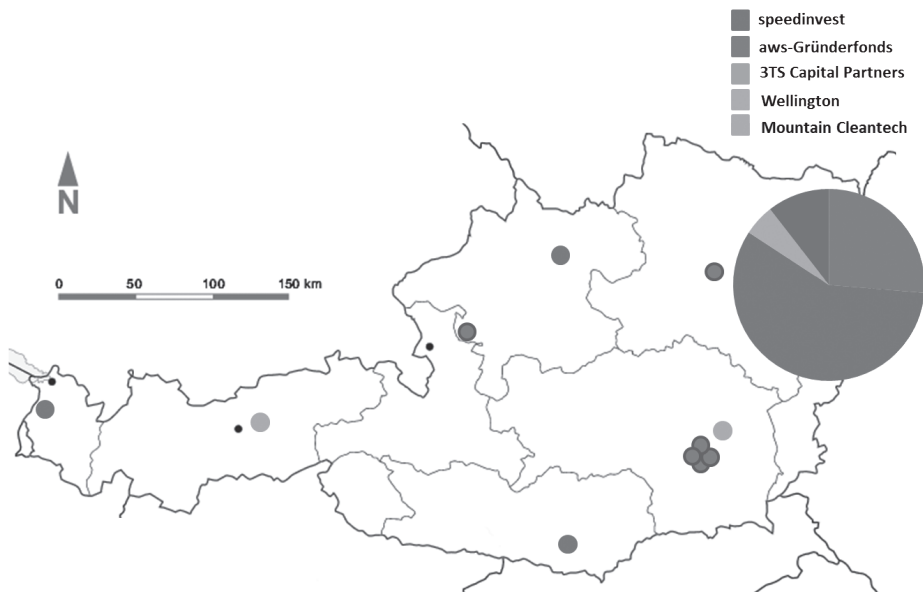
6   VC-FIRMS AND THE SPATIAL CONCENTRATION OF ENTREPRENEURIAL ACTIVITIES

In the continuation, we define start-ups as young (i.e. up to five years old) companies which are primarily focused on developing an innovative technology or service with a scalable business model, capable of and focused on rapid growth. Such firms are not founded in a vacuum or out-of-thin-air but are created and then co-evolve within a diverse system with dense interactions with suppliers of physical goods as well as ideas, customers and financiers. The two main pillars of an entrepreneurial eco-system are first and foremost the start-ups themselves which generate the ideas and try to develop these into scalable business models potentially leading to increases in value added, employment and profits. The second pillar is formed by financiers, i.e. individual business angels and institutionalised venture capital firms, which are ready to take the risk and inject venture capital into the start-up often long before any marketable product (and hence turnover) is available. These two pillars form the scissor blades of the regional VC market where VC firms provide the supply of risk capital and start-ups demand financing. However, the role of financiers goes well beyond mere capital allocation. Usually, they provide necessary business know-how and social capital (i.e. access to networks etc.) for the start-ups in their portfolio and offer strategic guidance and monitoring. Obviously, spatial proximity is beneficial for performing these tasks, nevertheless, externalities play a prominent role as well. It is easier to start a new business if there are plenty of other entrepreneurs around from whom one can learn. VC markets and start-ups, often co-evolve, and localised phenomena with their interdependency might initialise cumulative, self-reinforcing processes, in other words, VC goes to regions where new start-ups are created and new start-ups are created where VC is located (Lerner, 2010). This co-evolving pattern for Austria was analysed by the empirical approach of first identifying the major VC funds (and a selection of business angels) operating in Austria. Essentially, we made a selection of all the VC-funds that participated in the aws Venture Capital Initiative or a similar public policy program to support VC investments in Austria, including the aws Gründerfonds (public venture

capital).[4] The collected data represent the stock of investments in the year 2015. In the end, the portfolio firms (start-ups) of the selected VC funds were identified and their locational pattern recorded. Overall, even though this procedure does not consider all VC-funded firms, it is–based on the literature and anecdotal evidence–reasonable to assume that the locational pattern of the non-included VC-funded firms is similar to the one observed in our sample, in which in total a sample of 33 VC-funded firms was realized.

Figure 3 shows the spatial distribution of the VC-funded firms in Austria. The overall result is a striking degree of spatial concentration of VC-funded firms mainly in Vienna, while only two other cities manage to host more than one VC-funded firm, namely Graz (4 firms) and Linz (2 firms). In addition, only 18% of the 33 analysed start-ups are located outside Vienna or a regional capital.

Figure 3: *Locations of VC-funded start-ups (stock 2015)*

Source: Own empirical research

The issue of the spatial concentration of entrepreneurial activity is further explored in Table 4 for the nine Austrian NUTS 2 regions. The columns show the shares of the regions in entrepreneurial variables in comparison with the shares in GDP. In addition, the

4 https://www.aws.at/foerderungen/aws-venture-capital-initiative/ [15.11.2017]

Herfindahl-Index (HI) is given the last row. The Herfindahl-Index is a measure of concentration and defined for the variable x by

$$HI = \sum_{i=1}^{N} \left(\frac{x_i}{\sum_{i=1}^{N} x_i} \right)^2.$$

The higher the value of HI, the higher the degree of concentration. In the case of a uniformly distributed variable over the N statistical units, the HI takes on the minimum value of 1/N. If the entire sum of the variable is concentrated in one statistical unit, the HI assumes the maximum value of 1.

Comparing the shares of GDP and new ventures and the share of high-growth firms indicates a strong relationship between them, which is a result that is also corroborated by the almost identical number of the HI for the three variables. Hence, at least at the NUTS 2 level, the entrepreneurial activities in the form of new ventures and the high growth firms are not more concentrated in space than GDP. However, things are different when considering VC-funded firms, as Vienna hosts about 55% of them whereas no VC-firm is located in Burgenland or Salzburg. Consequently, the corresponding HI is more than double the size compared to the share of all new ventures.

Table 4: *Share, concentration and spatial disparity GDP, new ventures, high growth firms, venture capital (VC) financed firms and gross expenditures on R&D (GERD)*

NUTS 2 Region	Share GDP (2015)	Share new ventures (2015)	Share high growth firms (2015)	Share VC firms (2016)	Share GERD (2015)
Burgenland	2.3	4.2	2.5	0.0	0.8
Carinthia	5.5	7.1	4.5	3.0	5.6
Lower Austria	15.7	18.8	13.4	6.1	8.9
Salzburg	7.3	6.2	8.1	0.0	3.7
Styria	12.8	14.3	14.0	15.2	21.3
Tyrol	9.1	7.8	9.6	6.1	9.2
Upper Austria	17.1	14.0	16.2	12.1	17.6
Vienna	25.5	23.9	27.3	54.5	30.2
Vorarlberg	4.7	3.6	4.4	3.0	2.9
Herfindahl-Index	*0.154*	*0.151*	*0.159*	*0.344*	*0.189*

Source: Own empirical research, Statistik Austria

If it is the case that the praised benefits of start-ups accrue first and foremost to the region which they are located in, for example because of localized positive externalities, then the hope that public policy initiatives fostering start-ups will "lift all boats" is misplaced. Lerner (2010) points out that the overall dynamic of VC investments may induce a vicious circle in regions with few venture capital related activities. Thereby, publicly supported VC investments may increase the overall level of entrepreneurial activities at the high end of the quality distribution of new ventures. Concomitantly, however, this may also lead to rising interregional disparities in the Austrian landscape of entrepreneurship. There may be no simple way to counteract this tendency by redirecting publicly supported VC investments into non-central regions, because the efficiency gains associated with VC investments are assumed to emanate only in an open, creative and high-skilled environment of cities.

Hypothesis 5 postulates a higher concentration of venture capital investments as compared to the spatial concentrations of innovation and entrepreneurial activities in general. Indeed, our data support the hypothesis and the analysis shows that start-ups with venture capital investment are basically concentrated in Vienna and the second biggest city of Austria, namely Graz. These results are essentially in line with the existing empirical literature (Mason & Harrison, 2002; Lerner, 2010) and suggest that venture capital might contribute to increasing spatial disparities between the central and peripheral regions in Austria.

7   ENTREPRENEURIAL ACTIVITIES AND UNEMPLOYMENT DYNAMICS

The effect of self-employment on the labour market has been controversially discussed within the academic literature, as the relationship between entrepreneurship and unemployment seems to be a complex puzzle. One stream argues that a higher rate of unemployment might stimulate the creation of new ventures (the "refugee" effect), while another stream counters that higher rates of self-employment indicate an increased economic activity within a certain region (the "entrepreneurial" effect). Both arguments have different implications for the job market (Thurik et al., 2008). In general, the public discourse usually associates new ventures with employment growth, yet, this conjecture may be overoptimistic about the actual employment effects of new firms (Fritsch, 2008). One explanation for this biased perception of entrepreneurship may have to do with the distinction between partial equilibrium effects versus general equilibrium effects. Of course, a new firm increases ceteris paribus and on average total employment. But this usually goes together with a loss of employment in incumbent firms because of the competition from the new venture. If new ventures are more productive than established companies, then the total direct employment effect becomes negative. The positive effects of new ventures rest predominantly upon indirect, supply side effects that ultimately lead to an improved competitiveness of the regional business sector. This reasoning points to the fact that the innovativeness of entrepreneurial activities is a crucial variable in determining the employment impact of new businesses.

Analysing the causal employment effects of entrepreneurship requires the use of advanced quantitative techniques and panel data. In the present study, we follow a humbler approach and provide only bivariate descriptive evidence. Figure 4 shows the relationship between the level of unemployment rate (average 2009-2015) and the level of entrepreneurial activity (also measured as average over several years to account for idiosyncratic effects). The overall picture is that there is no clear relationship between entrepreneurship activities and unemployment rate, as both slope coefficients are not significant at the 5% level. It could theoretically be expected that higher unemployment leads to a higher level of new firm formation as unemployed workers are "pushed" into precarious forms of self-employment. Yet, this is–at least at the regional level–not the case.

A different question is whether entrepreneurial activities may influence a change in unemployment rate. Figure 5 shows a change in the unemployment rate between 2009 and 2015 as a dependent variable on the y-axis. However, the relationship is quite the opposite of what policy-makers hope for, namely a higher level of entrepreneurial activity is associated with a higher increase in the unemployment rate. The slope coefficient is significant at the 1% level for both entrepreneurship indicators, however, the explanatory power seems to be higher for the firm entry rate ($R^2=0.38$) than for the share of high growth firms ($R^2=0.17$). For the firm entry rate, the numerical relationship is as follows: With 95% confidence, the unemployment rate increases between +0.9 and +2.4 percentage points when the firm entry rate increases by one percentage point. Of course, this result may not be interpreted in a causal way even though the initial effect of new ventures on employment might be initially negative (see above). The outlier in the three scatter plots in Figure 5 is Vienna, which again shows the peculiar role of the capital city in shaping the entrepreneurial dynamics in the Austrian economy.

Figure 4: *The relationship between the level of unemployment rate and entrepreneurship*
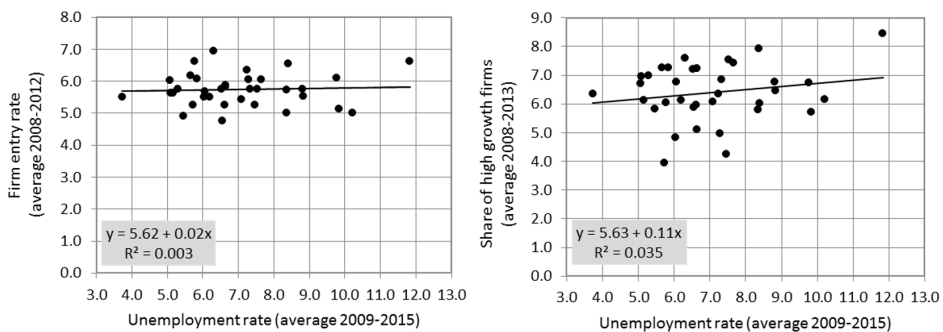
Source: Statistik Austria, Eurostat, AMS

Figure 5: *The relationship between the change of unemployment rate and entrepreneurship*
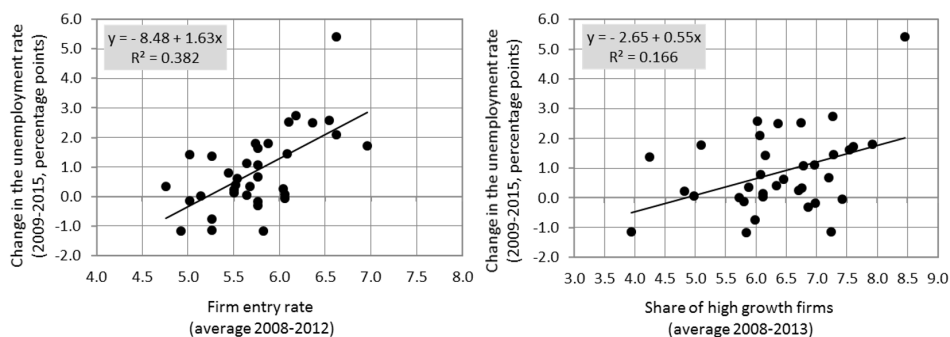
Source: Statistik Austria, Eurostat

In this section, the question whether regional entrepreneurial activities lower regional unemployment rates (hypothesis 4) is tested. The results based on the changes observed in the unemployment rate as a dependent variable lead us to reject our claim since they suggest that higher levels of entrepreneurial activity are associated with a higher unemployment rate, in other words, entrepreneurial regions experienced a higher increase in unemployment than less entrepreneurial regions. Interestingly, the results hold for both new firm formation and the share of high-growth firms. Of course, these results are based on a simple bivariate analysis, while more sophisticated research designs have identified a negative impact of entrepreneurship on unemployment rates (Thurik et al., 2008). On the other hand, Fritsch and Schroeter (2011) investigate regional differences in the effect of new firms on the employment growth in West Germany and finds a negative influence of a high share of small business employment on the employment effect of new firms. This effect may be behind our finding of entrepreneurial regions experiencing a more pronounced increase in unemployment. However, our results should be interpreted with a grain of salt in terms of an interpretation of a causal relationship between entrepreneurial activities and unemployment because there may be a number of confounding variables at work which may impact upon both unemployment and entrepreneurship. At least our findings suggest that there is no simple direct relationship between new ventures and lower unemployment rates. The regional economic context and other variables are of relevance as well and may even be more important than entrepreneurial activities.

8   CONCLUSIONS

This paper contributes to the emerging literature on the relationship between entrepreneurship and regional development by testing five hypotheses about spatial patterns of entrepreneurship in Austria. Concerning hypothesis 1, claiming that the Great Recession had a negative effect on entrepreneurship in Austria, the empirical analysis provides mixed evidence. Hypothesis 2 states that there are persistent differences between the intensity of regional entrepreneurial activities. This hypothesis is supported by the data and in line with the international empirical evidence in entrepreneurship research. Also hypothesis 3, according to which core regions display higher levels of entrepreneurial activity, is corroborated by our statistical analysis. Hypothesis 4 tests the politically important question of whether regional entrepreneurial activities lower regional unemployment rates. Based on a bivariate data analysis, our findings suggest that there is no simple direct relationship between new ventures and lower unemployment rates. The regional economic context and other variables are also of relevance and may even be more important than entrepreneurial activities. Finally, hypothesis 5 postulates a higher concentration of venture capital investments as compared to innovation and entrepreneurial activities in general. We find supporting evidence for hypothesis 5, a result which is in line with the literature on regional economics and entrepreneurship research.

Regarding limitations, our research can be criticized on the following grounds: (a) short time series data, (b) focus on a bivariate data analysis instead of a multivariate data analysis, and (c) concentration on a small number of indicators of entrepreneurship.

The results suggest a number of research implications. Firstly, the link between unemployment and entrepreneurship should receive more attention in entrepreneurship research. Society and public policy consider the employment effects of new ventures as very important but showing them empirically is a rather challenging exercise. The following two questions might be of particular interest from a spatial perspective: What is the employment effect of entrepreneurship in different types of regions? What type of entrepreneurship has the highest employment impact in regions? In addition, our research suggests some differences between high growth firms and business demography variables, such as firm birth and death rates. As high growth firms display a more volatile pattern and less spatial persistency, the question to investigate this issue further is: What factors may explain this outcome? Finally, innovation-based development strategies in Europe aim to increase the creation of new start-ups. Our findings show that this results in a highly polarized pattern of spatial development and the question arises how to compensate for the losing regions in this increasingly unequal competition for investment and jobs.

Taken together, the empirical findings point to a few stylized facts that may be considered bad news for policy-makers. These findings suggest that policy-makers are probably too enthusiastic about the economic miracles entrepreneurship may deliver. Firstly, on the whole, entrepreneurial activities are declining without making significant contributions

to solving unemployment problems, and secondly, their spatial impact might increase the unevenness of spatial economic development.

New policy strategies should set realistic goals and consider potential negative side effects of entrepreneurship. Additionally, our analysis has revealed a potential policy failure in the Austrian entrepreneurship policies (Fink et al., 2012). Entrepreneurs receive the most support in the later stages of the start-up process, providing successful projects with an additional boost. Yet, such an approach fails to enable risk-taking at early stages, which is perhaps not only the most difficult phase of the life-cycle of a new venture but also more prone than others to market failures (Mazzucato, 2013).

REFERENCES

Adler, P., Florida, R., King, K. & Mellander, C. (2019). The city and high-tech startups: The spatial organization of Schumpeterian entrepreneurship. *Cities, 87*, 121-130.

Autio, E., Nambisan, S., Thomas, L.D.W. & Wright, M. (2018). Digital affordance, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal, 12*(1), 72-95.

Baumol, W. (1990). Entrepreneurship: productive, unproductive and destructive. *Journal of Political Economy, 98*, 893-921.

Baumol, W. & Strom, R. (2007). Entrepreneurship and economic growth. *Strategic Entrepreneurship Journal*, 1, 233-237.

Birch, D.A. (1981). Who Creates Jobs?, *The Public Interest*, 65, 3-14.

