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The Economic Policy Uncertainty and Firm Investment in Germany

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Abstract

The importance of the impact created by different uncertainties in the policies on the overall economy of a country or a region cannot be denied. These uncertainties might be because of political reasons but sometimes the overall economic environment brings such uncertainties as well. Being a crucial part of economy of the country, German firms might face different issues because of these uncertainties. In this regard, the researcher conducted this study with the motive to find the influence that EPU has on the investments made by various firms of Germany and for this purpose, the researcher derived data from the non-financial companies regarding their finance activities on quarterly basis for the time span consisting of 20 years. SYS GMM estimation was applied on the gathered data to fulfil the purpose of the study. The major result showed that EPU has important but negative impact on the investments made by the German firms. The next result that involves the heterogeneity impact of the firms show that although EFU alone has negative or declining impact on investments but when it is incorporated with the heterogeneity variables of the firm, the impact of these interactions become positive on the firms' investments. The last result including marketization is that when the marketization index interacts with EPU, the impact of EPU is more sensitive in case of highly marketed companies as compared to lower ones. The study has suggested that the policymakers must make transparent and favorable policies for the firms in regard of investments.

1. Introduction

In the modern age of digitalization and the electrification of production, the latest industrial trend has been seen in Germany: Industry 4.0. Its industry 4.0 is based on Engineering and Information Technology (Bauer, Schlund, Hornung, & Schuler, 2018). Well, the Germany engineering having a good reputation in the worldwide market and its IT industry is still leads the shadow existence, so overall there are many opportunities to enhance the investment rate of these industrial firms (Rojko, 2017). According to the statistics, the number of investments to the German companies is continuously increasing, as shown in the following figure;
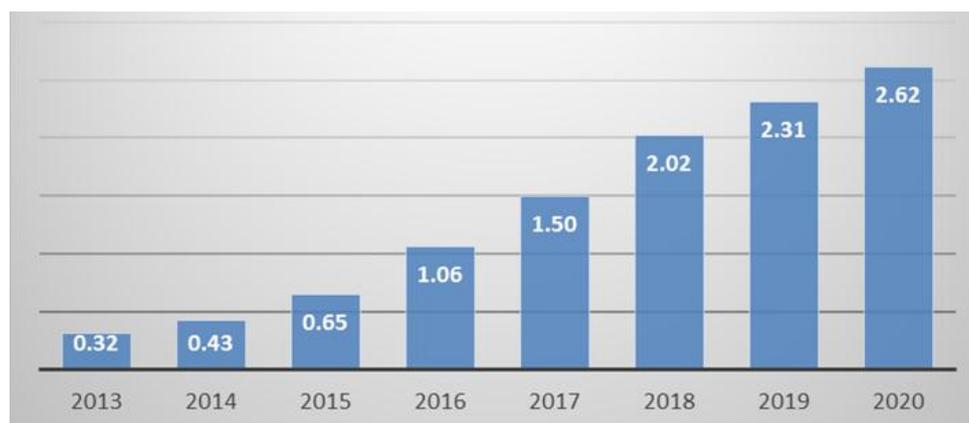
Figure-1. Investment in Germany Firms (in Billion Euro).

The graphical representation of the overall investment-based growth rate of Germany firms depicts that there are many chances to further increase the investment to its domestic firms in the upcoming future. In the last few years, the overall economic potential of its industrial sector is continuously increasing. Some of the investments towards the major industries of Germany are shown in the following table;

Table-1. Industries and their annual economic potential (In Euro).

Industries and their Annual Economic Potential (In Euro)	
Process Manufacturing	6 billion
Engineering	8 billion
Automotive	5,25 billion
Chemical Industry	4,2 billion
Electronics	4,2 billion
IT and Communication Technology	5 billion

The problem statement of this paper is to understand the impact of economic policy uncertainty on the firm investment within the Germany state by considering its cash flow, company size, and sales revenue based controlling variables. This research statement will be an informative approach to understand how much a business community is affected by the economic policy uncertainty within a state. The major aim of this paper is based on;

- Critically explore the influence of economic policy uncertainty on the firm investment within a Germany state.
- Critically investigate the influencing power of cash flow, company size and sales revenue as a controlling variable between the economic policy uncertainty and firm investment.

