Differences in Creating Product Innovations *versus* Process Innovations across the European Industries

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Abstract

The innovative performance of 1,200 representative firms in the Czech Republic, Germany, Hungary, Poland, Romania and the Slovak Republic was analyzed. The study differentiates between product innovation and three different forms of process innovations. This data was joined to the quality of societal institutions of the country containing the firms. Results show that institutional quality is correlated with the innovative performance of firms through different channels.

With respect to product innovations, institutional quality exhibits mediate effects through financing of R&D and the design of the organizational structure, with larger technical / R&D departments being found in firms in environments of high societal quality.

However when investigating process innovations, the pattern is surprisingly different: firms located in European countries with a relatively low score regarding institutional quality, develop predominantly more process innovations. We speculate that this is the result of the characteristics of competition in countries with a relatively poor quality of institutions.

With regard to industrial sector, the data reveals that firms in the wholesale and trade areas follow quite different patterns compared to firms involved in manufacturing/production. Manufacturing firms make predominantly product innovations and these are often financed by external sources, whereas firms in wholesale and trade make more process innovations and these tend to be financed by internal sources.

Keywords: Innovation Management, Product Innovations, Process Innovations, Institutions, SEMs

Introduction

In recent years, more and more scholars argue that empirical research performed previously in the field of innovation management is insufficient both from a theoretical perspective as also for gaining practical insight. One possible factor is the metrics used to measure innovative performance (e.g. Autio *et al* 2014, Kerr & Nanda, 2015, p. 457), for example, one commonly-used indicator of innovative performance is number of patents, however this metric has several flaws: Firstly patents are just an indicator for innovations and do not prove much beyond this i.e. they may be patents meant to block others. Secondly, especially SMEs avoid patenting their innovations in order to avoid the efforts of filing a patent and the expense of legally contesting or defending their patents. Thirdly, while product innovations can be protected by patents, it is quite difficult to patent process innovations and innovators may fall back on e.g. trade secrets, indeed Piening and Salge (2015) argue that research on specifically process innovations remains underdeveloped due to these kinds of issues. In addition to issues with common metrics, the field of innovation management seldom considers societal institutions (see; Ahmadjian, 2016, Crossan & Apaydin, 2010 pp. 1177-1178, Oliver, 1997, Peng *et al*., 2009, as well as Tylecote, 2007). According to this view, innovative performance is not just the consequence of a well-designed corporate strategy combined with innovative employees, but it also depends on the societal context that creates the environment for innovative behavior and an appropriate management. Knetter (1989) raises the question if firms (as social structures that have attained a high degree of resilience), achieve this by imitating the norms of the state to achieve "appropriate" behaviour? Clearly organizational adaptations to various societal contexts can be quite different, but nevertheless there could be some organizational patterns that are more successful - or more widely successful - than others in this respect.

In this paper, we present a general structural equation model (SEM) that analyses the innovative performance of European firms in the industry regarding product and process innovations. The data sources allow us to finely differentiate process innovations into innovations for producing, logistics and internal services. This approach also allows us to consider the societal environment of the

countries where the firms are located. We focus on the regulatory quality because as institutional economists highlight (e.g. North, 1990, North, 2009, and North *et al.*, 2009) this factor is a central parameter for economic development. Our approach also considers economic constraints and how firms finance their innovations, as well as pinpointing where this is in the organizational structure (e.g. the relative size of central organizational units) because different units play various important roles in creating innovations and the societal environment influences the size of these units. Finally, we investigate different industries and reveal that the existing literature (with its strong focus on manufacturers and product innovations) shows a blind spot, meaning that companies from other industries should be cautious when applying the lessons derived from findings on product-innovations, because both process innovations and other industries are quite different.

The paper is organized as follows: In the first section, we summarize the ongoing debate in the field of innovation management that goes beyond patents and product innovations and here we highlight why the field might benefit by considering institutional approaches. In the second section, we present our dataset and our general SEM. The third part of the paper presents the findings of our empirical approach. As we highlight, institutional quality influences the innovative performance of firms through different channels. Regarding product innovations, institutional quality has mediate effects through financing of R&D and the design of the organizational structure. Considering process innovations, the pattern is surprising: firms located in European countries with (relatively) poor institutions develop more process innovations. We explain this surprising finding through the characteristics of competition in countries with (relatively) poor institutions. Furthermore, industry sector matters too, and our findings reveal that firms in the wholesale and trade business follow quite different patterns compared to firms from industries involving production. Finally, we discuss our findings and highlight areas for further research and practitioners.

Process and Product Innovations, Societal Institutions and Financing

Explaining the innovative performance of firms remains a major goal of academic research but in recent years academic opinion tends to imply that the previous theoretical and empirical approaches are too narrow. For example, Crossan & Apaydin (2010, pp. 1177-1178) point out that for 30 years

the most highly-cited papers still lack multi-level approaches for revealing the mutual interdependencies between society, organization and individuals on corporate performance (for a quite similar critique regarding the research on entrepreneurial innovation see Autio *et al* (2014)). The need for more comprehensive explanations of innovative performance continues to challenge the field of institutional theory and some scholars in this field argue that an institutional perspective might complement resource based and industry based views e.g. Oliver (1997) and Peng *et al*. (2009). Briefly; we seek to understand why some firms are much more innovative than their competitors, even when parameters like industry sector, R&D expenditure, firm size etc. are similar.

With regard to societal factors, Van Waarden (2001) investigated the influence of cultural levels of risk-aversion on innovative behavior, finding that with culturally-influenced risk-aversion on the individual level, individuals would still develop as many other innovations compared to a more risk-friendly culture and Van Waarden (2001) concluded that in risk-adverse cultures there are not necessarily a lower number of innovations, but rather that risk-adverse cultures simply promote other types of innovations. Similarly, Tylecote (2007) argues that technological innovations need pre-conditions including solid corporate finance and corporate governance systems and that as a consequence, such institutions may come to exhibit internal technological path-dependencies regarding innovations.

Institution orientated approaches consider the heterogeneity of organizations: Even in a given macro-institutional setting, intra-organizational institutions like organizational cultures, informal and formal incentives, routines, etc. can differ significantly, as a consequence of different adaptations within organizations which in turn are responses to complex challenges from within and outside the organization. Geels (2004) aimed to explain inertia and stability, wanting to "*conceptualize the dynamic interplay between actors and structures*" (Geels, 2004). Ahmadjian (2016, p. 25) argues in a similar vein; "*institutions are not only a force to be resisted or adopted to, but are also, in complementary configurations that make up national business systems, sources of competitive advantage*."