Bivand, R. et al. (2019). Package 'spdep'. [https://cran.r-project.org/web/packages/spdep/spdep.pdf].

BMWFW (2015): Land der Gründer. Wien: BMWFW.

Bosma, N. & Schutjens, V. (2011). Understanding regional variation in entrepreneurial activity and entrepreneurial attitude in Europe, *Annals of Regional Studies, 47*(3), 711-742.

Burt, J., Barber, G & Rigby, D. (2009). *Elementary statistics for geographers.* New York, London: Guilford.

Dias, A. & Robalo Marques, C. (2018). Every cloud has a silver lining: Micro-level evidence on the cleansing effects of the Portuguese financial crisis. Working Papers Banco de Portugal, No. 18.

Eriksson, R. & Rataj, M. (2019). The geography of start-ups in Sweden. The role of human capital, social capital and agglomeration. In: *Entrepreneurship & Regional Development, 31*(9), 735-754.

European Commission (2018). Annual Growth Survey 2019: For a stronger Europe in the face of global uncertainty. Brussels.

European Union (2018). European Innovation Scoreboard 2018. Luxembourg: Publications Office of the European Union.

Eurostat (2012). Entrepreneurship determinants: culture and capabilities. Luxembourg: Publications Office of the European Union.

Fairlie, R.W. (2013). Entrepreneurship, Economic Conditions, and the Great Recession. *Journal of Economics & Management Strategy, 22*(2), 207-231.

Fink, et al. (2012). Understanding entrepreneurship policy in Austria. Institute for Small Business Management and Entrepreneurship, Vienna University of Economics and Business, Working Paper No. 1.

Fritsch, M. (2008). Die Arbeitsplatzeffekte von Gründungen - Ein Überblick über den Stand der Forschung. *Zeitschrift für ArbeitsmarktForschung, 1*, 55-69.

Fritsch, M. & Schroeter, A. (2011). Why does the effect of new business formation differ across regions?, *Small Business Economics, 36*, 383-400.

Fritsch, M. (2013). New business formation and regional development: A survey and assessment of the evidence. *Foundations and trends in entrepreneurship, 9*, 249-364.

Fritsch, M. & Wyrwich, M. (2014). The Long persistence of regional levels of entrepreneurship: Germany, 1925–2005. *Regional Studies, 48*, 955-973.

Gartner, W.B. (1989). "Who is an Entrepreneur?" is the Wrong Question. *Entrepreneurship Theory and Practice, 13*, 47-68.

Gomis, R. & Khatiwada, S. (2016). Firm dynamics and business cycle: What doesn't kill you makes you stronger? *International Labour Office, Research Department Working Paper No 14*, Geneva, ILO, 2016.

Hathaway, I. & Litan, R. (2014):. Declining business dynamism in the United States: A look at states and metros. Economic Studies at Brookings.

Hindle, K. (2010). How community context affects entrepreneurial process: A diagnostic framework. *Entrepreneurship and Regional Development, 22*, 599-647.

Hirschman, D. (2016). Stylized Facts in the Social Sciences. *Sociological Science, 3*, 604-626.

Hölzl, W. (2010): Unternehmertum und wirtschaftspolitische Prioritäten: eine empirische Annäherung, *Wirtschaftspolitische Blätter, 57*, 277-292.

Isaksen, A. (2015). Industrial development in thin regions: trapped in path extension?, *Journal of Economic Geography, 15*(3), 585-600.

Keuschnigg, C. et al. (2014). Vision Österreich 2050. Vorsprung durch Bildung, Forschung und Innovation. Wien: Holzhausen.

Kiendl, D., Schmalzer, T., Wenzel, R. & Penz, E. (2017). Global Entrepreneurship Monitor 2016. Bericht zur Lage des Unternehmertums in Österreich. Graz: FH JOANNEUM Gesellschaft mbH.

Koszerek, D. Havik, K., McMorrow, K., Röger, W. & Schönborn, F. (2007). An overview of the EU KLEMS Growth and Productivity Accounts. European Economy Economic Papers. No. 290.

Krugman, P. (1991). Geography and trade. Massachusetts: MIT Press.

Krugman, P. (1991a):. Increasing returns and economic geography. Journal of Political Economy, 99, 483-499.

Leamer, E. E. (2007). A flat world, a level playing field, a small world after all, or none of the above? A review of Thomas L. Friedman's the world is flat. *Journal of Economic Literature, 45*, 83-126.

Latham, S. & Braun, M. (2011). Economic recession, strategy, and performance: a synthesis. *Journal of Strategy and Management, 4*(2), 96-115.

Lee, Y. & Mukoyama, T. (2015) Entry and Exit of Manufacturing Plants over the Business Cycle. *European Economic Review, 77*(C), 20-27.

Lerner, J. (2010). Geography, venture capital, and public policy. Harvard Kennedy School Policy Briefs.

Mack, E. & Mayer, H. (2016). The evolutionary dynamics of entrepreneurial ecosystems. *Urban Studies, 53*(10), 2118-2133.

Maechler, M. (2018). Package "cluster". [https://cran.r-project.org/web/packages/cluster/cluster.pdf].

Mason, C. & Harrison, R. (2002). The Geography of Venture Capital Investments in the UK. *Transactions of the Institute of British Geographers, 27*(4), 427-451.

Mazzucato, M. (2013). The entrepreneurial state. London: Anthem Press.

McCann, P. (2013). Modern urban and regional economics. Oxford: Oxford University Press.

Metzger, G. (2016). KfW-Gründungsmonitor 2016. Kfw Research. Frankfurt am Main.

Moreno, F. & Coad, A. (2015). High-Growth Firms: Stylized Facts and Conflicting Results. SPRU Working Paper Series, No. 5.

Moscarini, G. & Postel-Vinay, F. (2012). The Contribution of Large and Small Employers to Job Creation in Times of High and Low Unemployment. *American Economic Review, 102*(6), 2509-2539.

OECD (2016):. Entrepreneurship at a glance. Paris: OECD.

OECD (2015). Going for Growth. Paris: OECD Publishing.

Peneder, M. & Schwarz, G. (2008). Venture Capital: Ergebnisse einer Wirkungsanalyse für Österreich. *WFO-Monatsberichte. 6*, 461-471.

Porter, M. (2000a). Locations, clusters and company strategy. In: Clark, G. et al. (eds.): Oxford handbook of economic geography (pp. 253-274). Oxford: Oxford University Press.

Porter, M. (2000b). Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly, 14*, 15-34.

Plummer, L. & Pe'er, A. (2010). The geography of entrepreneurship. In: Acs, Z.J. and Audretsch, (eds.): Handbook of entrepreneurship research, 519-556.

Republic of Austria (2011). Becoming an innovation leader. Strategy for research, technology and innovation of the Austrian Federal Government. Vienna.

RFTE (2017). Bericht zur wissenschaftlichen und technologischen Leistungsfähigkeit Österreichs 2017. Wien: RFTE.

Scarpetta, S. (2003). The Sources of Economic Growth in OECD Countries. Paris: OECD

Schumpeter, J. (1939). Business Cycles. Vol. 1, Cambridge Univ. Press.

Shane, S. & Venkataraman, S. (2000). The Promise of Entrepreneurship as a Field of Research. *Academy of Management Review, 25*, 217-226.

Sorenson, O. & Stuart, T.E. (2001). Syndication Networks and the Spatial Distribution of Venture Capital Investments. *American Journal of Sociology, 106*(6), 1546-1588.

Spiegel, B. & Harrison, R. (2018). Toward a process theory of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal, 12*, 151-168.

Sternberg, R. (2009). Regional dimensions of entrepreneurship, *Foundations and Trends in Entrepreneurship, 5*, 211-340.

Thurik, A.R., Carree, M.A., van Stel, A., Audretsch, D.B. (2008). Does self-employment reduce unemployment? *Journal of Business Venturing, 23*(6), 673-686.

Usai, S. (2011). The Geography of inventive activity in OECD regions. *Regional Studies, 45*, 711-731.

Optimal Capital Structure and Leverage Adjustment Speed of European Public and Private Firms

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ABSTRACT: *In this research paper, the dynamic trade-off theory is tested by applying European public and private firms, since as much of the existing research remains in the US public firm context only. The results of our research show that European firms, both private and public, follow the optimal capital structure path consistent with the dynamic trade-off theory. We find that above optimally levered firms adjust their leverage towards the optimal capital structure faster than the below optimally levered ones. In addition, the results show that public and private firms seem to make similar leverage adjustment decisions and that there are the size of the firms and the public/private status that account for the differences.*

1   INTRODUCTION

Despite capital structure decisions being one of the most extensively studied topics in corporate finance, no consensus has been reached about the main forces driving a corporate capital structure choice. One group of researches argues that firms aim at operating with an optimal capital structure that is found by trading-off the benefits and the costs of debt, as put forward by Modigliani and Miller (1963), while others argue in favour of the pecking-order theory (Myers and Majluf, 1984) which refutes the existence of the optimal capital structure and suggests that financing is driven by asymmetric information on the financial markets and the resulting pecking-order of the financing choices. The third theory of capital structure suggests that capital structure is merely a result of previous market timing attempts as firms raise capital when conditions on the market are favourable (Baker and Wurgler, 2002). Only recently have some authors (Byoun, 2008; Faulkender et al., 2012) tried to merge these theories in a unified capital structure framework in which factors proposed by alternative theories interact.

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The dynamic trade-off theory hypothesizes that the firm's debt-equity mix often deviates from the target leverage because firms face substantial adjustment costs when rebalancing their capital structures (Fischer et al., 1989). If adjustment costs exceed the benefits of operating with the optimal capital structure, firms are not motivated to adjust their leverage. Thus, firms rebalance only if their actual leverage diverges from the target leverage substantially (Strebulaev, 2007). A unified theory of capital structure adds to the dynamic trade-off theory model by proposing other possible leverage adjustment scenarios, which stem from the pecking-order theory and the market timing theory. The dynamic trade-off theory has been widely empirically tested so far, however, researchers have mainly addressed US public firms (Fama and French, 2002; Flannery and Rangan, 2006; Kayhan and Titman, 2007; Byoun, 2008; Huang and Ritter, 2009; Cook and Tang, 2010). Based on the empirical findings, one can conclude that the dynamic trade-off theory that assumes a partial convergence of leverage towards the firm's optimal capital structure is a prevalent explanation of the capital structure choice and leverage dynamics in practice.

In this paper, the optimal capital structure choice and leverage adjustment speed of European firms is investigated. In addition to public firms, we address also private firms. Both the selected European as well as private firms have received significantly less attention in the literature so far. By addressing a large sample of public and private European firms, we contribute to the existing literature by providing further empirical tests of the dynamic trade-off theory outside the context of the US firms and large public firms. Based on the scarce available literature, one could infer that the capital structure choice of European firms does not depart from the practices observed in the US firms. However, the extant literature does not provide a conclusive answer whether the capital structure choice and leverage adjustment process differ in public and private firms. Lemmon et al. (2008), Hanousek and Shamshur (2011), and Marinšek et al. (2016), for example, found that the capital structure decisions of public firms do not differ from the decisions in private firms, while Bartholdy and Mateus (2011), and Goyal et al. (2011) provide the opposite findings. To gain further insights into the capital structure choice and leverage adjustment process of the European private firms, we address a significantly larger sample than those used in similar studies. In addition to the robustness test of the theory for private firms, this allows us to test the theory for firms of different sizes.

Our empirical models build on a unified setting in which the leverage target is consistent with the dynamic trade-off theory, while the leverage adjustment process depends on the interacting effects proposed by various capital structure theories, especially the pecking-order theory. The approach follows the idea of Gaud et al. (2007) who found that the capital structure choice of European firms cannot be sufficiently explained by relying solely on the rationale of one capital structure theory alone. In our research, the unified capital structure framework is tested by first predicting the firms' optimal capital structure using the optimal capital structure model. Then, the gap between the target and actual leverage is calculated. Knowing this gap and the change of leverage in the period allows us to analyse the leverage adjustment process, i.e. to estimate the leverage adjustment speed. As argued by Byoun (2008), the pecking-order theory provides us with an additional explanation

of the leverage adjustment process, as it was found that the leverage adjustment speed depends also on the firm's cash flow imbalances. We expand Byoun's view by hypothesising that the effect of the firm's cash flow imbalances could also be analysed from the trade-off theory perspective, which is related to the findings of Strebulaev (2007). However, as recognised in many previous capital structure studies, these two approaches should not be understood as mutually exclusive.[3] We also analyse the impact of the financial crisis that emerged in 2008 on the leverage adjustment process. According to Goyal et al. (2011), the existing literature assumes infinitely elastic supply of debt and equity, which leaves no room for the market timing arguments. Conversely, Cook and Tang (2010), and Dang et al. (2014) argue that a reduction of the leverage adjustment speed is likely to occur in a stressed economic environment, which provides evidence that external market forces are important capital structure determinants too.

In our empirical study, we found strong empirical evidence that European firms adjust their leverage towards the optimal capital structure and that both public and private firms have a similar leverage adjustment speed. The results show that the above optimally levered firms adjust towards the target leverage faster than the below optimally levered firms. Investigating the impact of the firm's cash flow imbalances on the leverage adjustment process, we found that it should be studied from both the trade-off and the pecking-order perspectives. In addition to providing the evidence for the robustness of the theory outside of the context of the US large public firms, it was found that the leverage adjustment speed depends significantly on the size of the private firm. Moreover, the results show that the leverage adjustment speed is related more to the size of the firm than to the public/private status of the firm. Somewhat in contrast to our expectations, smaller firms adjust their leverage towards the optimum faster than larger firms, and we observe an opposite asymmetry in the adjustment speed in the group of the smallest private firms as the adjustment speed of the bellow optimally levered firms exceeds the adjustment speed of the above optimally levered firms.

The rest of the paper is structured as follows. In section 2, the literature is reviewed, in section 3, the empirical models and estimation techniques described, in section 4, the collected data analysed, in section 5, the results presented, and in section 6, concluding remarks provided.

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3 The interacting effects of alternative theories have been found also when studying security issuance. See, for example, Dong et al. (2012) who show how the effects of market timing and the pecking order interact when a firm issues and repurchases equity.

2   LITERATURE REVIEW

The trade-off theory describes the optimal capital structure choice as a process of weighing the benefits and costs of debt financing. The benefits of debt result from the interest tax shield (Modigliani and Miller, 1963). Debt also mitigates the agency conflict between managers and shareholders and reduces the free cash flow problem (Jensen, 1986). The costs of debt financing refer to the costs of financial distress (Baxter, 1967) and agency costs related to the underinvestment problem and debt overhang problem (Myers, 1977). According to the static trade-off theory, a firm estimates its optimal capital structure, i.e. capital structure that maximizes the value of the firm, and then adjusts the leverage to adopt the optimal debt-equity mix. The static trade-off theory, however, ignores the adjustment costs that make firms reluctant to continuously adjust their capital structure and operate with the optimal capital structure. Fischer et al. (1989) show that even low adjustment costs lead to a wide capital structure interval that is optimal for the firm, in contrast to a precise estimate of the optimal debt-equity mix and the required continuous rebalancing. Leary and Roberts (2005) show that because of the adjustment cost, firms rebalance their capital structure only infrequently. Strebulaev (2007) argues that even though a firm follows the optimal capital structure path and converges to the target leverage, the actual leverage is likely to deviate from the target leverage most of the time, as the adjustments occur only in the refinancing points.

The alternative pecking-order hypothesis is built on another key capital market imperfection. Myers and Majluf (1984) argue that because of asymmetric information and the transaction costs faced by the firms when raising capital, the firm's financing process follows a pecking-order. According to the pecking-order, firms always first exhaust all internal financing resources and when external sources are required, firms first issue debt, while they choose to issue equity only as the last resort option. Consequently, there is no optimal capital structure in a pecking-order explanation of the firm's capital structure choice. Bessler et al. (2011) explain the pecking-order behaviour also in a dynamic context in which information asymmetry is time varying and firms have more external financing options than in the static pecking-order hypothesis. As opposed to the static pecking-order hypothesis, equity issues are not discouraged. Probability of issuing equity increases with the fall in the firm-level information asymmetry and firms exploit such opportunities for large equity offerings to build up cash reserves. The fall in the firm-level information asymmetry can be a consequence of a share price increase (decrease in the relative value of information asymmetry) or the firm's previous information disclosures needed for accessing external financial resources.

Most of researchers agree that the dynamic trade-off theory that assumes a partial convergence of leverage towards the firm's optimal capital structure is a prevalent explanation of the capital structure choice and leverage dynamics in practice. This behaviour is inter alia empirically confirmed by Fama and French (2002), Flannery and Rangan (2006), Kayhan and Titman (2007), and Huang and Ritter (2009) who all show that the US public firms adjust their leverage towards the optimal capital structure.

However, Lemmon et al. (2008) found that sub-optimally levered firms, operating with above or below optimal leverage, even though they converge to the target on a long run, remain sub-optimally levered for a long time. Byoun (2008) shows that firms operating with above optimal leverage adjust their leverage faster than the firms operating with below optimal leverage. He also shows that the adjustment speed depends on the firm's cash flow imbalances, as it looks like that firms that operate with above optimal leverage adjust their leverage faster when having a financial surplus, while firms that operate with below optimal leverage adjust faster when having a financial deficit. Similar findings were obtained by Faulkender et al. (2012) who show that firms with ample operating cash flow make larger leverage adjustments than firms with low operating cash flow. By studying the impact of cash flow imbalances on the leverage adjustment process, both Byoun (2008) and Faulkender et al. (2012) attempt to develop a unified capital structure framework that incorporates the elements of both alternative capital structure theories.