It is highly known and observed that the firm investment is very important for a company to form a developed reputation all over the market. Therefore, the firm investment could be inward as well as outward. The inward investment opportunities for a firm produce valuable benefits than outward firm investment because of the chances of losses. This paper covers the gap of previous literature by specifically worked on the major economic factor that causes a direct impact on the overall firm performance within a Germany state. In the last researches, economist and business scholars worked on China's case study as their economic policy uncertainty and the overall corporate investment (Xie, Chen, Hao, & Lu, 2019), the effect of economic policy uncertainty on the risk spillovers within the Euro-zone by considering the Brunnermeier and Adrian to measure the risk spillovers of the sovereign bonds (Bernal, Gnabo, & Guilmin, 2016), and also on how the policy uncertainty directly weakens the sensitivity of the investment to the cost of capital within a state (Drobetz, El Ghoul, Guedhami, & Janzen, 2018). Besides, they also worked on evaluating the non-performing loan in Germany, France, Spain &Italy in economic policy uncertainty (Karadima & Louri, 2020), the causal relationship between the economic policy uncertainty, systematic risk, and the firm bankruptcies by considering the multivariate casual interference-based evidence (Stolbov & Shchepeleva, 2020), and the usage of unsupervised machine learning approach to study the economic policy uncertainty within a developing state But no one majorly considered the firm investment factor of Germany that may be affected by such an economic policy uncertainty factor, and this limitation will be overcome by this informative research.

This is informative research for the government, policymakers and economists of a Germany state to make some effective policies to overcome the uncertainty factors within the economic activities of a state after considering its valid outcomes. Also, this research paper will help the local natives of this state to understand their responsibilities towards economic growth and enhanced the firm investment. As far as its academic significance is concerned, it becomes concluded that this data will help the upcoming scholars to utilize this valid information in their research analysis portion. After this introductory section 1 which based on

discussing all the relevant information regarding this research objectives, problem statement, justification and rationale, and the significance; the section 2 will be based on discussing the theoretical and relational literature review of the selected variables of this paper. After this, section 3 will be based on discussing the research method, data collection and other analytical measures to justify the tested hypothesis. Then, the results and analysis based technical section 4 will be quite helpful to understand the statistical outcomes of this valid research. Last but not the least, the discussion and conclusion based section 5 will be based on summarizing all the above sections outcomes in a concluded form, and also discussed the future implications and limitations of this paper that will help the scholars to work on this paper's weakness in their upcoming researches.

2. Review of Past Literature

The classical theory of Knight will be considered which majorly based on considering the entrepreneurial ability to evaluate and seize the investment opportunity in the uncertainty situation and generate an excessive profit through the resource integration (Sakai, 2019a). As uncertainty is a major source of generating profit, the perfect competition based assumption will be considered on the symmetrical adjustment cost and constant rate of return. According to the classical theory of economic growth, every economy has a steady-state of GDP and any change within a state is temporary and will return (Kates, 2018; Witt, 2016). If the uncertainty based risk factor is involved in it, then there will be a chance to gain a higher return with higher risk. Its fundamental concept in the economic field was developed by Knight (1921) who considered that in the human decisions, some uncertainty factors impact the final outcomes (Sakai, 2019b; Sakai, 2019c). This theoretical approach is considered by previous researchers to differentiate the decision models under the uncertain situation, fault detection and diagnostics (Lemma, 2018; Mihalciuc, Grosu, & Musteață, 2018).

2.1. Economic Policy Uncertainty and Firm Investment

Liu, He, Liang, Yang, & Xia, (2020) discussed the effect of the economic policy uncertainty on the investment of cultural and replaceable energy firms. In their study, they also examined the irregular impact of firms like funding restriction, outward request, freehold industry, and extension chances, and studied the association between the economic policy uncertainty and investment. They concluded that the economic policy uncertainty effectively impacts the cultural energy firms and investment 0.0042, and its impact is not effective in the replaceable energy firms. Liu et al., (2020) explained the economic policy, firm investment, and financing decisions in China. They utilized the master plan of difference to examine the two different contrasts in time and benefit changeability. Their outcomes show that economic policy uncertainty has a positive impact on firm investment by decreasing the debt ratio for particular firms (Demir & Ersan, 2018).