This implies that managerial capabilities should not just to bring together different resources (Mellor, 2019), but also develop and maintain social structures and cultural flavors to create an innovative

firm: For example Galang (2012) highlights that in corrupt societies, firms have strategies to react to corrupt officials and that according to organizational structures, political resources, industry regulation etc., firms may follow strategies ranging from fighting corruption to becoming victims (or bullies) in order to survive in such societies. The essentially entropic views of e.g. Dimaggio and Powell (1991) predict that nation-states, as enactments of the world cultural order, will drift closer together, although recent world events seem to indicate that political turmoil can partially reverse the process. Nevertheless, these findings are compatible with theories from the field of institutional economics and, as North (1990), North (2009) and North *et al* (2009) argue, successful firms adapt themselves to existing societal institutions. Micro-founded socio-theoretical approaches invoke two extremes along a spectrum; (1) open-access orders (where companies primarily address costumers' needs) or (2) limited-access (where firms participate in a political rent-seeking processes) and argue that positioning depends on societal institutions like law, constitution and the economic order. According to this approach, open-access societies spark an enormous economic (and social) dynamic because such an institutional environment promotes competition based on merits within both markets and politics. On the other end of the spectrum, competition hardly works within limited-access societies because access to markets, resources and power is limited, rationed and sold, by the 'rulers'. As a consequence, companies inhabiting limited-access societies may be less innovative because they have less incentive to compete for customers but rather have to spend resources to participate in rent-seeking processes for retaining the rulers' favour. Thus the terms open- and limited-access are clearly of interest to managers.

Of course, organizations have a range of possible reactions to existing institutions e.g. passive tolerance, political exploitation or change them for the better. This wide variety led Greenwood *et al*. (2014) to speculate that a core challenge of institutional theory is an understanding of how organizations can be structured to survive in a given institutional context.

A very powerful predictor of innovative output (Hempelmann & Engelen, 2014, Kerr & Nanda, 2015) is how firms make decisions regarding the financing of R&D. Indeed Kerr & Nanda (2015, p. 457) state that the capital structure of a firm plays a "*central role in the outcome of innovativeness*". Important sources of financing R&D include bank finance and public capital markets (although the

latter often causes high agency costs) financial constraints are often thought of as a serious restriction to the innovative capabilities of a firm. As a consequence, many governments try to address these constraints by subsidizing corporate R&D. The review provided by Becker (2015) summarizes recent findings concluding that state subsidies are ambivalent because government money may cause a crowding-out of private financing (it seems that this does not only hold for Europe but also for China, see Guan & Yam (2015)). However a less controversial finding is that state subsidies might have a positive effect for small firms because small firms are much more constrained regarding access to private finance (see also Bronzini & Iachinie, 2014, Bronzini & Piselli, 2016, Czarnitzki & Hottenrott, 2011, as well as Ughetoo, 2008). Government grants may furthermore signal potential investors that this firm has a solid business model (Takalo & Tanaymama, 2010), and therefore grants could increase the prototyping capabilities of small firms which in turn enables more convincing presentations to private investors (Howell, 2016).

Obviously, finance and external institutions are just two facets of the whole picture and a timely and valuable addition includes other organizational factors relevant for corporate innovativeness (see e.g. Corssan & Apaydin, 2010) and indeed the study of Drechsler *et al* (2013) is an illustrative example highlighting the role of intra-organizational interdependencies on innovation. The Drechsler *et al* (2013) study revealed that the marketing department may have a positive impact on innovation if this department can influence R&D. Hempelman & Engelen (2014) go further and present a correlation between marketing and the financing of R&D, especially if the products are not very innovative. Lee *et al* (2015) highlight that innovative firms are more affected by credit rationing than non-innovative firms, implying that e.g. a financial crisis might have a selective effect against innovative companies.

Most previous studies focus on formal IPR like patents as a metric of innovation, which in our view is a poor metric (see for a similar critique e.g. Kerr & Nanda, 2015, p. 457). SMEs may not patent their innovations or defer due to lack of capability of protecting patents. In addition, patenting focusses on product innovations whereas especially SMES often prefer process innovations (Piening & Salge, 2015). As previous studies indicate, innovative behavior regarding process innovations might be quite different (Robin & Schubert, 2013). Therefore this study uses new tools to look at the size of the

department in a range of firms involved in developing new products and compares this with sources of finance. Previous modelling (e.g. Mellor, 2014 and Mellor, 2018) has focused on SMEs partly because SMEs rarely possess formal intellectual property in the sense of patents, and partly due to the relatively tight coupling between innovation and annual performance in SMEs. To provide a cross-cultural component we compare data from Germany, Poland, Czech Republic, Slovakia, Hungary and Romania.

Data and Econometric Approach

The first data source was the IWH-FDI-micro-database (IWH, 2013). This is a dataset that includes around 1,200 firms in Germany and East Europe (Czech Republic, Hungary, Poland, Romania and Slovakia) for the year 2013, containing 36 firms with more than 1000 employees, 150 firms with between 250 and 1000 employees and around 1000 SMEs (with fewer than 250 employees) and contains data from the previous two years regarding the innovative performance, the organizational structure and the sources of finance for innovations in of these firms. According to IWH (2013, p. 13), this dataset is representative regarding the industries in this region. Table 1 and Table 2 give a short overview of the dataset regarding the firms' location, industries and size.

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The second data source concerned the quality of societal institutions and came from the Worldwide Governance Indicators (WGI, 2017) project, a research project supported by the World Bank Group (Table 3). This data is country-specific and includes information regarding quality of societal institutions like voice and accountability, government effectiveness, regulatory quality, rule of law, control of corruption, political stability and absence of violence/terrorism. The third data source was provided by Eurostat (2017a, 2017b, 2017c), the statistical agency of the European Union, it contains (macro-) economic data (see Table 4).

Although the countries included in our investigation countries are within the European Union, these six countries are quite different regarding their institutional quality and the stage of the business cycle

they are in. The differences are remarkable; institutional quality is an illustrative example and according to the WGI Project (2017), Germany is around the global 10% percentile, while countries like Czech Republic, Poland, Slovak Republic and Hungary are around the 20% percentile whilst Romania is the country in the dataset with the poorest quality of institutions (30% percentile). Table 5 illustrates that the regulatory quality indicator enables a direct comparison of different institutional settings across countries and cultures. Because of this, the conclusions presented here are probably applicable to other countries within the 10 – 30 percentile limits (and perhaps outside of these limits), both within and outside the European Union. We will discuss this in the final section of our paper.

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Analysis of the data regarding the quality of the societal institutions shows that indicators are highly correlated within countries (see Table 6). This means that all parameters are aligned regarding quality. Briefly; countries with "poor" institutions have a low quality in all six dimensions, while countries with "good" institutions score highly in all dimensions. These findings are hardly surprising because according to the work of North (1990), North (2009) and North *et al* (2009) the open-access orders i.e. societies with a high institutional quality, achieve this because they accept civil rights, keep political stability and largely banish violence by using democratic process that allow unpopular governments to be removed, thus increasing government effectiveness and regulatory quality, by minimizing corruption by competition and transparency within the political system, and by implementing the rule of law *via* politically independent courts and administrations.

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On the other side of the spectrum, the limited-access cultures achieve a generally poor quality regarding societal institutions. According to North (1990), North (2009) and North *et al* (2009) this could imply conflicts between rulers and population, and consequently firms are less productive and

innovative because these firms have less incentives to do so, plus they might also fear expropriation by selfish rulers and officials.