Compared to the empirical studies addressing the US public firms, the literature investigating European firms and private firms is rather scarce. What is more, there is mixed evidence available whether private firms exhibit the behaviour proposed by the dynamic trade-off theory. In a recent study, Marinšek et al. (2016) who addressed the EU public and private firms found that the leverage adjustment speed towards the optimal capital structure is similar for firms regardless of their size, public/private status, ownership structure and origin. Similar findings were obtained by Hanousek and Shamshur (2011) who addressed private firms from the European transition economies. On the other hand, Bartholdy and Mateus (2011) argue that small private firms that are predominantly bank-financed differ from large public firms in terms of agency problem and information asymmetry. Therefore, they conclude that their behaviour cannot be explained by the determinants used to model the capital structure choice of large public firms. Brav (2009) argues that private firms rely exclusively on debt financing when raising capital and that their capital structures are very sensitive to fluctuations in their performance. The same argument was brought forward by Goyal et al. (2011), and Saunders and Steffen (2011).

We conclude this literature review with the contributions studying the impact of the macroeconomic conditions and the conditions on the financial market on the capital structure choice. Cook and Tang (2010) show that US firms adjust their leverage towards the optimal capital structure faster in times of good macroeconomic conditions than in times of crisis. Dang et al. (2014) found that the impact of the recent financial crisis on the leverage adjustment speed is asymmetric as financially constrained firms experience more pronounced reduction in the leverage adjustment speed than unconstrained firms, while Caglayan and Rashid (2014) show that the macroeconomic risk affects public and private firms' leverage choices similarly. Öztekin and Flannery (2012) link firms' leverage adjustment speed to the legal, institutional and financial development of particular countries. They show that firms in the US, the UK, Canada and New Zealand exhibit a significantly higher leverage adjustment speed than firms from South America or Central Asia.

3   EMPIRICAL MODELS AND ESTIMATION TECHNIQUES

The dynamic trade-off theory is empirically examined by analysing the leverage adjustment process towards the optimal capital structure. To estimate the leverage adjustment speed, one needs to first estimate the firm's optimal capital structure and then analyse the firm's actual leverage and the convergence towards the target leverage. Following the existing literature (Flannery and Rangan, 2006; Byoun, 2008), the optimal capital structure model in which leverage is approximated with 1) long-term debt ratio and 2) total debt ratio has the following form:[4]

$$
\begin{aligned}
LEV(1,2)_{i,t} = \alpha + &\beta_1 * TANG_{i,t} + \beta_2 * SIZE_{i,t} + \beta_3 * GROWTH_{i,t} + \beta_4 * PROF_{i,t} \\
+ &\beta_5 * DEP_{i,t} + \beta_6 * R\&D_{i,t} + \beta_7 * R\&DDUM_{i,t} + \beta_8 * LIQ_{i,t} + \beta_9 \\
* &MLEV_{i,t-1} + \varepsilon_{i,t}
\end{aligned}
\tag{1}
$$

Table 1: *Optimal capital structure determinants*

Variable	Definition	Expected correlation to leverage
TANG	$\dfrac{tangible\ fixed\ assets}{total\ assets}$	Positive correlation; tangible assets can be used as a collateral that retains value also in liquidation of a firm and helps to mitigate agency costs of debt (Rajan and Zingales, 1995).
SIZE	$\ln(total\ assets)$	Positive correlation; large firms tend to be more transparent and/or more diversified than small firms and thus associated with lower information asymmetry (Titman and Wessels, 1988).
GROWTH	$\dfrac{total\ assets_t}{total\ assets_{t-1}} - 1$	Negative correlation; because of the underinvestment problem (Myers, 1977). We use GROWTH as an alternative to market-to-book ratio as market values of equity is not available for private firms.
PROF	$\dfrac{EBIT}{total\ assets}$	Positive correlation; according to the static trade-off theory of capital structure, leverage provides the interest tax shield (Modigliani and Miller, 1963). However, empirical tests (Rajan and Zingales, 1995; Shyam-Sunder and Myers, 1999; Fama and French, 2002) usually indicate negative correlation. The reason is the pecking-order explanation of the financing process, however, Strebulaev (2007) shows that the negative correlation results also in the dynamic trade-off setting as firms do not continuously adjust their capital structures.
DEP	$\dfrac{depreciation}{total\ assets}$	Negative correlation; depreciation provides a tax shield similar to the interest tax shield (DeAngelo and Masulis, 1980).

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4 Long-term debt ratio is defined as the ratio of long-term debt to total assets, while total debt ratio includes long-term and short-term debt.

R&D	$\dfrac{R\&D\ expenses}{total\ assets}$	Negative correlation; firms with more R&D expenses are less levered because of higher information asymmetry (Flannery and Rangan, 2006). R&D is set to 0 in case of missing R&D data.
LIQ	$\dfrac{current\ assets}{current\ liabilities}$	Negative correlation in case of total debt; internal liquid funds diminish the need for short-term borrowing (Öztekin and Flannery, 2012). Positive correlation in case of long-term debt; current assets can be easily collateralized (Korgaonkar and Nini, 2010).
MLEV(t-1)	$\underset{by\ insutry,year}{median}\ LEV(1,2)$	Positive correlation; lagged median debt ratio proxy for industry specific effects that proved to be an important determinant of optimal capital structure (Bradley et al. 1984).

In a perfect capital market, where there are no market frictions and costs associated with capital structure adjustments, firms always maintain the optimal capital structure. Though in real world, where adjustment costs are significant, firms are expected to operate with sub-optimal leverage, as departures from the target leverage are associated with lower costs than continuous readjustments (Fischer et al., 1989; Flannery and Rangan, 2006). We estimate the leverage adjustment speed using a partial adjustment model, similar to those used by Byoun (2008) and Hovakimian and Li (2011). The model has the following form:

$$LEV_{i,t} - LEV_{i,t-1} = \alpha + \lambda * (LEV_{i,t}^{*} - LEV_{i,t-1}) + \varepsilon_{i,t} \qquad (2)$$

where $LEV_{i,t} - LEV_{i,t-1}$ is the change of the firm's leverage in period t (year), $LEV_{i,t}^{*} - LEV_{i,t-1}$ is the difference between the target leverage in period t (year) and actual leverage in period $t-1$ (previous year), and λ is the leverage adjustment speed to be estimated with the model. λ shows the percentage of the gap between the firm's actual leverage and the optimal leverage that is closed on average per period (year). λ is expected to be on the interval between 0 and 1. A value close to 0 means that the leverage adjustment speed is low or almost non-existent, while a value close to 1 points to perfect capital structure readjustments. A positive and significant λ implies that firms converge to the optimal capital structure and provides the evidence in favour of the dynamic trade-off theory. On the other hand, a negative λ value indicates that firms diverge from the optimal capital structure.[5]

Following Byoun (2008) who argues that firms operating with above optimal leverage adjust their leverage faster than firms operating with below optimal leverage, we estimate the model controlling for the difference in the leverage adjustment speed of above and below optimally levered firms:

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5 One would fail to confirm the convergence of firms' capital structure towards the optimal capital structure and the dynamic trade-off theory also by finding λ insignificant.

$$RAdj_{i,t} = \alpha + \lambda_1 * OAdj_{i,t} * D_{i,t}^{above} + \lambda_2 * OAdj_{i,t} * D_{i,t}^{below} + \varepsilon_{i,t} \qquad (3)$$

where $RAdj_{i,t}$ and $OAdj_{i,t}$ are abbreviations for $LEV_{i,t} - LEV_{i,t-1}$ and $LEV_{i,t}^* - LEV_{i,t-1}$ from equation (2), respectively. $D_{i,t}^{above}$ is a dummy variable that takes value 1 if the firm is above optimally levered and 0 otherwise. $D_{i,t}^{below}$ is a dummy variable that takes value 1 if the firm is below optimally levered and 0 otherwise. λ_1 is the leverage adjustment speed of the above optimally levered firms and λ_2 is the leverage adjustment speed of the below optimally levered firms to be estimated.

Byoun (2008) and Faulkender et al. (2012) also show that the adjustment speed depends on the firm's cash flow imbalances. When firms operate with (high) financial deficit or surplus adverse selection costs arising from the information asymmetry and transaction costs of capital structure adjustments are addressed simultaneously and are consequently lower. There are several possible outcomes of this phenomenon, each with different implications for the leverage adjustment process. According to the traditional pecking-order hypothesis (Myers and Majluf, 1984), firms would decrease (increase) debt, if they had a financial surplus (deficit), regardless of their leverage position relative to the optimal capital structure. Byoun (2008) found that although the above (below) optimally levered firms with a financial surplus (deficit) adjust faster than similar firms with a financial deficit (surplus), the above (below) optimally levered firms with the financial deficit (surplus) still make leverage adjustments towards the optimal capital structure. This can be labelled as a quasi pecking-order behaviour. According to the dynamic pecking-order theory (Bessler et al., 2011), the probability of issuing equity increases with the fall in the firm-level information asymmetry and firms exploit such opportunities for large equity offerings to build up cash reserves or rebalance the capital structure. Acknowledging these various explanations, the results of the leverage adjustment process are in these specific circumstances difficult to predict as the level of information asymmetry guides firms' decisions either towards or away from the optimal capital structure.

It is clear that the leverage adjustment speed depends on the financial surplus and financial deficit of the firm, however, as argued by Byoun (2008), the pecking-order theory alone could not provide us with a complete explanation on how the leverage adjustment speed is affected. We thus extend his framework by introducing an alternative, the trade-off based explanation that is linked to the findings obtained by Strebulaev (2007). He argues that the above (below) optimally levered firms with a financial deficit (surplus) adjust faster than their peers due to the fact that they are more likely to reach the "refinancing point", which requires an active response from the firm.

To control for the forces beyond the traditional trade-off theory model, we test a unified capital structure model that accommodates interactions of forces proposed by various capital structure theories. We first calculate the firm's financial deficit ($FD_{i,t}$). A positive value of $FD_{i,t}$ indicates that the firm does not generate enough internal funds to cover its needs and that it has a financial deficit. A negative value of $FD_{i,t}$ indicates, on the contrary,

that the firm has a financial surplus. We use an approach similar to the one of Kayhan and Titman (2007) and Byoun (2008), according to which financial deficit is calculated as follows:

$$FD_{i,t} = Div_{i,t} + Inv_{i,t} + \Delta WC_{i,t} - NI_{i,t} \tag{4}$$

where $Inv_{i,t}$ denotes the yearly net investment in fixed assets, $\Delta WC_{i,t}$ is the change in the net working capital, while $NI_{i,t}$ represents the net income.[6]

Based on the value of the firm's financial deficit ($FD_{i,t}$), we calculate two dummy variables. The dummy variable $D_{i,t}^{surplus}$ takes value 1 if the firm has a financial surplus and is 0 otherwise. The dummy variable $D_{i,t}^{deficit}$ takes value 1 if the firm has a financial deficit and is 0 otherwise.

A partial adjustment model that incorporates information about the firm's cash flow imbalances, as well as its leverage relative to the optimal capital structure, can be written as:

$$RAdj_{i,t} = \alpha + \lambda_1 * OAdj_{i,t} * D_{i,t}^{above} * D_{i,t}^{surplus} + \lambda_2 * OAdj_{i,t} * D_{i,t}^{above} * D_{i,t}^{deficit}$$
$$+ \lambda_3 * OAdj_{i,t} * D_{i,t}^{below} * D_{i,t}^{surplus} + \lambda_4 * OAdj_{i,t} * D_{i,t}^{below} * D_{i,t}^{deficit} + \varepsilon_{i,t} \tag{5}$$

Not least, to estimate the impact of the recent financial crisis, we expand our models from equitation (2) and equation (3) by including a dummy variable D_t^{crisis} which takes the value 1 in the years after the emergence of the crisis and 0 otherwise. We expect that the leverage adjustment speed decreases during the crisis, as the troubles in financial sector are likely to impede availability of financial resources, while the economic downturn hampers the firm's profitability. Such results would show that the market timing factors related to the external supply of debt and equity also have important implications for the capital structure choice.

Being aware of the possible differences in the optimal capital structure choice and its dynamics in public and private firms, we estimate the leverage adjustment speed, as well as the optimal capital structure model separately for public and private firms. Due to the fact that we are particularly interested in the European private firms and we expect high heterogeneity within this group, we estimate the leverage adjustment speed also separately for three different groups of private firms according to the size of the firm. We construct groups based on the value of total assets; in the first group we included the firms with total assets below 10 million EUR, in the second group we included the firms with total assets between 10 and 100 million EUR, while the third group includes the firms with total assets larger than 100 million EUR.

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6 As we do not have data about firms' pay-out policies, we set $Div_{i,t} = 0$.

We estimate the optimal capital structure model using a panel regression model with fixed effects. Petersen (2009) argues that in short datasets the use of a fixed effect model is appropriate because in such a setting it is hard to differentiate between a permanent (fixed) effect and a temporary effect. In addition, Lemmon et al. (2008) show that the firm's leverage remains stable over a long period of time and that most of the variation in leverage is time-invariant. Graham and Leary (2011), and Rauh and Sufi (2012) argue that the firm's fixed effect is a crucial determinant of capital structure. However, in a recent study, DeAngelo and Roll (2015) come to a different conclusion about the capital structure developments over the long run, but note that in the short run the capital structure stability hypothesis is not violated. Partial adjustment models outlined in equation (2), equation (3) and equation (5) are estimated using OLS. Due to the overlapping intervals, the bootstrapping technique is applied to determine the statistical significance of the estimated coefficients (Kayhan and Titman, 2007).[7]

4   DATA

We use the data from the Bureau van Dijk's Amadeus database. Our sample consists of firms from EU15 countries excluding Austria, Denmark and Luxembourg because we lack reliable information on the financial debt for the firms from these countries. The analysis is based on an unbalanced panel for the period 2006-2012. As typical for capital structure research, we exclude banking and insurance companies (NACE revision 2 codes K64 and K65) for the reason of their capital structure being subject to regulatory rules, and utility firms (NACE revision 2 codes D35 to E39) for the reason of usually operating under special government concessions. We limit our sample to the firms that had at least 2 million EUR of total assets at the end of year 2012. Our panel consists of 1,188,762 firm-year observations and 183,130 unique firms,[8] with 14,570 firm-year observations of public firms and 1,174,192 firm-years observations of private firms.

As seen in Table 2, there are significant differences in the size of an average public and private firm. Public firms are significantly larger on average than private firms. The distribution of sales, net income and number of employees is skewed to the right for both private and public firms which indicates the presence of some very large firms in both groups.

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7 The bootstrapping technique derives standard errors that are robust to heteroscedasticity and autocorrelation concerns.

8 The firm-year observations that do not contain all the variables needed for the calculation of the optimal capital structure determinants are excluded and the data bellow and above the 1st and 99th percentile winsorized in order to remove any outliers from our analysis.

Table 2: *Descriptive statistics of the panel*

	Mean	Median	Standard Deviation
Sales (in million EUR)			
Public	2,367.252	142.669	9,860.356
Private	39.902	7.008	449.293
Net income (in million EUR)			
Public	123.944	4.402	810.308
Private	1.542	0.117	35.148
Number of employees*			
Public	9,997	725	38,322
Private	191	39	1,823

Descriptive data correspond to 1,188,762 firm-year observations of 183,130 firms for the time period 2006-2012. There are 14,570 firm-year observations of public firms and 1,174,192 firm-years observations of private firms. *Descriptive statistics for number of employees is shown only for firms with available data.

In Table 3 we present descriptive statistics for the variables used in the estimation of the optimal capital structure model. As can be seen, the public firms operate with higher leverage than private firms, since the latter rely also on trade credit and other non-financial liabilities when financing their business. Moreover, the private firms tend to rely more extensively on short-term debt than the long-term one. The median long-term debt ratio of the studied private firms is only 3.338%, while the median total debt ratio for the same firms is 15.365%. The fact that there are around one fifth of public and private firms with virtually no financial debt is also important to note.

Table 3: *Descriptive statistics of the firm-level variables used in the estimation of the optimal capital structure model*

	Mean	Standard deviation	1st percentile	25th percentile	Median	75th percentile	99th percentile
LEV1 - Long term debt / total assets (%)							
Public	14.794	14.672	0	2.143	11.014	22.874	59.458
Private	10.073	14.322	0	0	3.338	15.193	61.995
LEV2 – (Long + short term debt) / total assets (%)							
Public	22.291	17.578	0	7.197	20.161	33.798	67.814
Private	20.251	19.728	0	1.391	15.365	34.089	72.404
TANG – Tangible fixed assets / total assets (%)							
Public	22.480	21.650	0.079	4.778	16.207	33.227	89.878
Private	24.951	23.521	0.117	5.558	17.650	38.080	92.767
SIZE – Natural logarithm of total assets							
Public	19.215	2.180	19.996	17.664	18.979	20.625	24.827
Private	15.912	1.358	13.590	14.969	15.637	16.571	20.246
GROWTH - Growth rate of total assets (%)							
Public	8.984	25.797	-33.355	-3.676	4.158	14.876	122.098
Private	8.042	21.696	-31.267	-4.259	4.044	15.664	91.445
PROF – EBIT / total assets (%)							
Public	4.937	10.678	-38.749	1.723	5.840	10.182	27.972
Private	5.999	8.605	-17.391	1.665	4.649	9.561	33.099
DEP – Depreciation / total assets (%)							
Public	4.384	4.377	0.023	2.000	3.396	5.352	21.732
Private	3.847	3.697	0.009	1.469	2.841	5.037	17.604
R&D* – R&D expenses / total assets (%)							
Public	5.401	8.340	0.025	0.093	2.512	6.345	38.760
Private	5.739	12.629	0.001	0.079	2.488	6.331	43.064
LIQ – Current assets / current liabilities (%)							
Public	183.476	142.049	28.697	105.741	145.043	208.670	813.922
Private	171.485	131.305	20.015	103.646	133.008	192.152	762.478

The descriptive data correspond to 1,188,762 firm-year observations of 183,130 firms for the time period from 2006 to 2012. There are 14,570 firm-year observations of public firms and 1,174,192 firm-years observations of private firms. *Descriptive statistics for R&D are shown only for firms with available data.

The descriptive statistics show minor differences in the capital structure determinants between the analysed public and private firms (other than firm size that has been analysed already in Table 2). For example, private firms show to have more tangible assets and exhibit higher profitability but grow with a slower pace than public firms.