The firm sustainability with the factors of policy uncertainty, firm investment, and firm profitability. As China has a big region so the firm profitability and firm investment are enhancing in China (Guo, Wei, Zhong, Liu, & Huang, 2020). The economic policy uncertainty, charge of capital, and collective innovation. He also investigated the effect of government economic policy uncertainty on collective innovation and recognizes the charge of a capital communication channel. According to them, the government's economic policy uncertainty enhances the firms' charge of capital which converts into the bottom change. Changing of funding labored firms majorly dependent on the outward money in the collective environment that is more affected (Xu, 2020). Many researchers focused on the impacts of economic policy uncertainty on economic activity, utilization, and financing. In his study, he enlarged their paper to investigate the impacts of economic policy uncertainty in world-wide trade, firm manufacturer, and cross-boundary trade and investment for both countries (Kirchner, 2019).

Luo & Zhang, (2020) investigated the effect of economic policy uncertainty on the stock price strike chance. In their study, they stated that the firms are more effective in the economic policy uncertainty's position. Their outcomes show that economic policy uncertainty is noteworthy related to the stock price strike chance at the local level. Demir & Ersan, 2017; Nagar, Schoenfeld, & Wellman, (2019) examined the effect of the economic policy uncertainty on firm investment in the market of the United State of America and argued the uncertainty of the U.S market in both long-term and short-term investments. When the economic policy uncertainty becomes high, the firm investment of short-term, long-term will be decreased (Chen, Lee, & Zeng, 2019). The impact of economic policy uncertainty on the economic activities in Turkey in which, they discussed the economic activities of Turkey in a crisis environment (Chi & Li, 2017; Li, 2019; Shahzad, Raza, Balcilar, Ali, & Shahbaz, 2017). In addition to this, they also compared these activities with past economic activities. In the investigation of the impact of economic policy uncertainty, they also disclosed the effect of economic policy uncertainty on the economic growth, utilization, and investment in Turkey (Sahinoz & Erdogan Cosar, 2018). In their paper, they regulated the effect of the economic policy uncertainty on the firm investment of Russian production companies. According to them, the increase of economic policy uncertainty results in a decrease of firm investment (Naidenova & Leonteva, 2020).

3. Research Methodology

As discussed in the earlier sections that the current study has been designed with the basic motive to investigate and analyze the impact of economic policy uncertainty EPU on the firm investment in Germany, therefore the researcher has collected the financial data of the listed companies of Germany and the data has been collected on quarterly basis. The time span for which the data has been composed is 20 years, all on quarterly basis. It must be noted here that the special treatment shares as well as the shares of financial companies have not been included in the data collection process. In addition, as there is the possibility of the presence of outliers in the collected data, therefore it is winsorized by the researcher so that the outlier impact can be reduced dramatically. This process involves that the obtained values which are outside the 1% and 99% quantiles are removed and the values that are present within this range are included in their place.

3.1. Variables

The dependent variable of the current study is firm investment while the independent variable is EPU. In addition to these, the researcher has also taken three control variables i.e. cash flow, company's size and sales revenue of firm. The capital expenditures have been calculated by adding the total paid cash in order to acquire all form of assets i.e. fixed, intangible and long term assets as represented in the cash flow statement provided by the particular firm. On the other hand, the EPU of Germany has been measured in context of the uncertainty index introduced by Baker. As the data in that index is provided on monthly basis but the researcher required the quarterly data. Therefore, in order to convert the monthly data into quarterly data, the researcher has used geometric mean method. Furthermore if the measurement of control variables is concerned, the first one, cash flow has been calculated in terms of net operating cash's flow by total assets at the start of the fiscal period. The next control variable, company's size has been measured in terms of the natural logs of the present assets in total. The last control variable has been calculated in context of cash received through goods selling and services provision by total assets at the start of the fiscal period (Chen & Chen, 2012; Love, 2003).

The invested capital has been taken as shareholders' equity with addition of liabilities in total and finally subtracting no interest containing current and long-term liabilities. It can be said that in the invested capital, there is no cash, financial assets fixed for trading purposes and the assets that are not capitalized. In addition, internal finance has been calculated in context of the sum of net profit and depreciation with the normalization by total assets at the start of the fiscal period. In regard of corporate ownership, the selected forms have been divided on the basis of 1 and 0 where 1 means the owner is not a government official and 0 means the owner is a government official (Chen, Sun, Tang, & Wu, 2011). In the last, marketization index has also been used to check its impact on the basic relationship of the study. In this way, all the variables of the study can be measured.