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Table 7 describes the data used. Companies are assigned binary data type with two values: true or false if they had any process and product innovations in the last two years. Within process innovations classifications are; production, logistics or internal services. The share of employees working in the different departments of these firms is also captured and used to understand organizational structures, allowing estimations like; do they have small or large R&D departments, do they employ relatively few or many people on a production line, are these companies more sales/marketing-driven or do we have companies with a large but possibly unproductive administration? There is also rather nuanced information regarding how companies invest in their R&D; some use internal funds, others receive money from shareholders and owners, while others use external sources like bank loans. Clearly government grants and subsidies are another possibility. In addition, the data specifies if a firm has spent its R&D money in-house or on external R&D, or both.

Figure 1 summarizes the idea of our structural equation model (SEM): Previous work implies that societal institutions and the general economic situation can have direct effects on the innovativeness of firms, so if a company has had a product innovation (or any of the process innovations) then it can be correlated back by mediation analyses to structural, societal and financial variables. This allows the direct impact of society on innovativeness to be modelled as well as the mediate effects that the society might have on the availability of finances, how firms finance their innovations, and how firms adapt their organizations to reflect societal context. Furthermore the direct effects of organizational structure and financing on innovativeness can be estimated.

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Figure 1 shows a generalized SEM (see Rabe-Hesketh *et al*, 2004). This method reduces problems of endogeneity that might bias our findings, because the modelling is performed amongst mutual interdependencies between the explanatory variables on the company level and because all four types of innovations are estimated at the same time. This SEM was chosen firstly because this modelling strategy enables us to apply a probit estimation of the binary outcomes and secondly if a usual SEM approach would be used, then (1) our findings might be biased because ordinary regression techniques assume continuous outcomes, whereas here there are only two possible and ordered outcomes, and (2) such a regression would come up with findings that are difficult to interpret and could potentially even bias parameters and levels of significance. In addition, we estimate the variance and co-variance matrixes of our error terms in a cluster robust way to control for unobserved heterogeneity on the country level that might be not controlled through our explanatory variables.

Findings: Process and Product Innovations follow different Institutional Logics

The core findings of our robust generalized SEM are summed in Table 7 and highlight that different logics are applied by organizations regarding how they develop innovations. That, *per se*, is hardly surprising. However the data presents a more integrated perspective than hitherto on both product and process innovations, making it worthwhile because much research on this topic has had a strong focus on product innovations rather than process innovations (Piening & Salge, 2015), so the analyses presented here present a more integrated perspective on both product and process innovations.

Table 8 presents the findings of the cluster robust generalized Structure Equation Model used:

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The first results were aimed at illuminating correlations between product innovations and departmental structure, looking at the relative size of technology-related departments like IT, the production department and the R&D department. Only the R&D has a positive and statistically significant impact on the probability that a firm will come up with a product innovation. In addition, the relative size of the administration has a negative (and statistically significant) impact.

Another interesting finding is that internal in-house R&D investments have a large impact, in contrast to external R&D investments that have on average no impact; in the case of external R&D investments the parameter is close to zero and it is also insignificant. There are several explanations for this; firms might have issues around outsourcing R&D on mission-critical innovations, or external actors may have difficulties in grasping the needs of the client, or even if external agencies do come up with good ideas, implementation fails due to employees and managers having prejudices regarding external ideas (Czarnitzki & Thorwarth, 2012, Grimpe & Kaiser, 2010).

The second set of results investigated the financing of product innovations: A high proportion of external funds (like bank loans) and also government grants increased the probability of having a product innovation. Other sources of financing (including internal funds and resources from the owner and/or shareholders) had only a slightly positive but statistically insignificant impact. Surprisingly, the lack of finance for business operations in the last two years increased the probability of having a product innovation on a statistically significant level. The quality of the societal institutions has a slightly negative but statistically insignificant effect on developing product innovations. Not surprisingly, a positive economic development increases the probability, while inflation (used as an indicator for macro-economic insecurity) reduced the probability.

The third set of results looked at process innovations and the findings underline that conclusions from research on product innovations cannot simply be transferred onto process innovations. Looking at process innovations, the R&D, the production departments and the distribution and logistics department are relevant. For process innovations, the size of the firm (number of employees) has a slightly positive impact. Compared with product innovations, in-house R&D investments have a positive impact but not on a statistically significant level, while external R&D investment have a positive but significant impact. Furthermore, the slope of the external R&D parameter for process innovations is much steeper than the corresponding slope obtained for product innovations. This indicates that external R&D works better for process innovations closely related to production.

The fourth set of results investigated the financing of process innovations: In contrast to product innovations, process innovations for production rely more on money from shareholders and owners.

Regarding the correlation between societal environments and process innovation; inflation has again a negative impact while the regulatory quality has a relatively strong negative impact on process innovations. This is quite surprising because one would have otherwise assumed that a low institutional quality would reduce the probability of being innovative. We will return to this surprising finding in the interpretation section.

Analyzing process innovations in the firms' logistics revealed four important empirical findings: first and hardly surprising, the relative share of the distribution and logistics department is highly relevant for developing innovations in this field. Second, firms finance these efforts through external funds and, third, the quality of the societal institutions has, again, a negative impact. Finally, the lack of finance for business operations increases the probability of achieving a process innovation.

Regarding the development of process innovations for internal services, no special department had a positive or negative impact. Surprisingly, the probability of having process innovations for internal services is negatively linked with investments in in-house R&D and to the change in GDP. An interpretation of these findings is presented in the next section.

The mediate effects that were measured by our model include that economic development as measured by change of GDP real, is positively linked with the number of employees in the R&D and IT department, as is the number of employees working for sales and marketing. Other correlations with economic development include (negatively) the number of employees in the producing units plus the potential to finance R&D through shareholders' money and internal funds. Also, inflation has a slight positive impact on the number of employees in the R&D units and inflation may reduce the number of people in the sales and marketing just as the distribution and logistics department. In addition, inflation may increase the shareholder's available money for R&D, while it marginally decreases internal funds. We can also see a small size effect: companies with many employees invest more money both in in-house and external R&D investments. About 16% of the firms in the dataset are larger than 250 employees, although we control for company size in our estimations, we can measure the effects of "bigger" firms separately and there is hardly any difference to taking the whole sample set, reinforcing the information IWH (2013, p. 13), that the sample of the industry of these countries actually is representative. SMEs dominate the dataset so we conclude that the functional

logic of a SME is quite similar to the logic of larger companies and that even companies with 1000 employees do not follow a completely different logic than companies with 250 employees. Indeed it would be surprising if abrupt changes could be seen at the 250 employee "border". As seen above, large companies invest marginally more money both in in-house and external R&D investments, but interestingly the changes between SME behaviour and large company behaviour is small and gradual, not abrupt. Finally, the metric 'institutional quality' shows a strong positive impact on the size of the R&D effort and size of the distribution and logistics departments in companies, but exhibits a strong negative impact on the number of employees in the production division and the sales and marketing department. This seems at fist glace to be contradictory to received wisdom that well-governed countries have much more productive firms, and indeed these findings will be discussed in the next section.