5   RESULTS

In Table 4, we present the results of the optimal capital structure model estimation outlined in equation (1). The regression coefficients are broadly in line with the expected correlations (presented in Table 1). All the determinants are statistically significant, except the depreciation and R&D expenses. Although there are some differences in the size of the effect of some determinants in public and private firms, the impacts exhibit the same direction for almost all the determinants. The only important exception is the relationship between the growth rate of the firm and total debt, which is positive for public firms and negative for private firms.

Table 4: *Optimal capital structure model of public and private European firms*

	Long-term debt		Total debt	
	Public	Private	Public	Private
TANG	0.149***	0.193***	0.123***	0.123***
	(0.011)	(0.001)	(0.012)	(0.001)
SIZE	0.033***	0.034***	0.038***	0.051***
	(0.002)	(0.000)	(0.002)	(0.000)
GROWTH	0.011***	0.001**	0.009***	-0.005***
	(0.003)	(0.000)	(0.003)	(0.000)
PROF	-0.122***	-0.094***	-0.237***	-0.216***
	(0.010)	(0.001)	(0.011)	(0.001)
DEP	-0.012	-0.001	0.004	-0.014**
	(0.024)	(0.004)	(0.025)	(0.006)
R&D	-0.078**	-0.014	-0.148***	-0.032***
	(0.037)	(0.009)	(0.039)	(0.012)
R&DDUM	-0.011**	0.003*	-0.012**	0.005**
	(0.005)	(0.002)	(0.005)	(0.002)
LIQ	0.011***	0.017***	-0.012***	-0.005***
	(0.001)	(0.000)	(0.001)	(0.000)
$MLEV_{(t-1)}$	0.197***	0.200***	0.279***	0.106***
	(0.020)	(0.006)	(0.019)	(0.003)
constant	-0.552***	-0.509***	-0553***	-0.625***
	(0.043)	(0.005)	(0.045)	(0.006)
R^2	0.208	0.141	0.226	0.077
N	14,570	1,174,192	14,570	1,174,192

The table reports the optimal capital structure model regression results for long-term debt and total debt. The optimal capital structure model is estimated separately for public and private firms. Besides regression coefficients, standard errors are reported in brackets. Additionally, R^2 and number of observations are shown. *, ** and *** denote the statistical significance at 10%, 5% and 1%, respectively.

Using the estimated coefficients of the optimal capital structure model, we then predict the firm's target leverage and calculate the gap between the target and the actual leverage. Figure 1 reveals that approximately one third of the firms operate with an optimal capital structure meaning their actual leverage is less than 5 percentage point above or below the optimum. Other firms operate with either lower or higher leverage than optimal, but as can be noticed, there is a larger proportion of firms operating with leverage that is below the optimum. The distribution thus reveals a rather conservative use of debt among the public and private European firms.

Figure 1: *Distribution of the differences between the target (optimal) leverage and the actual leverage*
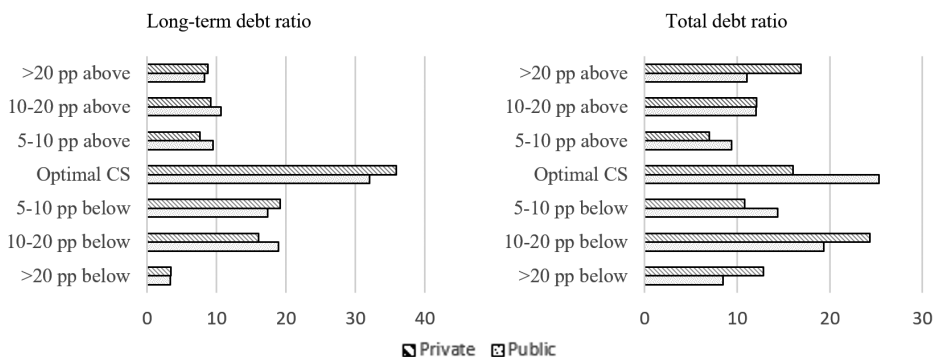
The figure shows shares of public and private firms (in % of total firms) that have their actual leverage more than five percentage points above the target leverage (red), approximately around the target leverage level (green) or more than five percentage points below the target leverage (blue).

Further, we estimate the leverage adjustment speed. The leverage adjustment speed of the public and private European firms are shown in Table 5 and 6, respectively. The results suggest that public and private European firms adjust their leverage as predicted by the dynamic trade-off theory. The leverage adjustment speed of the studied public firms is estimated to 0.184 and 0.131 for long-term and total debt, respectively. Compared to the adjustment speed of the public firms, we estimate slightly lower adjustment speeds in private firms, 0.171 and 0.128 for long-term and total debt, respectively. That means that public firms close on average 18.4% (13.1% if total debt is used) of the gap between the actual and target leverage per year. The estimate for the private firms stands at 17.1% (12.8% if total debt is used). The results are not surprising, as public firms are expected to have lower adjustment costs than private firms. As expected, we also found the lower adjustment speed for the total debt, as the short-term debt which is a component of the total debt is a more volatile resource and thus more likely to depend on the firm's liquidity position than the long-term debt. That can add some distortion into the leverage adjustment process and negatively affect the adjustment speed.

Table 5: *Leverage adjustment speed of public European firms*

	Long-term debt			Total debt		
	(I)	(II)	(III)	(IV)	(V)	(VI)
LAS–total	0.184***			0.131***		
	(0.007)			(0.006)		
LAS–above target		0.191***			0.144***	
		(0.014)			(0.013)	
LAS–below target		0.174***			0.116***	
		(0.020)			(0.015)	
LAS–above/surplus			0.239***			0.169***
			(0.015)			(0.015)
LAS–above/deficit			0.140***			0.115***
			(0.018)			(0.017)
LAS–below/surplus			0.186***			0.066***
			(0.026)			(0.012)
LAS–below/deficit			0.158***			0.162***
			(0.019)			(0.019)
constant	-0.006	-0.006	-0.006	-0.002	-0.000	0.00
	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)	(0.007)
R^2	0.104	0.104	0.108	0.095	0.095	0.101
N			11,470			

The table reports the leverage adjustment speed of the public European firms estimated using partial adjustment models outlined in equations (2), (3) and (5). Besides regression coefficients, standard errors are reported in brackets. Additionally, R^2 and the number of observations are shown. LAS is an abbreviation for leverage adjustment speed. *, **, *** denote the statistical significance at 10%, 5% and 1%, respectively.

Table 6: *Leverage adjustment speed of private European firms*

| | Long-term debt | | | Total debt | | |
	(I)	(II)	(III)	(IV)	(V)	(VI)
LAS–total	0.171***			0.128***		
	(0.001)			(0.001)		
LAS–above target		0.178***			0.139***	
		(0.001)			(0.001)	
LAS–below target		0.158***			0.114***	
		(0.002)			(0.002)	
LAS–above/surplus			0.234***			0.167***
			(0.001)			(0.002)
LAS–above/deficit			0.091***			0.117***
			(0.002)			(0.001)
LAS–below/surplus			0.167***			0.074***
			(0.003)			(0.002)
LAS–below/deficit			0.142***			0.162***
			(0.003)			(0.002)
constant	-0.004***	-0.003***	-0.002***	-0.005***	-0.003***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
R^2	0.096	0.096	0.106	0.069	0.069	0.074
N			901,177			

The table reports the leverage adjustment speeds of the private European firms estimated using partial adjustment models outlined in equations (2), (3) and (5). Besides regression coefficients, standard errors are reported in brackets. Additionally, R^2 and the number of observations are shown. LAS is an abbreviation for leverage adjustment speed. *, **, *** denote the statistical significance at 10%, 5% and 1%, respectively.

Our estimates of the leverage adjustment speed are in line with the findings obtained in similar studies that to a large extent address public US firms (Fama and French, 2002; Kayhan and Titman, 2007; Flannery and Rangan, 2007; Byoun, 2008). Similar studies that use the same estimation technique (OLS) report estimates of the leverage adjustment speed on the interval 10-20%. However, the estimates of the leverage adjustment speed tend to be higher–up to 30%–if alternative estimators, such as the fixed effect or mixed effect model, are used (Flannery and Rangan, 2007; Byoun, 2008). Marinšek et al. (2016) who use a mixed effect model, and Hanousek and Shamshur (2011) relying on a one-stage partial adjustment model with fixed effects, estimate the leverage adjustment speed of the studied European firms even higher. Their estimates are on the interval between 25-40%.

We found a significant asymmetry in the leverage adjustment speed. Our results show that firms that operate with leverage that is above the optimal on average exhibit a higher adjustment speed than the firms that are below optimally levered. The leverage adjustment

speed estimates of the above optimally levered firms are between 10-25% higher than the estimates for the below optimally levered firms for both, long-term and total debt. Byoun (2008), for example, reports a slightly more pronounced asymmetry in the adjustment speed between the above and below optimally levered public US firms.

Moreover, we documented significant effects of the firm's cash flow imbalances. We ascertained that the above optimally levered firms that have a financial surplus exhibit a higher leverage adjustment speed. The result is consistent with the pecking-order explanation and is in line with the results obtained by Byoun (2008). The differences in the adjustment speed of the firms with a financial surplus and those with a financial deficit are more evident in the models with the long-term debt, implying that the financial surplus is being primarily used to lower the long-term debt. On the other hand, the positive adjustment speed found for the above optimally levered firms with a financial deficit point to the leverage adjustment consistent with the trade-off rationale (Strebulaev, 2007), according to which firms that have accumulated too much debt divest by selling their assets or issue new equity to rebalance their capital structures. On the other hand, we detected to some extent different capital structure dynamics for the below optimally levered EU firms, when compared to the behaviour of the US public firms (as found by Byoun, 2008). Our results show that the leverage adjustment speed for the long-term debt is approximately 15% higher for the firms with a financial surplus in comparison to those with a financial deficit. The obtained results are however consistent with the trade-off theory, as well-performing firms that operate with large profits issue debt to take advantage of the interest tax shield. Moreover, one can also infer that the supply of debt impacts corporate capital structure decisions, as creditors are unwilling to enter in long-term relationship with the firms with insufficient probability of survival. For total debt we found a significantly lower leverage adjustment speed for the firms with a financial surplus than for those with a financial deficit, which indicates that the below optimally levered firms with a financial deficit rely heavily on short-term financing that carries less debt-related agency problems (Titman and Wessels, 1988). Again, both the pecking-order and the trade-off theories should be considered when explaining the impact of financial performance of firms on their leverage adjustment process.

Next, we estimate the leverage adjustment speed for private firms of different sizes. As seen in Table 7 and Table 8, the leverage adjustment speed is on average negatively associated with the size of the firms. It can be noticed that there are far the largest differences in the leverage adjustment speed identified for the below optimally levered private firms. The observed decrease in the leverage adjustment speeds between the group of the smallest and the largest private firms of the below optimally levered private firms is approximately 60% (from 0.269 to 0.102) and 80% (from 0.225 to 0.043) for long -term and total debt, respectively. However, the leverage adjustment speeds of the above optimally levered private firms remain more stable along the groups of firms of different sizes (or slightly increase with the size). Furthermore, the smallest group of the below optimally levered private firms exhibits a higher adjustment speed than the smallest above optimally levered private firms, indicating a certain level of aggression in the use of debt, a relatively low

ability to control excessive leverage, pointing to a high risk taking appetite of those private firms.[9] The same phenomenon is not observed for larger private firms, as the above optimally levered firms adjust faster towards the target leverage than the below optimally levered firms. Even more, the asymmetries between the leverage adjustment speed of both the above and below optimally levered private firms with more than 10 million EUR of total assets are higher than those found for public firms. This leads us to the conclusion that larger private firms are likely to be more risk averse than public firms in the capital structure choice.

When estimating the impact of the firm's cash flow imbalances on the leverage adjustment speed, we notice that again both the pecking-order and the trade-off theories should be used to explain the leverage adjustment process. As found for the sample of public and the sample of private firms, a financial surplus enables the above optimally levered firms to adjust their capital structure towards the target leverage faster than the firms operating with a financial deficit. However, we found that the firm's cash flows imbalances only marginally impact the leverage adjustment speed of the below optimally levered private firms from the two groups of the largest private firms, leading us to a conclusion that it is hard to distinguish whether the pecking-order or the trade-off theory is the dominant explanation for the leverage adjustment process of those firms. On the other hand, leverage dynamics is much more interesting for the group of the smallest below optimally levered private firms. We observe the below optimally levered private firms operating with a financial surplus to have a higher leverage adjustment speed for long-term debt than the comparable firms with a financial deficit (0.303 versus 0.220). The trade-off consistent leverage adjustment process also points to a limited access to a long-term debt for the smallest private firms, as the smallest below optimally levered private firms with a financial deficit rely mainly on short-term debt financing.[10]

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9 Additionally, Croci et al. (2011) argue that debt financing can be viewed as a non-control-diluting security for family controlled firms, while those firms issue external equity only rarely. The majority of the smallest firms from our sample are likely to be family controlled.

10 The leverage adjustment speed of the smallest below optimally levered private firms operating with a financial deficit is 0.318, which is considerably higher in comparison to similar firms operating with a financial surplus, which stands at 0.126.

Table 7: *Long-term debt adjustment speed of private firms (by the value of the firm's total assets)*

Size of the firm	Total assets<10 million EUR			10 million EUR<Total assets<100 million EUR			Total assets>100 million EUR		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
LAS – total	0.198***			0.165***			0.144***		
	(0.001)			(0.002)			(0.003)		
LAS – above target		0.171***			0.188***			0.197***	
		(0.002)			(0.003)			(0.011)	
LAS – below target		0.269***			0.135***			0.102***	
		(0.005)			(0.005)			(0.010)	
LAS – above/surplus			0.239***			0.222***			0.167***
			(0.002)			(0.003)			(0.008)
LAS – above/deficit			0.005***			0.145***			0.227***
			(0.003)			(0.005)			(0.016)
LAS – below/surplus			0.303***			0.134***			0.097***
			(0.006)			(0.005)			(0.011)
LAS – below/deficit			0.220***			0.133***			0.114***
			(0.006)			(0.004)			(0.009)
constant	0.000	-0.003***	-0.002***	-0.008***	-0.006***	-0.005***	-0.015***	-0.007***	-0.007***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)
R^2	0.111	0.114	0.134	0.091	0.092	0.095	0.078	0.082	0.084
N	557,384			289,141			54,652		

The table reports the long-term debt adjustment speed of the private European firms divided into three groups using the firm's total assets as a splitting criterion estimated using partial adjustment models from equations (2), (3) and (5). Besides regression coefficients, standard errors are reported in brackets. Additionally, R^2 and the number of observations are shown. LAS is an abbreviation for leverage adjustment speed. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Table 8: *Total debt adjustment speed of private firms (by the value of the firm's total assets)*

Size of the firm	Total assets<10 million EUR			10 million EUR<Total assets<100 million EUR			Total assets>100 million EUR		
	(I)	(II)	(III)	(I)	(II)	(III)	(I)	(II)	(III)
LAS – total	0.160***			0.107***			0.099***		
	(0.001)			(0.001)			(0.002)		
LAS – above target		0.129***			0.132***			0.231***	
		(0.002)			(0.003)			(0.009)	
LAS – below target		0.225***			0.081***			0.043***	
		(0.004)			(0.003)			(0.005)	
LAS – above/surplus			0.154***			0.176***			0.266***
			(0.002)			(0.003)			(0.012)
LAS – above/deficit			0.117***			0.093***			0.200***
			(0.002)			(0.003)			(0.011)
LAS – below/surplus			0.126***			0.067***			0.045***
			(0.004)			(0.003)			(0.005)
LAS – below/deficit			0.318***			0.102***			0.042***
			(0.005)			(0.003)			(0.005)
Constant	-0.000	-0.006***	-0.003***	-0.009***	-0.005***	-0.004***	-0.019***	-0.003	-0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
R²	0.088	0.090	0.099	0.056	0.058	0.062	0.051	0.068	0.069
N	557,384			289,141			54,652		

The table reports the total debt adjustment speed of the private European firms divided into three groups using the firm's total assets as a splitting criterion estimated using the partial adjustment models from equations (2), (3) and (5). Besides the regression coefficients, standard errors are reported in brackets. Additionally, R² and the number of observations are shown. LAS is an abbreviation for the leverage adjustment speed. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Additionally, we test how the leverage adjustment speed of the European firms has changed since the emergence of the financial crisis in the year of 2008.

Table 9: *Impact of the recent financial crisis on the total leverage adjustment speed*

	Long-term debt		Total debt	
	Public	Private	Public	Private
LAS	0.185***	0.191***	0.165***	0.137***
	(0.011)	(0.001)	(0.010)	(0.001)
LAS * crisis	-0.001	-0.033***	-0.055***	-0.015***
	(0.14)	(0.002)	(0.011)	(0.001)
crisis	0.004*	0.000	0.006**	-0.004***
	(0.003)	(0.000)	(0.003)	(0.000)
constant	-0.006	-0.004***	-0.002	-0.005***
	(0.005)	(0.000)	(0.006)	(0.000)
R^2	0.104	0.097	0.098	0.069
N	11,470	901,177	11,470	901,177

The table reports the impact of the recent financial crisis on the leverage adjustment speed estimated using the partial adjustment model from equation (2) with the inclusion of a dummy variable D_t^{crisis}. Besides the regression coefficients, standard errors are reported in brackets. Additionally, R^2 and the number of observations are shown. LAS is an abbreviation for leverage adjustment speed. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

Not least, we estimate the effect of the financial crisis on the leverage adjustment speed. As can be observed in Table 10, we found a statistically significant reduction in all leverage adjustment speeds in the years during the recent financial crisis, however, with only one exception, namely the long-term debt adjustment speed for public firms which is statistically insignificant. The results are in line with the findings obtained by Cook and Tang (2010), Dang et al. (2014) and Marinšek et al. (2016), and suggest that market timing factors interact with the forces proposed by the other two capital structure theories when European firms make capital structure decisions. To better understand the leverage dynamics following the beginning of the crisis, we again study the above and below optimally levered firms separately.