3.2. Estimation Procedure

First of all, the researcher has found the descriptive statistics of the collected data. Afterwards, the correlation test was applied on the collected data in order to uncover if there is any correlation between the variables or not. In the next step, the researcher applied the base line regression estimation on the collected data based on the following equation;

$$\left(\frac{CAP_{it}}{TA_{it}}\right) = \alpha_i + \beta_1 EPU_{it-1} + \beta_2 CASH_{it} + \beta_3 SIZE_{it} + \beta_4 SALES_{it} + \sum Year \sum Quar + \varepsilon_{it}$$

In this equation, CAP is representing capital expenditures, TA is showing total assets at the start of fiscal period, EPU is denoting economic policy uncertainty, CASH is depicting the cash flow of the firm, SIZE is denoting the size of the firm, SALES is showing the sales revenue generated by the firm, ΣYEAR and ΣQUAR have been used as the dummies of year and quarter respectively. B is representing the coefficient associated with different variables. 'i' is representing the firm which is being considered and finally t is showing the time period of the quarterly collected data from the selected firms of Germany (Baum, Chakraborty, & Liu, 2010).

4. Results Estimations

Firstly, the descriptive statistics of the variables of the study have been presented in the Table 2. The table indicates that the average firm investment in Germany has the value of 0.03 and it can reach to its maximum at 0.17. In the similar manner, the EPU on average shows the value of 1.23 which can be maximized at 3.78. The average value of cash flow is found as 0.06 and its maximum will be 0.39. Similarly, the average size of the firms of Germany is found as 0.38 with the max value of 0.85 while sales in this context show higher values i.e. 3.44 and 6.71 respectively. In the same way, the descriptive statistics of the dummy variables included in the study have also been reported evidently in the 2 panel A. In the panel B, the researcher has used the t statistics and z statistics value so that the difference of effects of EPU on firm investment can be identified in low and high uncertainty situations. Both the values can be seen as significant and thus it can be said that there is difference of impact of EPU on investment in low and high uncertainty conditions.

Table-2. Descriptive statistics.

Panel A: Descriptive Statistics						
Variables	**Mean**	**St. Dev.**	**Min.**	**Median**	**Max.**	**Observ.**
Firm Investment	0.0359	0.0715	-0.0614	0.0142	0.1724	53,645
EPU	1.2357	0.4763	0.9173	1.1622	3.7875	86,837
Cash Flow	0.0645	0.0243	-0.7132	0.0725	0.3979	52,335
Size	0.3826	0.0983	0.7163	0.0863	0.8514	58,864
Sales	3.4432	2.9521	0.6428	3.1625	6.7175	55,245
Invested Cap. Return	0.6864	0.0863	-0.1753	0.0871	0.3736	53,755
Internal Fin.	0.2542	0.0615	-0.9173	0.0615	0.2253	57,824
Ownership	0.0816	0.0614	0.6152	0.0241	0.6244	81,973
Marketization	6.6624	2.5973	0.9615	6.3523	9.4984	63,234
Panel B: Investment in low and high EPU						
High-Low Difference	Diff (T statistics)			Diff (Z statistics)		
	-7.636 [0.0000]			-5.643 [0.0000]		

The researcher has identified the correlations present between the variables by developing a correlation matrix in which the values of correlation related to all variables are presented 3. It is clear that the correlation between EPU and investment is negative which provides the evidence that EPU has negative influence on the investments made by the firms of Germany.

Table-3. Correlation Matrix.