Companies in well-governed countries seem at first to be exposed to a lower risk of lack of finance for business operations and these companies also spend much more money for in-house and external investments in R&D. In addition, well-governed countries seem to offer much higher subsidies for corporate R&D activities, although the effect of state finance for in-house and external investments in R&D, under all of the conditions tested, was zero. In addition, companies in well-governed countries seem to rely more strongly on external funding and less on both internal funds and investments through shareholders.

In a second step, we investigated industry specific behavior (see Appendix). Initially we investigated the industry 'manufacturing, repairing and installation', which is the largest industry in our dataset - about 50% of the firms belong to this industry. Within this industry, firms come up with many more product innovations and fewer process innovations for internal services compared to the average firm of the dataset. Furthermore, companies within this industry have many more people employed for producing goods and services, while they employ fewer people within the IT-department, sales and marketing, distribution and logistics and within the administration. In average, this industry spends more money for investments on in-house and external R&D. In addition, this industry seems to have good access to external funds for R&D investments.

Then we investigated the second largest industry: ‘wholesale and trade’, which accounts for around 20% of the firms within the dataset. Firms within this industry have on average more process innovations in logistics and internal services. Not surprisingly, they employ fewer people in production and more in sales, marketing, distribution and logistics. They also have larger administrations. On average, they invest less in in-house and external R&D, as well as using less money from shareholders and governments for financing their R&D efforts.

Interpretation and Discussion: Beyond Product Innovations and Patents

Do societies and their institutions affect the innovative ability of corporations? Ahmadjian (2016) and Geels (2004) both argue that firms are quite agile and adaptive in their handling of societal institutions. Nevertheless, organizational capabilities could be restricted because limiting-access orders across a spectrum may end in the incentivization of rent-seeking behavior, which in turn results in fewer innovations, while open-access order incentivizes exactly the opposite, arguably to the advantage of the firm and the consumer. The dataset used, as illustrated by the metric "Control of corruption", ranges from Germany (93/100) to Romania (58/100), yet this wide range, in a global comparison, still represents an institutional quality of above average. It would be foolhardy to expect linear extrapolations beyond this range, thus our findings may not be immediately transferable to limited-access orders with very poor societal institutions. Nevertheless, we believe that our contribution is worthwhile in unveiling the impact of institutional quality – especially in a European context. As a natural consequence of a variety of organizational structures and institutions, there could be a variety of strategies that are sustainable in a given societal setting. Nonetheless the results presented here show that some patterns could be more successful than others regarding the innovative performance of firms in the European context.

These results show that companies develop and finance process innovations quite differently to how they develop and finance product innovations, also under a range of societal conditions. Product innovations arise mainly in the R&D department, but process innovations can arise elsewhere too, and larger firms might have a small advantage, possibly indicating that process innovations may need a ‘critical mass’. These findings complement the study of Robin & Schubert (2013), who reveal that cooperative initiatives between firms and public research institutions increase the number of product

innovations, but not of process innovations. As our findings highlight, developing process innovations might require a lot of internal knowledge and single actors like R&D departments or public research institutions might be overwhelmed by the internal complexities of an organization. However, our analysis does not indicate if the size of the firm is a cause or a consequence: do larger firms become less efficient *per capita* and thus tend to develop process innovations, or does a firm need a critical mass of experts from different departments to come up with such innovations? Answering this question might be interesting for further research.

Second, scholars like Czarnitzki & Thorwarth (2012) and Grimpe & Kaiser (2010) argue that many firms have issues around the implementation of innovations arising externally from the organization. Many scholars focus on product innovations, and our findings confirm this view for product innovations. However, our findings also indicate that firms can be quite successful by implementing external process innovations if these innovations are in the field of production. Thus, the adaptation and implementation of external innovations might be quite different regarding the kind of innovation. Analyzing these facets into detail might be another field for further research.

One of the surprising result of the findings presented here is that relatively poor societal institutions (regarding the European context) increase the share of people working in the production area, which at first glance appears counterintuitive, but from an institutional perspective, there could be a simple logic: Could it be that in societies with average institutions, mass production with a high number of (poorly paid) workers is a suitable business model, while human capital intensive value creation processes are difficult to run because relatively poor societal institutions reduce the incentives for employers and employees to invest in firm-specific skills (Acemoglu *et al*., 2014, Assiotis *et al*., 2015)? A consequence of this strategy would be that companies in these industries face a strong price competition because they cannot use product innovations for differentiation strategies. This will in turn increase their need to implement process innovations in production and logistics for staying competitive. This might explain why relatively poor institutions increase the number of process innovations. Understanding this better ought to be another field for further research.

Overall the data indicates that companies in relatively poorly governed countries spend less on both internal and external investments in R&D. In addition, firms in such countries also have relatively

small R&D departments. Such corporate strategies may be rational regarding the institutional environment; however, this may also result in lock-in effects: the gap may become wider between innovative firms in countries with good institutions as compared to less innovative firms in countries with average institutions. This might explain the observation why East Europe has established a highly competitive industry of suppliers and subcontractors, while many German firms, especially SMEs, are world-market leaders in niche markets with their innovative products. As for financing these innovations, the data shows that external funds seem to be the most used source for product innovations as well as process innovations in logistics, while funding for process innovations in production and internal services is achieved typically using resources derived from shareholders and owners.

In addition to this general pattern, the quality of societal institutions also influences financing. According to our empirical findings, firms in well-governed countries have better access to government grants and external funds for financing their R&D investments. Conversely, firms in relatively poorly governed countries use internal funds and money from their shareholders. Confirming this different financing behavior supports the study of Lee *et al* (2015) who showed a strong negative effect of credit rationing after the financial crisis in the UK and goes further to intimate that the effect may only be strong in highly developed countries because firms in highly developed countries use well-developed capital markets more frequently for support. However, further research will address this finding and strive to reveal any causality behind it.

Our dataset also reports on if companies have experienced a lack of finance for business operations in the last two years. Such issues have a statistically significant impact on the number of product innovations and process innovations in logistics. Surprisingly, considering the sign of the slopes, firms often become more innovative when they have to handle a lack of finance for business operations, and one can speculate that necessity incentivizes being innovative. However, these findings can also be explained as the result of a survival bias: a lack of finance exerts a force on all companies, but only the survivors reported on this because only they could create adequate innovations to compensate for the lack of finance.

Finally, our findings reveal that different industries follow different innovation strategies. Not surprisingly, manufacturers have stronger focus on product innovations and hardly implement process innovations for internal services, while wholesalers and traders encourage process innovations for logistics and internal services. According to Kerr & Nanda (2015) and Piening & Salge (2015), previous empirical research in the field of innovation management had a primary focus on product innovations using patents as a metric for being innovative. We criticize this approach because most process innovations are not represented by patents, and the findings reported here show that industries that focus on process innovations follow different patterns of developing and financing innovations. The quality of country institutions is possibly correlated to other characteristics of the economic structure of a country which affect innovations, thus the relationship between institutions and innovation can be affected by other factors omitted from the analysis, nonetheless we urge caution when applying findings from product innovations and manufacturers to other types of innovation and other sectors, in countries with differing quality of societal institutions.