Table 10: *Impact of the recent financial crisis on leverage adjustment speeds (disintegration)*

	Long-term debt		Total debt	
	Public	Private	Public	Private
LAS – above target	0.235***	0.211***	0.223***	0.149
	(0.020)	(0.002)	(0.019)	(0.002)
LAS – above/crisis	-0.071***	-0.051***	-0.133***	-0.017
	(0.027)	(0.003)	(0.022)	(0.003)
LAS – below target	0.116***	0.161***	0.095***	0.122
	(0.032)	(0.004)	(0.025)	(0.003)
LAS – below/crisis	0.097**	-0.004	0.039	-0.014
	(0.041)	(0.006)	(0.033)	(0.004)
crisis	-0.003	-0.002***	-0.003	-0.004
	(0.004)	(0.000)	(0.005)	(0.001)
constant	-0.001	-0.002***	0.006	-0.003
	(0.006)	(0.000)	(0.007)	(0.001)
R^2	0.106	0.097	0.102	0.070
N	11,470	901,177	11,470	901,177

The table reports the impact of the recent financial crisis on the leverage adjustment speeds of the above and below optimally levered firms estimated using the partial adjustment model from equation (3) with the inclusion of a dummy variable D_t^{crisis}. Besides the regression coefficients, standard errors are reported in brackets. Additionally, R^2 and the number of observations are shown. LAS is an abbreviation for leverage adjustment speed. *, **, *** denote statistical significance at 10%, 5% and 1%, respectively.

The results in Table 10 reveal much more complex changes than initially expected in the leverage adjustment speed following the emergence of the crisis. We do not find the leverage adjustment speed of the below optimally levered public firms to fall, which signals that these firms retain in their leverage choice during the crisis as much manoeuvring space as they had before the crisis. What is more, the below optimally levered public firms manage to increase their leverage adjustment speed for the long-term debt during the crisis. This might be a consequence of the reduction in interest rates that first resulted from the flight to quality in some countries and the expansionary monetary policy, and/or a consequence of the shift in creditors' preferences and risk taking. On the other hand, we observe a statistically significant reduction of the total debt adjustment speed of the below optimally levered private firms, while a decrease in the long-term debt adjustment speed of the same firms is found to be statistically insignificant. Our results show that the below optimally levered private firms experience more restrictions in their debt choice during distressed period than public firms. However, these limitations should be viewed as less important.

The leverage adjustment speed of the above optimally levered firms are reduced for all firms during the crisis period, which confirms the findings of Dang et al. (2014) that the

impact of the financial crisis on leverage adjustment speeds is asymmetric, with financially constrained firms being more adversely affected. While the decrease in the long-term debt adjustment speed is at around 25% when compared to the pre-crisis levels for both the above optimally levered public and private firms, the total debt adjustment speed is sharply reduced for the above optimally levered public firms and only marginally for the above optimally levered private firms, which is a rather unexpected outcome. For that reason, we also look at the profitability of the above optimally levered firms and notice that the median above optimally levered public firm was more profitable in the years before the crisis than the comparable private firm, while the opposite is true for the crisis period. Additionally, following the market timing theory of capital structure (Baker and Wurgler, 2002) or the dynamic pecking-order theory (Bessler et al., 2011), firms tend to issue new equity capital when share prices are high and the relative level of information asymmetry is low. As the European stock markets declined sharply during the crisis, we assume that the public firms' propensities to issue new equity capital with the purpose of lowering their (short-term) leverage also decreased in the same time period.[11]

6 CONCLUSION

Our research paper looks into a large sample of the European public and private firms that have received significantly less attention in the existing literature and examine their capital structure choice. We estimate an empirical model that is based on a unified setting in which leverage targets remain consistent with the dynamic trade-off theory, while the leverage adjustment process depends on the interacting effects proposed by different capital structure theories. We estimate the leverage adjustment speed and point at factors that explain the differences in the leverage dynamics.

We find strong empirical evidence that the European firms adjust their leverage towards the optimal capital structure and that both public and private firms have a similar leverage adjustment speed. The above optimally levered firms are found to adjust faster than the below optimally levered firms, while the impact of the firm's cash flow imbalances on the leverage adjustment process should be studied from both the trade-off and the pecking-order perspectives. The acquired results imply that private firms should have very similar adjustment costs and rebalance their capital structures as often as the public firms. Analysing private firms further, our results show that private firms represent a very diverse group of firms and that the size of the firm is a far more important factor that determines the capital structure dynamics than its public/private status. Somewhat in contrast to our expectations, we ascertain that smaller firms adjust their leverage towards the target faster than larger firms. Moreover, we observe the opposite asymmetry in the adjustment speed in the group of the smallest firms compared to the asymmetry found in the larger firms.

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11 Taking into account all of our results, we additionally argue that the low asymmetry between the leverage adjustment speed of the above and below optimally levered firms reported in the Tables 5 and 6 might be a consequence of the recent financial crisis, as the above optimally levered firms experience a more pronounced reduction in leverage adjustment speeds during the period of stress than the below optimally levered firms.

Analysing the group of the smallest firms, we find that the adjustment speed of the bellow optimally levered firms exceeds the adjustment speed of the above optimally levered firms.

Analysing the effect of the recent financial crisis, we document a reduction in the leverage adjustment speed for all firms on average. By disintegrating the total leverage adjustment speed into two components (separate estimations for the above and below optimally levered firms), we notice much more complex changes in the leverage adjustment speed than expected, with the above optimally levered firms being more adversely impacted than the below optimally levered firms.

Our findings have several important implications, as , on the one hand, they confirm the robustness of the dynamic trade-off theory outside the context of the US large public firms, and on the other hand, that including the interactive effects proposed by alternative capital structure theories can substantially contribute to the understanding of the complex leverage adjustment process. By incorporating parts of the pecking-order and the market timing related logic in the dynamic trade-off theory framework, we were able to better explain the leverage adjustment process compared to the explanation that would be obtained relying solely on the trade-off theory rationale. What is probably more important and goes beyond the test of the theory robustness is that the results imply that the idea of an optimal capital structure is not relevant only in large but also small firms. The results of our research show the optimal capital structure could prove even more important.

REFERENCES

Akbar, S., ur Rehman, S., and Ormrod, P. (2013). The Impact of Recent Financial Shocks on the Financing and Investment Policies of UK Private Firms. *International Review of Financial Analysis, 26*, 59-70.

Baker, M. and Wurgler, J. (2002). Market Timing and Capital Structure. *The Journal of Finance, 57*(1), 1-32.

Bartholdy, J. and Mateus, C. (2011). Debt and taxes for private firms. I*nternational Review of Financial Analysis, 20*(3), 177-189.

Baxter, N. (1967). Leverage, Risk of Ruin, and the Cost of Capital." *Journal of Finance, 22*(3), 395-403.

Bessler, W., Drobetz, W. and Grüninger, M. C. (2011). Information Asymmetry and Financing Decisions. *International Review of Finance, 11*(1), 123-154.

Bradley, M., Jarrell, G. A. and Kim, E. H. (1984). On the Existence of an Optimal Capital Structure: Theory and Evidence. *The Journal of Finance, 39*(3), 857-878.

Brav, O. (2009). Access to Capital, Capital Structure, and the Funding of the Firm. *The Journal of Finance, 64*(1), 263-308.

Bureau van Dijk (2014). *Amadeus database of comparable financial information for public and private companies across Europe*. https://amadeus.bvdinfo.com (accessed March 15, 2015).

Byoun, S. (2008). How and When Do Firms Adjust Their Capital Structures towards Targets? *The Journal of Finance, 63*(6), 3069-3096.

Caglayan, M. and Rashid, A. (2014). The Response of Firms' Leverage to Risk: Evidence from UK Public versus Nonpublic Manufacturing Firms. *Economic Inquiry, 52*(1), 341-363.

Cook, D. and Tang, T. (2010). Macroeconomic Conditions and Capital Structure Adjustment Speed. *Journal of Corporate Finance, 16*(1), 73-87.

Croci, E., Doukas, J. A. and Gonenc, H. (2011). Family Control and Financing Decisions. *European Financial Management, 17*(5), 860-897.

Dang, V. A, Kim, M. and Shin, Y. (2014). Asymmetric Adjustment towards Optimal Capital Structure: Evidence from a Crisis. *International Review of Financial Analysis, 33*, 226-242.

DeAngelo, H. and Masulis, R.W. (1980). Optimal Capital Structure under Corporate and

Personal Taxation. *Journal of Financial Economics, 8*(1), 3-29.

DeAngelo, H. and Roll, R. (2015). How Stable Are Corporate Capital Structures? *The Journal of Finance, 70*(1), 373-418.

Dong, M., Loncarski, I. ter Horst, J. and Veld C. (2012). What Drives Security Issuance Decisions: Market Timing, Pecking Order, or Both? *Financial Management, 41*(3), 637-663.

Fama, E. F. and French, K. R. (2002). Testing Trade-Off and Pecking Order Predictions about Dividends and Debt. *Review of Financial Studies, 15*(1), 1-33.

Faulkender, M., Flannery, M., Hankins, K. and Smith, J. (2012). Cash Flows and Leverage Adjustments. *Journal of Financial Economics, 103*(3), 632-646.

Fischer, E. O., Heinkel, R. and Zechner, J. (1989). Dynamic Capital Structure Choice: Theory and Tests. *The Journal of Finance, 44*(1), 19-40.

Flannery, M. J. and Rangan, K. P. (2006). Partial Adjustment towards Target Capital Structures. *Journal of Financial Economics, 79*(3), 469-506.

Gaud, P., Hoesli, M. and Bender, A. (2007). Debt-equity Choice in Europe. *International Review of Financial Analysis, 16(*3), 201-222.

Goyal, V. K., Nova, A. and Zanetti, L. (2011). Capital Market Access and Financing of Private Firms. *International Review of Finance, 1*1(2), 155-179.

Graham, J. R. and Leary, M. T. (2011). A Review of Empirical Capital Structure Research and Directions for the Future. *Annual Review of Financial Economics, 3,* 309-345.

Hanousek, J. and Shamshur, A. (2011). A Stubborn Persistence: Is the Stability of Leverage Ratios Determined by the Stability of the Economy? *Journal of Corporate Finance, 17*(5), 1360-1376.

Hovakimian, A. and Li, G. (2011). In Search of Conclusive Evidence: How to Test for Adjustment to Target Capital Structure. *Journal of Corporate Finance, 17*(1), 33-44.

Huang, R. and Ritter, J. R. (2009). Testing Theories of Capital Structure and Estimating the Speed of Adjustment. *Journal of Financial and Quantitative Analysis, 44*(2), 237-271.

Jensen, M. C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review, 76*(2), 323-329.

Kayhan, A. and Titman, S. (2007). Firms' Histories and Their Capital Structures. *Journal of Financial Economics, 83*(1), 1-32.

Korgaonkar, S. and Nini, G. (2010). Special Purpose Vehicles and Nonfinancial Corporate Finance. *SSRN working paper.* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1639548 (accessed 15 March, 2015).

Korteweg, A. (2010). The Net Benefits to Leverage. *The Journal of Finance, 65*(6), 2137-2170.

Kraus, A. and Litzenberger, R. H. (1973). A State-preference Model of Optimal Financial Leverage. *The Journal of Finance, 28*(4), 911-922.

Leary, M. T. & Roberts, M. R. (2005). Do Firms Rebalance Their Capital Structures? The *Journal of Finance, 60*(6), 2575-2619.

Leland, H. E. (1994). Corporate Debt Value, Bond Covenants, and Optimal Capital Structure. *The Journal of Finance, 49*(4), 1213-1252.

Lemmon, M. L., Roberts, M. R. and Zender, J. F. (2008). Back To The Beginning: Persistence And The Cross-Section Of Corporate Capital Structure. *The Journal of Finance, 63*(4), 1575-1608.

Marinšek, D., Pahor, M., Mramor, D. and Luštrik, R. (2016). Do European Firms Behave as if they Converge towards a Target Capital Structure? *Journal of International Financial Management & Accounting, 27*(2), 97-125.

Modigliani, F. and Miller, M. H. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. *The American Economic Review, 53*(3), 433-443.

Morellec, E. (2004). Can Managerial Discretion Explain Observed Leverage Ratios?. *Review of Financial Studies, 17*(1), 257-294.

Myers, S. C. (1977). Determinants of Corporate Borrowing. *Journal of Financial Economics, 5*(2), 147-175.

Myers, S. C. and Majluf, N. S. (1984). Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. *Journal of Financial Economics, 13*(2), 187-221.

Öztekin, Ö. and Flannery, M. (2012). Institutional Determinants of Capital Structure Adjustment Speeds. *Journal of Financial Economics, 103*(1), 88-112.

Petersen, M. (2009). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *Review of Financial Studies, 22*(1), 435-480.

Rajan, R. G. and Zingales, L. (1995). What Do We Know about Capital Structure? Some Evidence from International Data. *The Journal of Finance, 50*(5), 1421-1460.

Rauh, J. D. and Sufi, A. (2012). Explaining Corporate Capital Structure: Product Markets, Leases, and Asset Similarity. *Review of Finance, 16*(1), 115-155.

Saunders, A. and Steffen, S. (2011). The Costs of Being Private: Evidence from the Loan Market. *The Review of Financial Studies, 24*(12), 4091-4122.

Shyam-Sunder, L. and Myers, S. C. (1999). Testing Static Tradeoff against Pecking Order Models of Capital Structure. *Journal of Financial Economics, 51*(2), 219-244.

Strebulaev, I. A. (2007). Do Tests of Capital Structure Theory Mean What They Say? *The Journal of Finance, 62*(4), 1747-1787.

Titman, S. and Wessels, R. (1988). The Determinants of Capital Structure Choice. *The Journal of Finance, 43(*1), 1-19.

van Binsbergen, J. H., Graham, J. R. and Yang, J. (2010). The Cost of Debt. *The Journal of Finance, 65*(6), 2089-2136.

Past, Present and Future of the Research on the Pro-Environmental Behaviour in Tourism: A Bibliometric Analysis

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ABSTRACT: *Environmental sustainability is one of the key challenges humanity is facing today. Tourism is an invasive industry in terms of the damage it causes to the environment. An effective way to mitigate the negative environmental impacts of tourism is to shift tourist behaviour towards environmentally friendly behaviour. While there is a growing number of publications on tourist pro-environmental behaviour (PEB), this paper aims to overview the existing research in this area by applying a bibliometric analysis. Co-citations, keyword co-occurrences and bibliographic coupling are used to analyse the tourism PEB research and provide guidelines for the future.*

1   INTRODUCTION

Environmental sustainability represents one of the key challenges humanity is faced with today. In addition to the recent cases with global media coverage on the issue, such as the exponential growth of the amount of plastic in the ocean – the Great Pacific Garbage Patch (Lebreton et al., 2018), or reaching the point of no return for the glaciers melting (Marzeion et al., 2018), there is ample evidence about environmental degradation resulting from human activities. The consequences of such environmental degradation have had and will continue to have a direct impact on the quality of human life.

Major emissions on a global scale are related to the sectors of energy supply, agriculture and industry, however, the precise contribution of tourism to global pollution is more complicated to estimate. This is because tourism is assembled from different sub-sectors (Peeters & Dubois, 2010), and is at the same time recognized as the runner-up in terms of contributing to the global climate change (Gössling, 2013). More recent studies indicate

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that tourism contributes around 8% of greenhouse gas emissions, which are expected to rise to 12% until 2025 (Lenzen et al., 2018).

The consumer lifestyle, behaviour and spending practices are critically important for sustainable transformations (IPCC, 2014), where individuals play a central role in the process of climate change mitigation (Gössling & Peeters, 2007; O'Brien, 2015). In the last 10 years, there has been a continuous growth in research on the pro-environmental behaviour in tourism. The pro-environmental behaviour (PEB) is the "behavior that consciously seeks to minimize the negative impact of one's actions on the natural and built world" (Kollmuss & Agyeman, 2002, p. 240). The PEB research uses different levels of pro-environmental concepts, from pro-environmental beliefs to knowledge, attitude, intention, and also past, current, intended or actual behaviour (Diamantopoulos et al., 2003).

The purpose of this paper is to identify the main topics of the ongoing discourse researching the PEB phenomenon. A bibliometric analysis is applied, allowing us to summarise a large amount of data and reflect on the existing and actual streams within the relevant literature.

The objectives of the paper are: 1) to identify the theoretical bases upon which the tourism PEB research is built; 2) to define the main sub-topics within the tourism PEB research and their change over time; 3) to determine the frontiers and current trends in the tourism PEB research; 4) to explore the directions for future research by reviewing the identified elements, relationships and gaps in the existing literature.

2. METHOD

A bibliometric analysis enables a quantitative approach to the literature overview. We use the bibliometric networks visualisation, or science mapping (Eck & Waltman, 2014), in order to explore the topic of PEB in tourism. This method provides an overview of the area by using a large number of sources. It compares the similarities in the references cited in the documents, or keywords extracted from a title, keyword list and abstract, and thus identifies the relationships between the documents. There are two types of documents, namely the primary ones (A, B; Figure 1), acquired by searching the database, and the secondary ones (a, b; Figure 1), cited in the reference list of the primary documents. The bibliometric network consists of nodes, i.e. publications or keywords in our analysis, and edges, i.e. links and relations between the nodes (Eck & Waltman, 2014). The distance between the nodes reflects the relatedness between them, while the size of the nodes points to the link strength. Further, link strength indicates either the number of cited references that the two publications share in the bibliographic coupling, the number of publications that cite the two documents together in the co-citations, or the number of publications in which two terms occur together in the keyword co-occurrence analysis.

So far this method has been underused in sustainable tourism research. We found few studies in the area that apply bibliometrics to reviewing the existing literature. Lu and Nepal (2009) analysed publications from the Journal of Sustainable Tourism in a 15-year period (1993–2007). Ruhanen, Weiler, Moyle and McLennan (2015) provided a bibliometric analysis of their 25-year sustainable tourism research published in the four highest-ranking journals in the field.