Conclusion: Institutions as a central factor for explaining innovative performance

These findings enrich the theoretical discussion how societal institutions, financing and the innovativeness of firms are linked. Furthermore the results have far-reaching implications for managerial practice and management education. From the perspective of innovation management, managers have to decide how many resources to invest in process or product innovations. Our findings reveal that this decision should not only be considered by the availability of financial and human resources, because societal institutions could have a far-reaching impact on if product or process innovations are appropriate for achieving economic sustainability. Even if employees propose innovations and even if resources were available, managers might have decide against implementing innovations because, in the case of limiting-access orders, these innovations could conflict with societal norms and in such an environment it might be counter-productive to increase the number of product innovations and improve corporate performance (because high profits presumably attract corrupt officials and politicians).

As a consequence, choosing the right innovative strategies is not only a question that considers human and financial resources; it is also a decision that has to consider the given societal context. This is also true *vice versa*, as Pies *et al* (2009) argue, managers can also influence societal institutions and help overcome societal deficits to promote innovations and this might be true in limited-access societies and especially prominent in societies that are undergoing the transformations process into open-access societies, as indeed some countries in our sample are striving to do.

We have a European "bias" in our dataset and further research might reveal additional or different patterns in other (non-European) regions. If so, then panel studies could be used to analyze changes over time and add more links between innovations and financial performances in regard to societal institutions

A tipping point may exist where institutional quality affects whether companies are innovative at all: The countries of our dataset cover the first third of all nations but these findings do not of necessity have to be transferable to the other two thirds. Nonetheless it remains open as to whether the effects of societal institutions are linear within the range investigated, or if there is a tipping point on the scale (also outside of the limits investigated here) at which firms in a country may drift away from a process innovation strategy to follow a more product innovation strategy as the societal institutions improve (or *vice versa* if the quality is decreasing).

Ultimately, a future perspective includes that a stronger micro-foundation could conceivably be useful to elucidate how institutions frame and constrain the decisions of managers and employees regarding their innovative behavior. We believe that such research will further develop innovation management, not only for academic ends, but will also have powerful practical applications.

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Table 1: Industries

	CZ	DE	HU	PL	RO	SK	**Total**
Attribution missing	3	1	0	0	0	0	**4**
Mining	1	3	1	2	1	1	**9**
Manufacturing, Reparing and Installation	149	184	57	91	91	46	**618**
Electricity, Gas, Water, Sewerage, Waste	6	30	4	11	3	2	**56**
Wholesale and trade	52	50	23	65	27	12	**229**
Transport, warehousing and postal services	12	12	5	21	10	6	**66**
Publishing, TV, Radio	5	4	1	3	2	0	**15**
Telecommunication, programming and IT	6	18	4	2	15	2	**47**
Finance, insurance and real estate	5	10	8	6	4	3	**36**
Legal and Accounting	3	14	2	2	4	0	**25**
Architectural and engineering activities, research and development	21	40	11	9	10	6	**97**
Total	**263**	**366**	**116**	**212**	**167**	**78**	**1202**

Source: IWH (2013)

Table 2: Firm Size

Number of Employees	CZ	DE	HU	PL	RO	SK	All
Min	15	1	10	10	10	15	1
Max	2.750	37.000	11.653	3.000	2.688	1.500	37.000
Mean	197	202	497	175	170	186	219
Median	75	34	87	60	45	100	51
Std. Dev.	351	1.947	1.640	359	399	248	1.225

Number of SMEs (Number of Emp. < 250)	212	335	87	175	143	60	1012
Bigger Firms (Number of Emp. >= 250)	51	31	29	37	24	18	190

Source: IWH (2013)

Table 3: Quality of Societal Institutions

	Voice and Accountability	Political Stability and Absence of Violence/Terrorism	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption
CZ	0.966159761	1.05212009	0.887555599	1.090325832	1.01224041	0.193954825
DE	1.418123722	0.928079724	1.530369759	1.556691051	1.626392126	1.790085435
HU	0.739539862	0.779447079	0.655329764	0.89416188	0.572680831	0.291925371
PL	0.981403828	0.960940003	0.719274938	1.052919269	0.794941187	0.553665996
RO	0.296449721	0.164314687	-0.062753692	0.606307864	0.114980102	-0.184331402
SK	0.944553137	1.099374533	0.788209677	0.922895908	0.455329895	0.061339367

Note: The indicators range from -2.5 (very poor) to 2.5 (very good), Source: Worldwide Governance Indicators (WGI) Project (2017)

Table 4: Macro-Economic Indicators

	Change of GDP real	Inflation
CZ	-0.9	1.4
DE	0.5	1.6
HU	0.2	1.9
PL	1.3	1.0
RO	3.5	3.2
SK	0.8	17.0

Sources: Eurostat (2017a, b, c)

Table 5: Regulatory Quality as an Indicator for Institutional Quality

Country/Territory	Rank	Percentile	Value	Country/Territory	Rank	Percentile	Value	Country/Territory	Rank	Percentile	Value
SINGAPORE	1	0%	1.98	LITHUANIA	34	16%	1.15	URUGUAY	67	32%	0.54
HONG KONG SAR, CH.	2	1%	1.94	CAYMAN ISLANDS	35	17%	1.12	BULGARIA	68	32%	0.53
SWEDEN	3	1%	1.90	ICELAND	36	17%	1.12	OMAN	69	33%	0.48
FINLAND	4	2%	1.86	JAPAN	37	17%	1.11	MEXICO	70	33%	0.47
NEW ZEALAND	5	2%	1.83	BRUNEI DARUSSALAM	38	18%	1.11	PERU	71	33%	0.47
DENMARK	6	3%	1.81	**CZECH REPUBLIC**	39	18%	**1.09**	CROATIA	72	34%	0.45
AUSTRALIA	7	3%	1.80	RÉUNION	40	19%	1.08	BARBADOS	73	34%	0.44
LUXEMBOURG	8	4%	1.78	**POLAND**	41	19%	**1.05**	TURKEY	74	35%	0.44
NETHERLANDS	9	4%	1.78	LATVIA	42	20%	1.04	SOUTH AFRICA	75	35%	0.42
UNITED KINGDOM	10	5%	1.77	KOREA, REP.	43	20%	0.99	ST. KITTS AND NEVIS	76	36%	0.41
CANADA	11	5%	1.73	MAURITIUS	44	21%	0.94	COLOMBIA	77	36%	0.41
NORWAY	12	6%	1.66	SPAIN	45	21%	0.94	AMERICAN SAMOA	78	37%	0.37
SWITZERLAND	13	6%	1.64	**SLOVAK REPUBLIC**	46	22%	**0.92**	PANAMA	79	37%	0.36
IRELAND	14	7%	1.58	CYPRUS	47	22%	0.92	MACEDONIA, FYR	80	38%	0.33

LIECHTENSTEIN	15	7%	1.57	**HUNGARY**	48	23%	**0.89**	ST. VINCENT AND THE G.	81	38%	0.32
ANDORRA	16	8%	1.56	PUERTO RICO	49	23%	0.85	EL SALVADOR	82	39%	0.32
GERMANY	17	8%	**1.56**	MARTINIQUE	50	24%	0.85	ST. LUCIA	83	39%	0.29
CHILE	18	8%	1.49	NETHERLANDS ANTILLES	51	24%	0.85	DOMINICA	84	40%	0.28
AUSTRIA	19	9%	1.49	PORTUGAL	52	25%	0.80	GRENADA	85	40%	0.28
ARUBA	20	9%	1.45	UNITED ARAB EMIRATES	53	25%	0.79	TRINIDAD AND TOBAGO	86	41%	0.26
ESTONIA	21	10%	1.44	ITALY	54	25%	0.78	ARMENIA	87	41%	0.25
GREENLAND	22	10%	1.41	QATAR	55	26%	0.75	JAMAICA	88	42%	0.24
MACAO SAR, CHINA	23	11%	1.34	GEORGIA	56	26%	0.75	THAILAND	89	42%	0.23
ANGUILLA	24	11%	1.32	MALAYSIA	57	27%	0.65	ALBANIA	90	42%	0.21
BERMUDA	25	12%	1.32	GREECE	58	27%	0.62	BAHAMAS, THE	91	43%	0.17
FRENCH GUIANA	26	12%	1.31	SLOVENIA	59	28%	0.62	WEST BANK AND GAZA	92	43%	0.16
MALTA	27	13%	1.30	BAHRAIN	60	28%	0.61	JORDAN	93	44%	0.13
BELGIUM	28	13%	1.30	ANTIGUA AND BARBUDA	61	29%	0.61	SAUDI ARABIA	94	44%	0.09
UNITED STATES	29	14%	1.26	GUAM	62	29%	0.61	NAMIBIA	95	45%	0.09
JERSEY, CHANNEL I.	30	14%	1.20	VIRGIN ISLANDS (U.S.)	63	30%	0.61	GHANA	96	45%	0.08
FRANCE	31	15%	1.16	**ROMANIA**	64	30%	**0.61**	BRAZIL	97	46%	0.08
ISRAEL	32	15%	1.16	COSTA RICA	65	31%	0.59	MONTENEGRO	98	46%	0.06
TAIWAN, CHINA	33	16%	1.15	BOTSWANA	66	31%	0.58	RWANDA	99	47%	0.02
								KOSOVO	100	47%	-0.03

Note: The tTop 100 countries according to the regulatory quality, total number of countries: 215, highest value: 2.5, lowest value: -2.5, Own calculations, Source: Worldwide Governance Indicators (WGI) Project (2017)

Table 6: Correlation Matrix of the Quality of Societal Institutions

	Voice and Accountability		Political Stability and Absence of Violence/Terrorism		Government Effectiveness		Regulatory Quality		Rule of Law		Control of Corruption	
Voice and Accountability	1											
Political Stability and Absence of Violence/Terrorism	0.7354	*	1									
Government Effectiveness	0.9874	*	0.6957	*	1							
Regulatory Quality	0.9776	*	0.5956	*	0.983	*	1					
Rule of Law	0.9585	*	0.6003	*	0.9715	*	0.9902	*	1			
Control of Corruption	0.8901	*	0.3553	*	0.8976	*	0.9474	*	0.9131	*	1	

Own calculations, Source: Worldwide Governance Indicators (WGI) Project (2017)

Table 7: Descriptive Statistics

	Obs	Mean	Std. Dev.	Min	Max
Product Innovations in the Last Two Years	1177	0.57	0.49	0.00	1.00
Process Innovations Producing in the Last Two Years	1184	0.43	0.49	0.00	1.00
Process Innovations Logistics in the Last Two Years	1183	0.27	0.44	0.00	1.00
Process Innovations Internal Services in the Last Two Years	1186	0.48	0.50	0.00	1.00
Lack of Finance for Business Operations in the Last Two Years	1178	0.15	0.35	0.00	1.00

Investments in Inhouse R&D	1159	0.44	0.50	0.00	1.00
Investments in External R&D	1170	0.35	0.48	0.00	1.00
% of Employees Producing Goods and Services	1169	57.05	32.19	0.00	100.00
% of Employees working for Distribution and Logistics	1169	10.58	16.55	0.00	100.00
% of Employees working for Sales and Marketing	1169	9.85	16.89	0.00	100.00
% of Employees working in the IT Department	1169	2.86	8.77	0.00	100.00
% of Employees working as Administrators/Managers	1169	10.97	12.71	0.00	100.00
% of Employees working for R&D	1169	5.08	12.36	0.00	100.00
% of Employee in other Functions	1169	3.70	11.27	0.00	100.00
Share of R&D Investments through Internal Funds	831	70.34	39.45	0.00	100.00
Share of R&D Investments through Shareholders	831	12.48	29.51	0.00	100.00
Share of R&D Investments through External Funds	833	5.99	19.11	0.00	100.00
Share of R&D Investments through Government Grants	835	4.47	13.39	0.00	100.00
Regulatory Quality	1202	1.13	0.32	0.61	1.56
Change of GDP real	1202	0.74	1.32	-0.90	3.50
Inflation	1202	2.70	3.82	1.00	17.00

Own calculations, Sources: Eurostat (2017a, b, c), IWH (2013), Worldwide Governance Indicators (WGI) Project (2017)

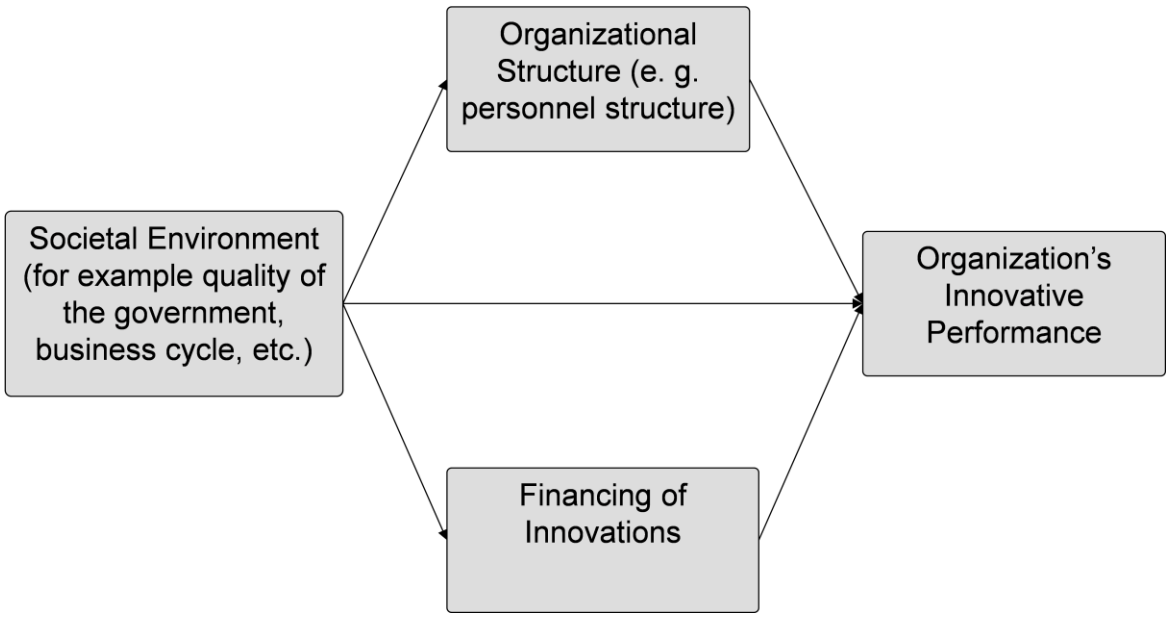
Table 8: Findings of the Generalized Structure Equitation Model