In this paper, we apply three types of the bibliometric analysis, namely co-citation, bibliographic coupling, and keyword analysis. In the next step, we visualise the networks by using VOSviewer (VOSviewer - *Visualizing Scientific Landscapes*, 2018). These three methods are complementary and when applied together, they allow us to see the analysed area from a multi-angle perspective (Zupic & Čater, 2014). VOSviewer uses distance-based visualizations, where the distance between the nodes reflects the relatedness of the nodes. The software creates a normalized network and maps nodes in a two-dimensional space, where strongly related nodes are located nearby and the less related nodes are located further (Eck & Waltman, 2014). The documents or terms (nodes) which occur together most frequently are then grouped in clusters. The latter are assigned by VOSviewer and indicated in different colours, while each node in the network is assigned to one cluster only (Eck & Waltman, 2014).

Figure 1: *Principles of the co-citation and bibliographic coupling analysis*
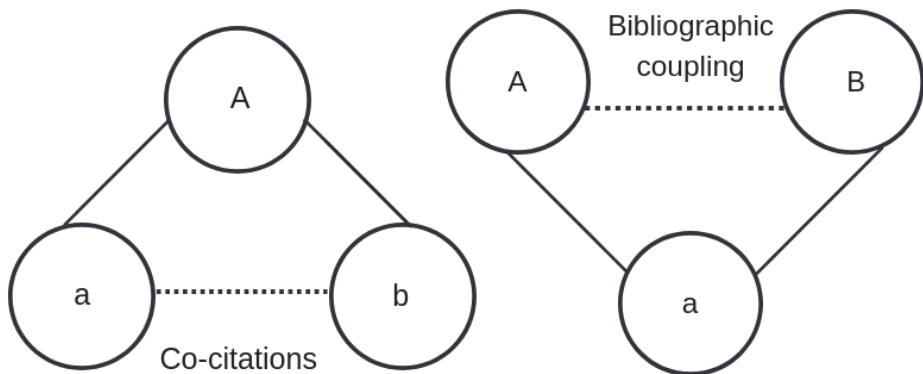
Source: adapted from Vogel and Güttel (2013)

In co-citations, we analyse the clusters of the documents from the primary document reference list. Two documents (a and b in Figure 1) are co-cited when there is a third document (A) citing them. The result therefore shows the relationship between the secondary documents cited together and can be used to identify the theoretical basis of

the PEB research. These publications are often referred to in the primary documents. By analysing the clusters which are based on the frequency of the secondary documents being cited together, we are able to ascertain the topic that connects them. This method is a good way to identify the most influential and fundamental pieces of any research and serves as the foundation for new knowledge (Zupic & Čater, 2014). Due to the time needed for the publication process, the identified documents reflect the state of the researched field from a few years ago. In other words, the outcome changes over time, which means the same documents might or might not be cited in future research (Zupic & Čater, 2014).

The keyword analysis is used for identifying the content structure of the tourism PEB research and analysing the change in topics over time. Keywords are extracted from the title, keyword list and abstract. We apply the term co-occurrence with binary counting, which means the keywords are counted if they are present in a document, however, the frequency of the word occurrence in a particular document does not impact the outcome. The keywords occurring together most frequently are grouped in clusters. In order to see the change over time, the analysis connecting the keywords to the average year of publication during which this keyword occurs is used. This analysis helps to trace how the research focus gradually shifts over the researched time.

To analyse the trends in the current research, the bibliographic coupling analysis is applied. The bibliographic coupling principle is the opposite of the co-citations principle, namely, it defines the similarities between the primary documents (A, B) based on the shared references, i.e. secondary documents (a, b). The primary documents are mapped, which allows inclusion of the newest publications that have not yet been cited. This method is a good way to identify the most recent research. For this analysis of the tourism PEB research, a period of 5 years (2014-2018) was selected.

In the research, the Web of Science (WoS) database was used. In the WoS database, the publications on pro-environmental behaviour within the tourism context were searched for, where the search words entered were "*pro-environment* behavio*" AND "touris*" to allow the variation in spelling. As the search results were not complete, we manually added the relevant publications from the key authors we knew of from the previous literature review, since they were missing in the machine-generated database. Some publications were missing because of the use of different terms to describe pro-environmental behaviour. Further, we checked the titles and abstracts of all documents in the database and deleted the irrelevant ones. The database, containing the main information about the document, i.e. title, year of publication, authors, source, list of references, abstract and keywords, was then processed with VOSviewer which created network maps based on the similarities found between the reference lists or keywords.

In total, 205 primary documents were used in the co-citation and keywords analysis (173 articles, 15 reviews, 7 proceedings, 6 book chapters, 3 editorials, and 1 book), and 142 documents in the bibliographic coupling analysis (120 articles, 11 reviews, 7 proceedings,

3 book chapters, and 1 book). Papers in the field of PEB in tourism are mainly published in the Journal of Sustainable Tourism (46 publications), Tourism Management (20), Annals of Tourism Research (9), Journal of Travel Research (9), Current Issues in Tourism (7) and Journal of Environmental Psychology (6).

The clusters were interpreted with the help of the "human" content analysis of the documents. In other words, we read the documents and analysed them in terms of their contribution to the story of their clusters. In the continuation, we identified the main idea of each document as well as the features which the selected document shared with the other documents in the cluster. In order to do this, we created a table with a short summary on the method, theories, context and findings of the research for each document. When the common theme of the read documents was identified, the selected cluster was assigned a name.

3.   RESULTS

3.1.   Theoretical basis for the tourism PEB research

In the co-citation analysis, the documents cited by the articles found in the WoS database are clustered. In total, 209 primary documents, which contain 10,676 cited documents in their reference lists, were identified. Out of these 10,676 documents, 83 have ten and more citations; the results are mapped as four clusters in Figure 2.

Figure 2: *Co-citation network visualization for tourism PEB*
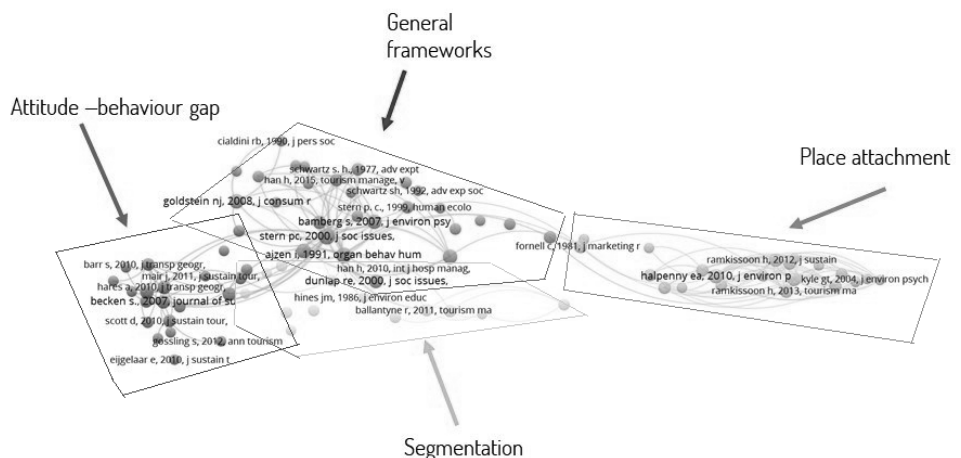
General frameworks, normative drivers of PEB. The red cluster summarizes the most frequently used theories in the PEB research, namely the theory of planned behaviour (TPB) (Ajzen, 1991), value-belief-norm theory (VBN) (Stern, 2000), norm-activation model (NAM) (Schwartz, 1977), new environmental paradigm (NEP) (Dunlap et al., 2000), and models combining certain components of these theories (Bamberg & Möser, 2007) or frameworks (Kollmuss & Agyeman, 2002; Steg & Vlek, 2009) to encourage PEB. Clustering these publications together might be a result of them being included in the literature review section of the majority of the publications as the basis of the PEB research. In addition, the papers from the cluster pay particular attention to the role of the normative drivers of PEB (De Groot & Steg, 2009; Goldstein et al., 2008; Hunecke et al., 2001).

Place attachment. The research in the green cluster is based on the place attachment by establishing the relationship between place attachment and pro-environmental behaviour. Place attachment is an attitudinal component that is closely related to the PEB intention, which leads to behaviour (Ramkissoon et al., 2012). This cluster analyses the engagement to PEB from the perspective of the sense of place (Jorgensen & Stedman, 2001; Stedman, 2002) and place attachment. The main concepts researched are the place identity, place dependence, place affect and place social bonding (Ramkissoon et al., 2012), and PEB intentions (Ramkissoon et al., 2013) or general PEB (Halpenny, 2010). Scannell and Gifford (2010) suggest distinguishing between the natural and civic place attachment due to them having a different effect on PEB. Similarly, Williams, Patterson, Roggenbuck and Watson (1992) differentiate between an attachment to the place and to the wilderness, where the latter includes more emotional and symbolic meaning.

Attitude-behaviour gap. The blue cluster brings attention to the inconsistency between the expressed attitudes and actual behaviour, especially with regard to high-cost behaviours, such as transportation (Barr et al., 2010; Becken, 2007; McKercher et al., 2010). While people agree to small behavioural changes, e.g. participation in the compensation schemes, travel behaviour is unlikely to be significantly modified. Firstly, this is because travel behaviour is high-cost behaviour (Barr et al., 2010), and secondly, because people believe they have the "right to holidays"(G. Miller et al., 2010). An attitude-behaviour gap (Juvan & Dolnicar, 2014) or even an awareness-attitude gap (Hares et al., 2010) characterises PEB in tourism. Even the most highly aware individuals are unlikely to act pro-environmentally while on holidays (Barr et al., 2010; Juvan & Dolnicar, 2014; McKercher et al., 2010). Some researchers report low awareness (Hares et al., 2010), lack of practical strategies and declarative character of the goals for climate change mitigation (Scott et al., 2010), however, even those that are aware are unlikely to reduce their impact because they do not consider holidays to be associated with PEB, or justify their inaction by barriers such as the insignificance of the individual's impact (Hares et al., 2010; Juvan & Dolnicar, 2014; G. Miller et al., 2010).

Segmentation of tourists according to their PEB. The yellow cluster focuses on the demand-side activities to encourage PEB, applying a segmentation of tourists depending on their level of PEB. Visually it is located very close to the red cluster, which we interpret as a result of paying attention to frameworks and constructs, however, testing them in different contexts. Tourists are not homogeneous in their behaviour neither in the general PEB patterns nor in the transfer of PEB from home to the tourism context (Dolnicar & Grün, 2009). For example, wildlife tourism or ecotourism often include pro-environmental actions as part of the offered experience, making such tours attract more pro-environmental tourists (Ballantyne et al., 2009, 2011). Nevertheless, even within this group, there are those who are initially more predisposed to PEB (Ballantyne et al., 2011). The approaches to segmentation differ, e.g. the use of value orientation associated with PEB (Fairweather et al., 2005), or environmental attitudes, moral obligations, travel patterns, as well as the context of PEB and personal characteristics (Dolnicar, 2010; Dolnicar & Grün, 2009; Dolnicar & Leisch, 2008). Another aspect highlighted in this cluster is the impact of environmental information and awareness. Knowledge and awareness are the basis for an intention which leads to behaviour (Hines et al., 1987). They also serve as a basis for the segmentation through which we distinguish people who are more likely to act pro-environmentally from the people who are less likely to do so.

3.2. Key topics of tourism PEB and the shift in focus over time

In order to analyse the development of the pro-environmental behaviour research in tourism, we conducted the keyword co-occurrence analysis. We used the same database of publications as for the co-citations analysis, extracting the keywords from the title, abstract and keyword list of the primary documents. This resulted in 751 keywords in total, of which 101 were mapped as a network because they occurred three and more times. The keyword co-occurrence analysis was conducted in two steps. Firstly, we analysed the keyword co-occurrences by clusters in order to see which topics are present in the discussion of tourism PEB research (Figure 3). Then we analysed the same keywords in relation to the average year of the publications in which they appeared (Figure 4).

Figure 3: *Keywords co-occurrence network visualization for tourism PEB*

Six clusters in total were identified. The red cluster includes the *predictors of PEB*, which are theories, frameworks and constructs. The green cluster is about the *tourist-place relationship* and focuses on place identity, place attachment and a sense of place elements. The dark blue cluster can be interpreted as *nature connectedness,* including also the concepts of environmentalism and conservation. The yellow cluster focuses on the *PEB management* and revolves around market segmentation and the strategies of the PEB implementation in hotels and organizations. The purple cluster describes *tourism impact on climate change*. The keywords used to explain this field of research are climate change paradigm, mobility, and behaviour change. Finally, the turquoise cluster is about *ecotourism* and represents protected areas and environmental education through tourist activities.

Figure 4 provides an overview of the keywords to illustrate how the topics changed through time. Dark blue indicates the oldest, while red represents the newest publications. However, the year data have been omitted here.– As an average number, year is instead used to identify the sequence in which keywords were trending in the research, without connecting them to particular time periods. Colours on this graph do not represent clusters, but are rather used to demonstrate the average year of publication when the keyword occurred.

Figure 4: *Keywords co-occurrence network by average year of publication for tourism PEB*

Initially, the research focus in PEB in tourism is related to *ecotourism* topics (blue dots), where pro-environmental activities are often part of the product. As a result, PEB is present mostly within this special-interest segment. With a focus on the behaviour in the protected areas and nature-oriented holidays, the attention further shifts to the problem of *climate change*, the role of the tourism industry in this issue, and a need for a broader view on the problem. Research further shifts to the *managing of PEB* and the consumer side of PEB (green dots). Next, *local communities* come into the focus of the research, adding social and economic behaviour to the PEB (yellow dots). Orange dots refer to the studies that use different *interventions* to trigger PEB in tourism. The most recent keywords (in red) show the focus on the *destination-level approaches* – encouraging PEB through the destination image, loyalty, and environmental education as a long-term strategy for PEB improvement.

We can also observe the change in the theories and constructs that are used to explain PEB in tourism by separating them from the rest of the keywords. Firstly, the research focuses on the environmental worldview (NEP), place satisfaction, values, and beliefs. Next, the attitudes, identity, norms and behaviour change become more prominent, which further shift the focus towards place attachment, PEB intentions, tourist satisfaction and social construction, assigning the subjective, idealized meaning to the objective environments (Gifford et al., 2011). The latest topics indicate that social norms, anticipated pride, i.e. positive emotion that is evoked by the future outcomes, which is not yet experienced but influences behaviour (Onwezen et al., 2013), and decision-making concepts prevail in the more recent tourism PEB research.

3.3. Frontiers in the PEB research

The aim of the bibliographical coupling analysis is to discover the frontiers in the PEB research in tourism. The directions for future research can be predicted from the analysis of literature gaps. For the bibliographic coupling analysis, we limit the publications to the ones published in the last 5 years (2014-2018). A total of 142 publications were mapped and analysed after a preliminary check for the relevance to the topic. A minimal number of citations was set as 0 in order to add even the most recent papers to the analysis. The analysis resulted in five clusters presented in Figure 5.

Figure 5: *Bibliographic coupling network visualization for the tourism PEB*
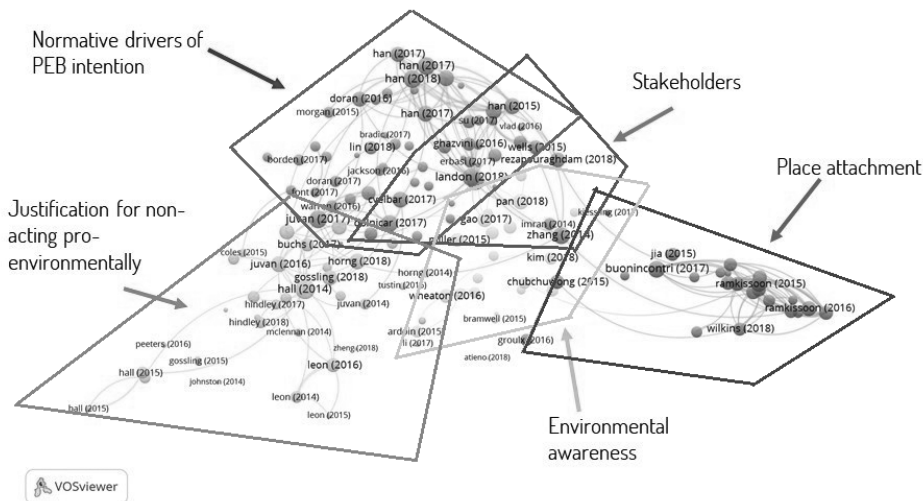
Normative drivers of the PEB intention. The studies using norms to predict an intention to behave pro-environmentally are within the red cluster of Figure 5. The norm-based research covers different tourist types: convention goers, youth tourists, cyclists, social media users and their relation towards PEB (H. Han, Hwang, et al., 2017; H. Han, Kim, et al., 2017; H. Han & Hwang, 2017; H. Han & Hyun, 2018; W. Han et al., 2018), except Lin, Yu and Chang (2018) who study the managers' perspective. Along with the social and personal norms, articles explore the role of the willingness to sacrifice (Doran & Larsen, 2016; Landon et al., 2018), cognitive and affective triggers (Dolnicar et al., 2017; H. Han, Hwang, et al., 2017; H. Han & Hwang, 2015; H. Han & Hyun, 2018) and habits (H. Han & Hyun, 2018). Mostly, researchers use pro-environmental intention as the dependent variable with only a few using behaviour (Cvelbar et al., 2017; Dolnicar et al., 2017). Dolnicar et al. (2017) find that pro-environmental appeals do not help to improve PEB in hedonic tourism contexts. To this end, they suggest motivating tourists for PEB with more tangible benefits. Cvelbar et al. (2017) use the segmentation approach to identify the

most pro-environmental tourists in the hotel and suggest that domestic tourists act more pro-environmentally because they feel more responsible for the environment of their own country, which can also be related to the normative impacts.