Basic Model (Cluster Robust: Country)	Product Innovations in the Last Two Years		Process Innovations Producing in the Last Two Years		Process Innovations Logistics in the Last Two Years		Process Innovations Internal Services in the Last Two Years									
% of Employees working for R&D	0.0045205	*	0.0126754	**	0.0027375		-0.0025264									
% of Employees working in the IT Department	0.0079471		0.0044621		0.0004166		-0.0037724									
% of Employees working for Sales and Marketing	0.0038196		0.0041692		0.0046488		-0.0037303									
% of Employees working for Distribution and Logistics	-0.0021877		0.0053924	**	0.0211424	***	0.0007657									
% of Employees Producing Goods and Services	-0.0019025		0.0126406	**	0.0035259		-0.0016638									
Number of Employees	0.0001469		0.0000742	***	0.0001097	*	0.0002769	***								
% of Employees working as Administrators/Managers	-0.010438	*	-0.0022446		0.0048235		0.0038975									
Lack of Finance for Business Operations in the Last Two Years	0.1576039	***	-0.0405701		0.1746165	*	-0.026236									
Investments in Inhouse R&D	0.6492888	***	0.2139422		0.0691015		-0.2384235	***								
Investments in External R&D	0.0415189		0.1693248	**	0.1577655		-0.0145263									
Share of R&D Investments through Internal Funds	0.0008516		0.0037704		0.0027812		0.0027764									
Share of R&D Investments through Shareholders	0.0016504		0.0050329	**	0.0037926		0.0055613									
Share of R&D Investments through External Funds	0.007149	*	0.0014426		0.0071977	***	0.0041015									
Share of R&D Investments through Government Grants	0.0079736	**	0.0044962		0.0011805		-0.0041501	*								
Change of GDP real	0.1100599	**	0.01293		0.038778	**	-	***								

							0.0719475						
Regulatory Quality	-0.0926569		-0.6847229	***	-0.4444006	***	0.0047991						
Inflation	-0.0414652	***	-0.0311588	***	-0.0169028	***	0.0019886						
Constant	0.3178887		-0.5864533		-0.9856893	**	0.1577317						
	% of Employees working for R&D		% of Employees working in the IT Department		% of Employees working for Sales and Marketing		% of Employees working for Distribution and Logistics		% of Employees Producing Goods and Services		% of Employees working as Administrators/Managers		
Number of Employees	0.0002415		-0.0000588		-0.0004828		-0.0003477	**	0.0006961		-0.0003027		
Change of GDP real	0.6183956	***	0.4988354	***	0.355447		0.0163851		-1.915181	**	0.5559726		
Regulatory Quality	9.060983	***	0.9886462	**	-3.67537	*	3.121621	***	-10.06075	***	0.7036125		
Inflation	0.2904861	***	0.0493547	*	-0.4196092	***	-0.1664233	***	0.0348941		-0.0863146		
Constant	-6.425321	***	1.26143	**	14.96912	***	7.538535	***	69.5918	***	10.05918	***	
	Lack of Finance for Business Operations in the Last Two Years		Investments in Inhouse R&D		Investments in External R&D		Share of R&D Investments through Internal Funds		Share of R&D Investments through Shareholders		Share of R&D Investments through External Funds		Share of R& Investmen through Governme Grants
Number of Employees	-0.000011	**	0.0000364	*	0.0000357	**	0.0006314		-0.0002819		-0.0000177		0.0002858
Change of GDP real	0.0516324	***	0.0147726	*	0.01579	*	-0.3470542	**	-1.884422	***	0.312943		0.009299
Regulatory Quality	0.0189948		0.2710484	***	0.1652953	***	-5.313884	***	-3.685608	***	3.29015	***	7.971051
Inflation	-0.0043813	*	0.0063546	***	-0.0041615	***	-0.0944826	***	0.3410939	***	-0.0202303		0.0099763
Constant	0.1012811	*	0.1000401	**	0.1507025	***	76.48501	***	17.51427	***	1.867077		-5.379127

Own calculations, Sources: Eurostat (2017a, b, c), IWH (2013), Worldwide Governance Indicators (WGI) Project (2017)

Figure 1: Overview of the Generalized Structure Equitation Model



Own illustration.