Justification for not acting pro-environmentally. The green cluster includes studies describing the gap between PEB awareness, intention and pro-environmental behaviour. Therefore, while norms are good predictors of intention, they do not fully transfer into the actual PEB due to either objective reasons, such as a lack of the infrastructure or subjective self-excuses (Juvan & Dolnicar, 2014) and a complete denial of the consequences of behaviour (Hall et al., 2015). In addition, this cluster highlights that in the vacation context people are more likely to justify not acting pro-environmentally (Juvan & Dolnicar, 2014; Vaske et al., 2015). Moreover, León, Araña, González, & De León (2014) perform tourist segmentation based on their willingness to pay a lower price for a tourist product and consequently be exposed to higher risks of climate change impacts. The gap between the willingness to accept and the willingness to pay depends on the type of the risk and socioeconomic characteristics of a tourist, but generally demonstrates the endowment effect, in other words, tourists value their losses more than they are willing to pay to avoid them (Kahneman & Tversky, 1979; Thaler, 1980 in León et al., 2014, p. 851). Further, Horng and Liaw (2018) find that scientific information about tourist behaviour consequences have a better effect on the PEB intention than appeals with the shared responsibility for the environment. Authors attribute this to "social loafing", which denotes putting fewer efforts in the collective action compared to acting individually (Karau & Williams, 1993 in Horng & Liaw, 2018, p. 2).

Different stakeholders and PEB. The purple cluster takes the perspective of different stakeholders in relation to PEB in tourism. Studies aim to offer the supply-side actions and actions, related to corporate social responsibility to encourage PEB. Chou (2014) and Wells, Taheri, Gregory-Smith and Manika (2016) cover the studies from the tourism employee perspective. Those studies mainly focus on personal norms, awareness and the knowledge of environmental issues and self-efficacy, offering the CSR actions to improve employees' micro-level PEB. For residents in tourist sites, personal norms are the strongest predictor of self-reported PEB (Zhang et al., 2014), while a study involving tourists in a national park shows that egoistic values negatively impact the environmental concern. Imran, Alam and Beaumont's (2014) study includes multiple stakeholders of the national park, from local communities, protected area authorities, tourism enterprises to tourists, in order to demonstrate that stakeholders differ in their value orientation towards the environment and the intention to engage in PEB.

Environmental awareness. The yellow cluster in Figure 5 describes informational strategies focusing on emotional connectedness, awareness, knowledge and education. To encourage PEB (intention), the interventions that educate tourists about wildlife and appeal to tourists' emotions are used during and after the visit (Jacobs & Harms, 2014; Wheaton et al., 2016). Teng, Horng, Hu and Chen (2014) explore the level of energy and carbon literacy of hotel employees and suggest evoking affective and attitudinal responses by the organizational culture. Miller et al. (2015) offer the concept of tourist social responsibility,

which means tourists' readiness to take action instead of waiting passively for good conditions to perform PEB. Social responsibility requires a high level of awareness and strong motivation to act regardless of the obstacles.

Place attachment. Similarly to the co-citation analysis, bibliographic coupling also has a separate cluster (blue in Figure 5) for the human-environment relationship. Place attachment develops as a result of the experience with a place (Beery & Wolf-Watz, 2014; Buonincontri et al., 2017; Wolf et al., 2015) and it helps to turn the concern for the abstract concepts of "environment" or "nature" into more practical steps to preserve a particular place (Beery & Wolf-Watz, 2014). While place attachment is more strongly related to place-specific behaviours, studies also report its impact on the general PEB (e.g. Buonincontri et al., 2017). The cluster includes testing a relationship of the place attachment and the PEB components in different contexts: marine and coastal environments (Tonge et al., 2015), cultural heritage sites (Buonincontri et al., 2017), outdoor and nature-based tourism (Beery & Wolf-Watz, 2014), guided tours in national parks (Wolf et al., 2015), coastal litter and communities in tourist destinations (Kiessling et al., 2017), and cultural tourism in an island destination (Ramkissoon, 2015). All of the above are nature-based tourism or activities in protected areas.

4.   DISCUSSION AND CONCLUSION

The bibliometric analysis applied in the research allowed us to overview the existing tourism pro-environmental behaviour literature. Firstly, we identified the most influential publications with the co-citation analysis. The latter is represented mostly by norm-based theories and frameworks applied to the tourist PEB, attitude-behaviour gap, segmentation and place attachment topics. Secondly, the analysis of the keywords demonstrated a shift in the topics over time. Based on the analysis, it can thus be concluded that PEB is no longer limited to a niche product such as ecotourism, but instead represents a switch to a sustainable development approach for the whole industry. Moreover, the most recent topics highlight the importance of environmental awareness, education and the development of the tourist-place relationship, which would enhance the quality of the interaction with a destination and thus stimulate PEB. Thirdly, bibliographic coupling summarizes the ongoing discussion in the tourism PEB. Some cluster topics are similar to those from the co-citation analysis, e.g. place attachment and normative drivers of PEB, and it is these that can therefore be considered as the core of the tourism PEB research.

A very limited set of theories has been used in the PEB tourism research to date. The most prominent are the theory of planned behaviour (Ajzen, 1991), the value-belief-norm theory (Stern, 2000) and the norm-activation model (Schwartz, 1977). These theories are framed by self-concept motives and are norm-driven. Self-concept motives make people feel good about themselves when doing good (Khan & Dhar, 2006). This means acting green is more appealing than acting greedy (Bolderdijk et al., 2013) and leads towards longer-lasting behavioural changes. This stream of literature emphasises the importance

of norms, values and attitudes in driving PEB, which is undoubtable. In addition, studies focusing on awareness and education as predictors of PEB are part of the norm-driven body of research.

Yet tourism is driven by desire to experience pleasure and is inherently hedonic. This stands in contrast to behaviours associated with responsibility. Moral norms as stimulators of PEB may have limited potential in the context of tourism (Dolnicar et al., 2017). This means that in addition to targeting self-concept motives, future research should pay more attention to other frames. A potential avenue can be the area of research investigating how to make PEB more pleasurable for tourists (Steg et al., 2014). Another stream of research that can bring new insights into the PEB tourism research is the focus on self-interest motives. The latter aim to maximise personal utility or benefits (Bolderdijk et al., 2013), emphasising that humans are willing to change their behaviour in exchange for personal benefits or rewards. Saving water or electricity on holidays would not reduce the costs of tourism services, so there is no incentive to behave environmentally friendly during holidays. And since so little is known about the efficiency of reward-driven or self-interest approaches in tourism, new knowledge in this area would be beneficial to both tourism research and businesses.

Another theoretical frame underused in tourism is the choice architecture focused on defaults (Thaler & Sunstein, 2008) in which individuals do not have to take actions regarding a particular choice. If a choice was green and not grey, we would record more environmentally friendly behaviours in tourists. More research using choice architecture would provide fresh knowledge in PEB predictors in tourism.

Furthermore, very few studies measure actual behaviour. In most of the cases, PEB intentions are used. The intention is easier to measure, however, given the high social desirability bias of pro-environmental questions, research cannot rely solely on the self-reported pro-environmental intention (Gifford & Nilsson, 2014). That is why future PEB research should focus more on measuring real behaviour rather than behavioural intentions.

Place attachment has proven important in explaining tourist PEB. In both the co-citation and bibliographic coupling analyses, we see that the place attachment clusters are spatially separated from the rest of clusters which are more compact. This can be attributed to the use of different theoretical bases, i.e. the nature connectedness and place attachment theory rather than the self-concept motives (e.g. the theory of planned behaviour or value-belief-norm theory). Also, such separation on the graph can be interpreted by use of the place attachment concept for the tourist PEB research in the natural areas, rather than all over the entire tourism contexts. The research on place attachment covers mostly nature-based tourism and protected areas, and is for that reason very likely to lead to biased results. In the future, the place attachment frame has potential to be applied beyond the protected area research (e.g. Buonincontri et al., 2017). Developing a meaningful

connection with a place could be used in many destination types to motivate tourist PEB. Future research should in addition focus on the segmentation studies identifying which socio-psychographic segments show high place attachment and could be stimulated to change their behaviour towards the environmentally-friendly one.

The role of the individual is crucial for climate change mitigation, and moreover, for the top-down governmental initiatives (O'Brien, 2015). However, the main goal is to use individual behaviours in order to stimulate collective changes in the society in the direction of climate change mitigation. A one-person activism does not necessarily stay on the individual level but may instead grow into a grassroots initiative, later becoming a political agency. This can be used to minimise the barrier of the insignificance of an individual's action either by providing access to the information about the summarised impact or connecting to the network of similar-minded people, serving as support and inspiration. The effect has already been demonstrated in political and social movements, pro-environmental initiatives, e.g. the ban on plastic straws (*No Straw Please — Plastic Pollution Coalition*, n.d.), outdoor community advocating against climate change (*Protect Our Winters*, n.d.), and numerous local initiatives aimed to protect the environment. With this approach an individual change of behaviour grows into a collective behavioural change, which is the ultimate goal. This could be achieved through a set of normative suggestions (policy implications) for an improved, sophisticated, experimentally- and behaviourally-informed policy intervention in tourism. The behavioural biases and patterns identified in the PEB research offer new insights into our understanding of the effects of different incentive streams and inducement mechanisms on the real human behaviour in a daily decision-making process. In the future, research should also focus on providing a normative set of suggestions for governments and tourism organisations based on advanced knowledge obtained from the behavioural PEB studies. Despite offering new insights into the field of the PEB research, this paper nevertheless has certain limitations. One of the limitations is the fact that only papers available in Web of Science were used, meaning the work published outside this database is not included in the study. Besides, as the selection of the search keywords could have impacted the results, our initial database did not include some of the important research work in the field, which were consequently added manually. A database search should therefore be supported by a search of the relevant publications through a traditional literature review. As regards the bibliometric method, it has its limitations. Although the method is based on the quantitative analysis, the interpretation of the clusters could lead to biased and subjective arguments. Another limitation is that due to the lag in citation, some important works may be underrepresented in the analysis. Based on this experience, we believe that for the future research a combination of the traditional literature review with software-aided methods would be the most appropriate and holistic approach to accessing and reflecting on the existing body of knowledge.

5. REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211. http://doi.org/10.1016/0749-5978(91)90020-T

Ballantyne, R., Packer, J. & Falk, J. (2011). Visitors' learning for environmental sustainability: Testing short- and long-term impacts of wildlife tourism experiences using structural equation modelling. *Tourism Management, 32*(6), 1243-1252. http://doi.org/10.1016/j.tourman.2010.11.003.

Ballantyne, R., Packer, J. & Hughes, K. (2009). Tourists' support for conservation messages and sustainable management practices in wildlife tourism experiences. *Tourism Management, 30*, 658-664. https://doi.org/10.1016/j.tourman.2008.11.003

Bamberg, S. & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology, 27*(1), 14-25. http://doi.org/10.1016/j.jenvp.2006.12.002.

Barr, S., Shaw, G., Coles, T. & Prillwitz, J. (2010). "A holiday is a holiday": practicing sustainability, home and away. *Journal of Transport Geography, 18*(3), 474-481. http://doi.org/10.1016/j.jtrangeo.2009.08.007.

Becken, S. (2007). Tourists' Perception of International Air Travel's Impact on the Global Climate and Potential Climate Change Policies. *Journal of Sustainable Tourism, 15*(4), 351-368. http://doi.org/10.2167/jost710.0.

Beery, T. H. & Wolf-Watz, D. (2014). Nature to place: Rethinking the environmental connectedness perspective. *Journal of Environmental Psychology, 40*, 198-205. http://doi.org/10.1016/j.jenvp.2014.06.006.

Bolderdijk, J. W., Steg, L., Geller, E. S., Lehman, P. K. & Postmes, T. (2013). Comparing the effectiveness of monetary versus moral motives in environmental campaigning. *Nature Climate Change, 3*(4), 413-416. http://doi.org/10.1038/nclimate1767.

Buonincontri, P., Marasco, A. & Ramkissoon, H. (2017). Visitors' experience, place attachment and sustainable behaviour at cultural heritage sites: A conceptual framework. *Sustainability, 9*(7). http://doi.org/10.3390/su9071112.

Chou, C. J. (2014). Hotels' environmental policies and employee personal environmental beliefs: Interactions and outcomes. *Tourism Management, 40*, 436-446. http://doi.org/10.1016/j.tourman.2013.08.001.

Cvelbar, L. K., Grün, B. & Dolnicar, S. (2017). Which hotel guest segments reuse towels? Selling sustainable tourism services through target marketing. *Journal of Sustainable Tourism, 25*(7), 921-934. http://doi.org/10.1080/09669582.2016.1206553.

De Groot, J. I. M. & Steg, L. (2009). Morality and Prosocial Behavior: The Role of Awareness, Responsibility, and Norms in the Norm Activation Model. *The Journal of Social Psychology, 149*(4), 425-449. http://doi.org/10.3200/SOCP.149.4.425-449.

Diamantopoulos, A., Schlegelmilch, B. B., Sinkovics, R. R. & Bohlen, G. M. (2003). Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. *Journal of Business Research, 56*(6), 465-480. http://doi.org/10.1016/S0148-2963(01)00241-7.

Dolnicar, S. (2010). Identifying tourists with smaller environmental footprints. *Journal of Sustainable Tourism, 18*(6), 717-734. http://doi.org/10.1080/09669581003668516.

Dolnicar, S., Knezevic Cvelbar, L. & Grün, B. (2017). Do Pro-environmental Appeals Trigger Pro-environmental Behavior in Hotel Guests? *Journal of Travel Research, 56*(8), 988-997. http://doi.org/10.1177/0047287516678089.

Dolnicar, S. & Grün, B. (2009). Environmentally Friendly Behavior. *Environment and Behavior, 41*(5), 693-714. http://doi.org/10.1177/0013916508319448.

Dolnicar, S. & Leisch, F. (2008). An Investigation of Tourists' Patterns of Obligation to Protect the Environment. *Journal of Travel Research, 46*(4), 381-391. http://doi.org/10.1177/0047287507308330.

Doran, R. & Larsen, S. (2016). The Relative Importance of Social and Personal Norms in Explaining Intentions to Choose Eco-Friendly Travel Options. *International Journal of Tourism Research, 113*(18), 159-166. http://doi.org/10.1002/jtr.

Dunlap, R. E., Liere, K. D. Van, Mertig, A. G. & Jones, R. E. (2000). Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale. *Journal of Social Issues, 56*(3), 425-442. http://doi.org/10.1111/0022-4537.00176.

Eck, N. J. van & Waltman, L. (2014). Visualizing Bibliometric Networks. In *Measuring Scholarly Impact* (pp. 285-320). Springer International Publishing. http://doi.org/10.1007/978-3-319-10377-8.

Fairweather, J. R., Maslin, C. & Simmons, D. G. (2005). Environmental Values and Response to Ecolabels Among International Visitors to New Zealand. *Journal of Sustainable Tourism, 13*(1), 82-98. http://doi.org/10.1080/17501220508668474.

Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro environmental concern and behaviour: A review. *International Journal of Psychology, 49*(3), 141-157. http://doi.org/10.1002/ijop.12034.

Gifford, R., Steg, L. & Reser, J. P. (2011). Environmental psychology. In P. R. Martin, F. M. Cheung, M. C. Knowles, M. Kyrios, L. Littlefield, J. B. Overmier & J. M. Prieto. (Eds.), *IAAP handbooks of applied psychology* (First edit, pp. 440-470). Blackwell Publishing Ltd. http://doi.org/10.1002/9781444395150.ch18.

Goldstein, N. J., Cialdini, R. B. & Griskevicius, V. (2008). A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels. *Journal of Consumer Research, 35*(3), 472-482. http://doi.org/10.1086/586910.

Gössling, S. (2013). National emissions from tourism: An overlooked policy challenge? *Energy Policy, 59*, 433-442. http://doi.org/10.1016/j.enpol.2013.03.058.

Gössling, S. & Peeters, P. (2007). 'It Does Not Harm the Environment!' An Analysis of Industry Discourses on Tourism, Air Travel and the Environment. *Journal of Sustainable Tourism, 15*(4), 402-417. http://doi.org/10.2167/jost672.0.

Hall, C. M., Amelung, B., Cohen, S., Eijgelaar, E., Gössling, S., Higham, J., …, Weaver, D. (2015). No time for smokescreen skepticism: A rejoinder to Shani and Arad. *Tourism Management, 47*, 341-347. http://doi.org/10.1016/j.tourman.2014.08.008.

Halpenny, E. A. (2010). Pro-environmental behaviours and park visitors: The effect of place attachment. *Journal of Environmental Psychology, 30*(4), 409-421. http://doi.org/10.1016/j.jenvp.2010.04.006.

Han, H., & Hwang, J. (2015). Norm-based loyalty model (NLM): Investigating delegates' loyalty formation for environmentally responsible conventions. *International Journal of Hospitality Management, 46*, 1-14. http://doi.org/10.1016/j.ijhm.2015.01.002..

Han, H. & Hwang, J. (2017). What Motivates Delegates' Conservation Behaviors While Attending a Convention? *Journal of Travel and Tourism Marketing, 34*(1), 82-98. http://doi.org/10.1080/10548408.2015.1130111.

Han, H., Hwang, J. & Lee, S. (2017). Cognitive, affective, normative, and moral triggers of sustainable intentions among convention-goers. *Journal of Environmental Psychology, 51,* 1- 13. http://doi.org/10.1016/j.jenvp.2017.03.003.

Han, H., & Hyun, S. S. (2018). What influences water conservation and towel reuse practices of hotel guests? *Tourism Management, 64,* 87-97. http://doi.org/10.1016/j.tourman.2017.08.005.

Han, H., Kim, W. & Kiatkawsin, K. (2017). Emerging youth tourism: fostering young travelers' conservation intentions. Journal of Travel and Tourism Marketing, 34(7), 905-918. http://doi.org/10.1080/10548408.2016.1261758.

Han, W., McCabe, S., Wang, Y., & Chong, A. Y. L. (2018). Evaluating user-generated content in social media: an effective approach to encourage greater pro-environmental behavior in tourism? *Journal of Sustainable Tourism, 26*(4), 600-614. http://doi.org/10.1080/09669582.2017.1372442.