APPENDIX 1: Generalized SEM: Manufacturing, Repairing and Installation

Manufacturing, Repairing and Installation (Cluster Robust: Country)	Product Innovations in the Last Two Years		Process Innovations Producing in the Last Two Years		Process Innovations Logistics in the Last Two Years		Process Innovations Internal Services in the Last Two Years							
% of Employees working for R&D	0.00441	*	0.0123815	**	0.0023073		-0.0031742							
% of Employees working in the IT Department	0.0092327		0.0049507		-0.0005882		-0.0066518							
% of Employees working for Sales and Marketing	0.0044762		0.0042382		0.0037234		-0.0060374							
% of Employees working for Distribution and Logistics	-0.0021548		0.0048779	**	0.0203559	***	-0.000307							
% of Employees Producing Goods and Services	-0.0031505		0.0118077	**	0.0035104		-0.0013295							
Manufacturing, Reparing and Installation	0.2714621	***	0.123999		-0.0665366		-0.2463128	***						
% of Employees working as Administrators/Managers	-0.0099139	*	-0.0026062		0.0042542		0.0015197							
Lack of Finance for Business Operations in the Last Two Years	0.1409645	**	-0.047186		0.1560435		-0.0526273							
Investments in Inhouse R&D	0.6256385	***	0.194037		0.0977694		-0.2004283	**						
Investments in External R&D	0.0376872		0.1672421	***	0.1670375		0.0227015							
Share of R&D Investments through Internal Funds	0.0007063		0.0037507		0.0028904		0.0031795							
Share of R&D Investments through Shareholders	0.0013109		0.0048912	**	0.0038481		0.0060477	*						
Share of R&D Investments through External Funds	0.0066037	*	0.0012355		0.0073788	***	0.0050252							
Share of R&D Investments through Government Grants	0.0080826	**	0.0046921		0.0013455		-0.0038777	*						
Change of GDP real	0.1106592	**	0.0118867		0.0310434	*	-0.0824133	***						
Regulatory Quality	-0.0936169		-0.691041	***	-0.4904501	***	-0.0820617							
Inflation	-0.0431302	***	-0.0319454	***	-0.0179861	***	0.0008008							
Constant	0.2941974		-0.557467		-0.8593796	**	0.4318596							
	% of Employees working for R&D		% of Employees working in the IT Department		% of Employees working for Sales and Marketing		% of Employees working for Distribution and Logistics		% of Employees Producing Goods and Services		% of Employees working as Administrators/Managers			
Manufacturing, Reparing and Installation	-0.1959745		-2.747014	***	-9.925694	***	-5.846119	***	23.60843	***	-4.48653	***		
Change of GDP real	0.6189487	***	0.456677	***	0.2297484		-0.0396142		-1.615611	**	0.5029555			
Regulatory Quality	9.063598	***	0.8563398		-4.02188	***	3.079682	***	-9.356954	***	0.5776449			
Inflation	0.2921809	***	0.0691642	**	-0.3463196	***	-0.1225055	***	-0.1387164	*	-0.0530138			
Constant	-6.287345	***	2.787539	***	20.25941	***	10.47041	***	57.01094	***	12.40052	***		
	Lack of Finance for Business Operations in the Last Two Years		Investments in Inhouse R&D		Investments in External R&D		Share of R&D Investments through Internal Funds		Share of R&D Investments through Shareholders		Share of R&D Investments through External Funds		Share of R& Investment through Governmer Grants	
Number of Employees			0.0000298		0.0000316	**								
Manufacturing, Reparing and Installation	0.0069067		0.1746393	***	0.133111	***	-0.3608399		1.865652		3.557112	**	0.2542456	
Change of GDP real	0.0522158	***	0.01735	***	0.0180382	*	-0.4720121	***	-1.765838	***	0.4105088	**	0.004139	
Regulatory Quality	0.0202884		0.2783192	***	0.170863	***	-5.567561	***	-3.304874	***	3.578648	***	7.913006	
Inflation	-0.0043591	*	0.0053383	***	-0.0048584	***	-0.1043638	***	0.344284	***	-0.0264886		0.0050964	
Constant	0.0930846	*	0.0034858		0.0767178	**	77.34095	***	15.89793	***	-0.4202667		-5.359682	

Own calculations, Sources: Eurostat (2017a, b, c), IWH (2013), Worldwide Governance Indicators (WGI) Project (2017)

APPENDIX 2: Generalized SEM: Wholesale and Trade

Wholesale and Trade (Cluster Robust: Country)	Product Innovations in the Last Two Years		Process Innovations Producing in the Last Two Years		Process Innovations Logistics in the Last Two Years		Process Innovations Internal Services in the Last Two Years							
% of Employees working for R&D	0.0040712	*	0.0123694	**	0.0032643		-0.0023197							
% of Employees working in the IT Department	0.0073573		0.0040397		0.000996		-0.0039575							
% of Employees working for Sales and Marketing	0.002817		0.0031438		0.0012209		-0.0070302							
% of Employees working for Distribution and Logistics	-0.0025558		0.0045283	*	0.0194594	***	-0.0009642							
% of Employees Producing Goods and Services	-0.0023804		0.0122489	**	0.0044395		-0.0014338							
Wholesale, Trade	0.0170399		0.0486108		0.3770385	***	0.2787328	**						
% of Employees working as Administrators/Managers	-0.0113524	**	-0.0032394		0.0047424		0.0024958							
Lack of Finance for Business Operations in the Last Two Years	0.1442808	**	-0.0467423		0.1620497	*	-0.0484215							
Investments in Inhouse R&D	0.6483699	***	0.2108967		0.1094588		-0.2175879	***						
Investments in External R&D	0.0561345		0.1766648	***	0.1627487		0.0036679							
Share of R&D Investments through Internal Funds	0.0010061		0.0038587		0.0032114		0.0032084							
Share of R&D Investments through Shareholders	0.0018042		0.0051027	**	0.0043522		0.006041	*						
Share of R&D Investments through External Funds	0.0072761	*	0.0015705		0.0076585	***	0.0046227							
Share of R&D Investments through Government Grants	0.0081724	**	0.0047225		0.001961		-0.0034907							
Change of GDP real	0.1082763	**	0.0106963		0.0364513	*	-0.0783807	***						
Regulatory Quality	-0.1110907		-0.6989657	***	-0.4596813	***	-0.0460757							
Inflation	-0.0421041	***	-0.0315081	***	-0.0166749	***	0.0012124							
Constant	0.4027644		-0.5159048		-1.08536	***	0.2154101							
	% of Employees working for R&D		% of Employees working in the IT Department		% of Employees working for Sales and Marketing		% of Employees working for Distribution and Logistics		% of Employees Producing Goods and Services		% of Employees working as Administrators/Managers			
Wholesale, Trade	-1.835132	***	-0.1968484		19.25834	***	12.67883	***	-34.33542	***	3.941058	***		
Change of GDP real	0.6077754	***	0.5027949	***	0.5549874		0.1625577	*	-2.298094	***	0.6121312			
Regulatory Quality	8.906056	***	0.9753694	**	-1.771105		4.52716	***	-13.66463	***	1.160679			
Inflation	0.2788215	***	0.0485539	*	-0.2904181	***	-0.0808588	***	-0.1967912		-0.0588472			
Constant	-5.816715	***	1.294076	*	8.533982	***	3.14087	***	81.26451	***	8.61037	***		
	Lack of Finance for Business Operations in the Last Two Years		Investments in Inhouse R&D		Investments in External R&D		Share of R&D Investments through Internal Funds		Share of R&D Investments through Shareholders		Share of R&D Investments through External Funds		Share of R& Investment through Governmer Grants	
Number of Employees			0.0000316	*	0.0000341	**								
Wholesale, Trade	-0.0244591		-0.1524672	***	-0.0574997	***	-0.7798945		-3.124685	*	-1.34081		-2.258792	
Change of GDP real	0.0518754	***	0.012869	**	0.0152516		-	***	-1.812953	***	0.3225356		-	

							0.4705143						0.0031424	
Regulatory Quality	0.0177533		0.2555413	***	0.1597901	***	-5.595367	***	-3.696955	***	3.191988	***	7.760907	
Inflation	-0.0044331	*	0.005596	***	-0.0044688	***	-0.108923	*	0.3212135	***	-0.0284554		-0.005663	
Constant	0.1045679	*	0.1512846	***	0.1693731	***	77.33489	***	18.01168	***	2.221952		-4.608524	

Own calculations, Sources: Eurostat (2017a, b, c), IWH (2013), Worldwide Governance Indicators (WGI) Project (2017)