Hares, A., Dickinson, J., & Wilkes, K. (2010). Climate change and the air travel decisions of UK tourists. *Journal of Transport Geography, 18*(3), 466-473. http://doi.org/10.1016/j.jtrangeo.2009.06.018.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis. *The Journal of Environmental Education, 18*(2), 1-8. http://doi.org/http://dx.doi.org/10.1080/00958964.1987.9943482.

Horng, J. S. & Liaw, Y. J. (2018). Can we enhance low-carbon tour intentions through climate science or responsibility sharing information? *Current Issues in Tourism, 21*(8), 877- 901. http://doi.org/10.1080/13683500.2017.1304363.

Hunecke, M., Blöbaum, A., Matthies, E. & Höger, R. (2001). Responsibility and Environment. *Environment and Behavior, 33*(6), 830-852. http://doi.org/10.1177/00139160121973269.

Imran, S., Alam, K. & Beaumont, N. (2014). Environmental orientations and environmental behaviour: Perceptions of protected area tourism stakeholders. *Tourism Management, 40*, 290-299. http://doi.org/10.1016/j.tourman.2013.07.003.

IPCC. (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. *Climate change and water. G*eneva, Switzerland.

Jacobs, M. H. & Harms, M. (2014). Influence of interpretation on conservation intentions of whale tourists. *Tourism Management, 42,* 123-131. http://doi.org/10.1016/j.tourman.2013.11.009.

Jorgensen, B. S. & Stedman, R. C. (2001). Sense of Place As an Attitude: Lakeshore Owners Attitudes Toward Their Properties. *Journal of Environmental Psychology, 21*(3), 233-248. http://doi.org/10.1006/jevp.2001.0226.

Juvan, E., & Dolnicar, S. (2014). The attitude-behaviour gap in sustainable tourism. *Annals of Tourism Research, 48*, 76-95. http://doi.org/10.1016/j.annals.2014.05.012.

Khan, U., & Dhar, R. (2006). Licensing effect in consumer choice. *Journal of Marketing Research, 43*(2), 259-266. http://doi.org/10.1017/CBO9781107415324.004.

Kiessling, T., Salas, S., Mutafoglu, K. & Thiel, M. (2017). Who cares about dirty beaches? Evaluating environmental awareness and action on coastal litter in Chile. *Ocean and Coastal Management, 137*, 82-95. http://doi.org/10.1016/j.ocecoaman.2016.11.029.

Kollmuss, A. & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 37-41. http://doi.org/10.1080/1350462022014540.

Landon, A. C., Woosnam, K. M. & Boley, B. B. (2018). Modeling the psychological antecedents to tourists' pro-sustainable behaviors: an application of the value-belief- norm model. *Journal of Sustainable Tourism, 26*(6), 957-972. http://doi.org/10.1080/09669582.2017.1423320.

Lebreton, L., Slat, B., Ferrari, F., Sainte-Rose, B., Aitken, J., Marthouse, R., …, Reisser, J. (2018). Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic. *Scientific Reports, 8*(1), 4666. http://doi.org/10.1038/s41598-018-22939-w.

Lenzen, M., Sun, Y.-Y., Faturay, F., Ting, Y.-P., Geschke, A. & Malik, A. (2018). The carbon footprint of global tourism. *Nature Climate Change, 8*(6), 522-528. http://doi.org/10.1038/s41558-018-0141-x.

León, C. J., Araña, J. E., González, M., & De León, J. (2014). Tourists' evaluation of climate change risks in the Canary Islands: A heterogeneous response modelling approach. *Tourism Economics, 20*(4), 849-868. http://doi.org/10.5367/te.2013.0310.

Lin, L. P. L., Yu, C. Y. & Chang, F. C. (2018). Determinants of CSER practices for reducing greenhouse gas emissions: From the perspectives of administrative managers in tour operators. *Tourism Management, 64*, 1-12. http://doi.org/10.1016/j.tourman.2017.07.013.

Lu, J., & Nepal, S. K. (2009). Sustainable tourism research: An analysis of papers published in the Journal of Sustainable Tourism. *Journal of Sustainable Tourism, 17*(1), 5-16. http://doi.org/10.1080/09669580802582480.

Marzeion, B., Kaser, G., Maussion, F. & Champollion, N. (2018). Mass loss commitment limits influence of climate change mitigation on glaciers. *Nature Climate Change, 8*, 305-308. http://doi.org/10.1038/s41558-018-0093-1.

McKercher, B., Prideaux, B., Cheung, C. & Law, R. (2010). Achieving voluntary reductions in the carbon footprint of tourism and climate change. *Journal of Sustainable Tourism, 18*(3), 297-317. http://doi.org/10.1080/09669580903395022.

Miller, D., Merrilees, B. & Coghlan, A. (2015). Sustainable urban tourism: understanding and developing visitor pro-environmental behaviours. *Journal of Sustainable Tourism, 23*(1), 26-46. http://doi.org/10.1080/09669582.2014.912219.

Miller, G., Rathouse, K., Scarles, C., Holmes, K. & Tribe, J. (2010). Public understanding of sustainable tourism. *Annals of Tourism Research, 37*(3), 627-645. http://doi.org/10.1016/j.annals.2009.12.002.

No Straw Please — Plastic Pollution Coalition. (n.d.). Retrieved September 5, 2018, from www.plasticpollutioncoalition.org/no-straw-please/.

O'Brien, K. (2015). Political agency: The key to tackling climate change. *Science, 350*(6265), 1170-1171. http://doi.org/10.1126/science.aad0267.

Onwezen, M. C., Antonides, G. & Bartels, J. (2013). The Norm Activation Model: An exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. *Journal of Economic Psychology, 39*, 141-153. http://doi.org/10.1016/j.joep.2013.07.005.

Peeters, P., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. *Journal of Transport Geography, 18*(3), 447-457. http://doi.org/10.1016/j.jtrangeo.2009.09.003.

Protect Our Winters. (n.d.). Retrieved September 5, 2018, from www.protectourwinters.org.

Ramkissoon, H. (2015). Authenticity, satisfaction, and place attachment: A conceptual framework for cultural tourism in African island economies. *Development Southern Africa, 32*(3), 292–302. http://doi.org/10.1080/0376835X.2015.1010711

Ramkissoon, H., Smith, L. D. G., & Weiler, B. (2013). Testing the dimensionality of place attachment and its relationships with place satisfaction and pro-environmental behaviours: A structural equation modelling approach. *Tourism Management, 36*, 552-566. http://doi.org/10.1016/j.tourman.2012.09.003.

Ramkissoon, H., Weiler, B., & Smith, L. D. G. (2012). Place attachment and pro environmental behaviour in national parks: The development of a conceptual framework. *Journal of Sustainable Tourism, 20*(2), 257-276. http://doi.org/10.1080/09669582.2011.602194.

Ruhanen, L., Weiler, B., Moyle, B. D. & McLennan, C. J. (2015). Trends and patterns in sustainable tourism research: a 25-year bibliometric analysis. *Journal of Sustainable Tourism, 23*(4), 517-535. http://doi.org/10.1080/09669582.2014.978790.

Scannell, L. & Gifford, R. (2010). The relations between natural and civic place attachment and pro-environmental behavior. *Journal of Environmental Psychology, 30*(3), 289- 297. http://doi.org/10.1016/j.jenvp.2010.01.010.

Schwartz, S. H. (1977). Normative Influences on Altruism. *Advances in Experimental Social Psychology, 10*, 221-279. http://doi.org/10.1016/S0065-2601(08)60358-5.

Scott, D., Peeters, P., & Gössling, S. (2010). Can tourism deliver its "aspirational" greenhouse gas emission reduction targets? *Journal of Sustainable Tourism, 18*(3), 393-408. http://doi.org/10.1080/09669581003653542.

Stedman, R. C. (2002). Toward a Social Psychology of Place. Predicting Behavior From Place-Based Cognitions, Attitude, and Identity. *Environment and Behavior, 34*(5), 561-581. http://doi.org/10.1177/0013916502034005001.

Steg, L., Bolderdijk, J. W., Keizer, K. & Perlaviciute, G. (2014). An Integrated Framework for Encouraging Pro-environmental Behaviour: The role of values, situational factors and goals. *Journal of Environmental Psychology, 38*, 104-115. http://doi.org/10.1016/j.jenvp.2014.01.002.

Steg, L. & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309-317. http://doi.org/10.1016/j.jenvp.2008.10.004.

Stern, P. C. (2000). Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues, 56*(3), 407-424. http://doi.org/10.1111/0022-4537.00175.

Teng, C. C., Horng, J. S., Hu, M. L. M. & Chen, P. C. (2014). Exploring the Energy and Carbon Literacy Structure for Hospitality and Tourism Practitioners: Evidence from Hotel Employees in Taiwan. *Asia Pacific Journal of Tourism Research, 19*(4), 451- 468. http://doi.org/10.1080/10941665.2013.764336.

Thaler, R. H. & Sunstein, C. R. (2008). Nudge: Improving decisions about health, wealth, and happiness. Yale University Press.

Tonge, J., Ryan, M. M., Moore, S. A. & Beckley, L. E. (2015). The Effect of Place Attachment on Pro-environment Behavioral Intentions of Visitors to Coastal Natural Area Tourist Destinations. *Journal of Travel Research, 54*(6), 730-743. http://doi.org/10.1177/0047287514533010.

Vaske, J. J., Jacobs, M. H. & Espinosa, T. K. (2015). Carbon footprint mitigation on vacation: A norm activation model. *Journal of Outdoor Recreation and Tourism, 11*, 80-86. http://doi.org/10.1016/j.jort.2015.05.002.

Vogel, R. & Güttel, W. H. (2013). The dynamic capability view in strategic management: A bibliometric review. *International Journal of Management Reviews, 15*(4), 426-446. http://doi.org/10.1111/ijmr.12000.

VOSviewer - Visualizing scientific landscapes. (2018). Retrieved September 17, 2018, from http://www.vosviewer.com/.

Wells, V. K., Taheri, B., Gregory-Smith, D. & Manika, D. (2016). The role of generativity and attitudes on employees home and workplace water and energy saving behaviours. *Tourism Management, 56*, 63-74. http://doi.org/10.1016/j.tourman.2016.03.027.

Wheaton, M., Ardoin, N. M., Hunt, C., Schuh, J. S., Kresse, M., Menke, C. & Durham, W. (2016). Using web and mobile technology to motivate pro-environmental action after a nature-based tourism experience. *Journal of Sustainable Tourism, 24*(4), 594-615. http://doi.org/10.1080/09669582.2015.1081600.

Williams, D. R., Patterson, M. E., Roggenbuck, J. W. & Watson, A. E. (1992). Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Sciences*. http://doi.org/10.1080/01490409209513155.

Wolf, I. D., Stricker, H. K. & Hagenloh, G. (2015). Outcome-focused national park experience management: transforming participants, promoting social well-being, and fostering place attachment. *Journal of Sustainable Tourism, 23*(3), 358-381. http://doi.org/10.1080/09669582.2014.959968.

Zhang, Y., Zhang, H. L., Zhang, J., & Cheng, S. (2014). Predicting residents' pro environmental behaviors at tourist sites: The role of awareness of disaster's consequences, values, and place attachment. *Journal of Environmental Psychology, 40*, 131-146. http://doi.org/10.1016/j.jenvp.2014.06.001.

Zupic, I., & Čater, T. (2014). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 1-44. http://doi.org/10.1177/1094428114562629.

E/B/R

**POVZETKI V
SLOVENSKEM JEZIKU**

Formal and Informal Institutions, and FDI Flows: A Review of the Empirical Literature and Propositions for Further Researchs

Formalne in Neformalne Institucije ter Tokovi Neposrednih Tujih Naložb: Pregled Empirične Literature in Predlogi za Prihodnje Raziskave

Judit Kapas

Namen članka je pod prvič, povzeti empirično literaturo, ki obravnava odnos med formalnimi in neformalnimi institucijami na eni strani in neposrednimi tujimi naložbami na drugi, ter pod drugič, predstaviti usmeritve za prihodnjo pot na tem področju. Glavni predlog članka je, da bi se empirično raziskovanje povezav med institucijami in neposrednimi tujimi naložbami moralo pri oblikovanju hipotez (v večji meri) opirati na teorije institucionalne ekonomije, bolj natančno, na teorijo institucionalne lepljivosti (Boettke in drugi, 2008) in hierarhije institucij (Williamson, 2000) ter teorijo sorazvoja kulture (neformalnih institucij) in formalnih institucij (Bisin and Verdier, 2017). V okviru navedenih teorij članek predlaga štiri načine, s katerimi bi dosegli nadaljnji napredek v empiričnem raziskovanju povezav med institucijami in neposrednimi tujimi naložbami.

THE RELATIONSHIP BETWEEN BUSINESS INTELLIGENCE AND ANALYTICS USE AND ORGANIZATIONAL ABSORPTIVE CAPACITY: APPLYING THE DELONE & MCLEAN INFORMATION SYSTEMS SUCCESS MODEL

RAZMERJE MED UPORABO POSLOVNE INTELIGENCE IN ANALITIKE TER ORGANIZACIJSKO ABSORPCIJSKO ZMOGLJIVOSTJO: UPORABA DELONEOVEGA IN MCLEANOVEGA MODELA USPEŠNOSTI INFORMACIJSKIH SISTEMOV

Katerina Božič, Vlado Dimovski

Na podlagi DeLoneovem in McLeanovem modelu uspeha informacijskih sistemov ter teorije absorpcijske zmogljivosti članek preučuje vlogo uporabe poslovne inteligence in analitike pri povečanju absorpcijske zmogljivosti podjetja za ustvarjanje znanja. Podatki uporabljeni v raziskavi so bili zbrani s pomočjo anketnega vprašalnika z 97 anketiranci na organizacijski ravni v slovenskih srednjih in velikih podjetij iz različnih panog. Rezultati iz strukturnega modeliranja z delnimi najmanjšimi kvadrati so pokazali, da je uporaba poslovne inteligence in analitike pozitivno povezana z izboljšanjem absorpcijske zmogljivosti podjetja za ustvarjanje znanja. Poleg tega je raziskava pokazala, da sta kakovost informacij in kakovost sistema posredno in pozitivno povezani z absorpcijsko zmogljivostjo ter da ima uporaba poslovne inteligence in analitike pri tem posredovalno vlogo.

Ključne besede: *poslovna inteligenca in analitika, DeLoneov in McLeanov model uspešnosti informacijskih sistemov, absorpcijska zmogljivost, ustvarjanje znanja*

The Spatial Dimension of Entrepreneurship: Stylized Facts for the Case of Austria

Prostorska Dimenzija Podjetništva: Stilizirana Dejstva za Primer Avstrije

Christian Reiner, Christopher Kronenberg, Helmut Gassler

Avstrija in ostale evropske države si prizadevajo povečati stopnjo podjetniških dejavnosti, s katerimi bi pripomogli ustvariti delovna mesta in prihodek pri odpravljanju posledic velike recesije. Namen našega prispevka je ugotoviti stilizirana empirična dejstva o regijskih podjetniških dejavnostih v Avstriji. Metodologija temelji na analizi prostorskih podatkov, glavni rezultati katere pokažejo upad v podjetniških dejavnostih v zadnjem desetletju, z enakomernim vzorcem prostorske razporeditve novih podjetij in hitro rastočih podjetij. Na splošno, naše empirične ugotovitve izpostavijo število stiliziranih dejstev, ki vodijo do vprašanja, ali podjetništvo lahko zagotovi vse predlagane čudeže, na katere upajo oblikovalci javnih politik. V skladu z raziskovalno literaturo na področju regionalne ekonomije in podjetništva, naše ugotovitve nakazujejo na stalne medregionalne razlike med intenzivnostjo regionalnih podjetniških dejavnosti, večjo razširjenost podjetniške dejavnosti med glavnimi regijami in višjo koncentracijo naložb tveganega kapitala v primerjavi z inovacijskimi in podjetniškimi dejavnostmi na splošno.

Ključne besede: *analiza prostorskih podatkov, podjetniške dejavnosti, brezposelnost, tvegan kapital, prostorska koncentracija, javna politika*

Optimal Capital Structure and Leverage Adjustment Speed of European Public and Private Firms

Optimalna Struktura Kapitala in Hitrost Prilagajanja Zadolženosti Evropskih Javnih in Zasebnih Podjetij

Klemen Stegovec, MAtjaž Črnigoj

V članku empirično testiramo dinamično trade-off teorijo z uporabo podatkov evropskih javnih in zasebnih podjetij. Večina obstoječih raziskav se namreč osredotoča samo na javna ameriška podjetja. Naši rezultati kažejo, da evropska podjetja, tako zasebna kot javna, sledijo optimalni strukturi kapitala, kot predlaga omenjena teorija. Ugotovili smo, da podjetja, ki poslujejo z zadolženostjo nad optimalno strukturo kapitala, zadolženost prilagajajo proti optimumu hitreje kot podjetja, ki imajo zadolženost pod optimalno strukturo kapitala. Poleg tega rezultati kažejo, da javna in zasebna podjetja sprejemajo odločitve o prilagajanju zadolženosti zelo podobno in da so razlike med njimi prej posledica razlik v velikosti podjetij, kot pa posledica statusa podjetja.

Past, Present and Future of the Research on the Pro-Environmental Behaviour in Tourism: A Bibliometric Analysis

Preteklost, Sedanjost in Prihodnost Raziskav o Okolju Prijaznem Vedenju v Turizmu: Bibliometrična Analiza

Iana Bilynets, Ljubica Knežević Cvelbar

Okoljska trajnost je eden izmed ključnih izzivov, s katerimi se človeštvo sooča danes. Turizem je panoga, ki povzroča škodo okolju. Eden od načinov za zmanjšanje negativnih vplivov turizma na okolje je stimulacija spremembe vedenja posameznikov proti okolju bolj prijaznem vedenju. Namen tega prispevka je pregled obstoječe literature, ki obravnava okolju prijazno vedenje v turizmu. Uporabili smo bibliometrično analizo z namenom pregleda ključnih področij raziskovanja na temo okolju prijaznega vedenja v turizmu danes in v prihodnje.