	Firm Investment	EPU	Cash Flow	Size	Sales	Invested Cap. Return	Internal Fin.	Ownership	Marketization
Firm Investment	1								
EPU	-0.9247	1							
Cash Flow	0.2974	-0.8356	1						
Size	0.8917	0.5123	0.7111	1					
Sales	0.0182	-0.9474	0.7826	0.1422	1				
Invested Cap. Return	0.1624	0.5142	0.1642	-0.8344	0.1856	1			
Internal Fin.	0.9568	0.1542	0.1863	0.4222	0.8346	0.6142	1		
Ownership	0.5123	0.8346	-0.6142	-0.7462	-0.1426	0.0313	0.2846	1	
Marketization	-0.1724	0.7253	-0.7153	0.9657	0.8475	0.7114	0.8163	0.1331	1

The direct impact of EPU on the investment decision of firms has been checked by applying regression model and the results have been shown in the 4 evidently. In this table, there are two columns. In the first column the impact of EPU on investment is checked without the control variables and in the column 2, the same impact is checked along with the control variables of the study. According to first column, the impact of EPU on firm investment is negative and this influence is perfectly significant as per the p value presented in brackets. In the second column, the control variables have been considered as well along with the direct impact. The results show that in this case too, the EPU has negative impact with perfect significance over the firm investment. In the opposite fashion, the control variables i.e. cash flow, sales and size associated with a particular firm have shown positive influences on firm investment and all these influences are perfectly significant as well. The whole scenario means that when there is uncertainty in the economic policy, the firm's investment will fall. When the cash flow, size and revenues of a particular firm increase, it will definitely raise the investments made by the firm.

After checking the direct effect, the researcher has incorporated the heterogeneity variables for the firm and their effect on the direct impact of EFU has been searched as per the following modified equation:

$$\left(\frac{CAP_{it}}{TA_{it}}\right) = \alpha_i + \beta_1 EPU_{it-1} + \beta_2 EPU_{it-1} * HET + \beta_3 CASH_{it} + \beta_4 SIZE_{it} + \beta_5 SALES_{it} + \sum Year \sum Quar + \varepsilon_{it}$$

In this equation, HET is showing the heterogeneity variables taken by the researcher which include return on the invested capital by firm, internal finance and ownership of firm (Tong & Wei, 2011). It can be seen that in the first column, the impact of EPU is negative on firm investment but it has changed to the positive impact with the interaction of heterogeneity variable, return on capital invested. In the same way, the next two columns also show that the effect of alone EPU is negative and it is changed to positive with the interaction of any heterogeneity variable selected by the researcher. In the last column all, HET variables have

been taken and the results are in consistency with the direct results. Most of the impacts in the 5 are showing a good significance level in terms if impact of the variable on firm's investment.

Table-4. Impact of EPU on Firm Investment.

Variables	1	2
EPU	–0.0423***	–0.0072***
	[0.0000]	[0.0000]
Cash Flow		0.0472***
		[0.0000]
Size		0.0035***
		[0.0000]
Sales		0.0052***
		[0.0000]
Observations	52,816	54,762
R squared	0.031	0.043

Table-5. Impact of EPU on Firm Investment.

Variables	1	2	3	4
EPU	–0.0021***	–0.0032***	–0.0022***	–0.0013***
EPU*Return on capital invested	0.0031***			0.0042***
EPU*Internal finance		0.0012***		0.0021***
EPU*Ownership			0.0041***	0.0032
Cash Flow	0.0463***	0.0472***	0.0423***	0.0481***
Size	0.0015***	0.0020*	0.0023***	0.0019**
Sales	0.0027**	0.0030***	0.0034*	0.0032***
Observations	55,726	52,816	59,263	51,635
R squared	0.062	0.071	0.042	0.051

Table-6. Marketization Impact.

	1 (High)	2 (Low)	3 (Varied)
EPU	–0.0014***	–0.0015***	–0.0019***
EPU*Marketization (Less than 5p)			0.0031*
EPU* Marketization (Between 5p and 25p)			0.0023*
EPU* Marketization (Between 25p and 75p)			0.0011*
EPU* Marketization (Between 75p and 95p)			0.0035
Cash Flow	0.0673***	0.0532***	0.0713***
Size	0.0032***	0.0031***	0.0026***
Sales	0.0019*	0.0022	0.0026**
Observations	51,572	54,826	55,615
R squared	0.051	0.062	0.073

In the last, the researcher has incorporated the marketization index with the motive to check its influence on the basic impact of EFU on firm's investment. The results in this regard have been given in the Table 6. The first column involves the results for companies having high degree of marketization and the second column involves the results for companies with low degree of marketization. In the third column, all the interactions of marketization have been shown. The first two columns show that there is no much difference in the effect of EPU on firm's influence in high and low marketization companies. In the last, column it is evident that the companies with low level of maketization are less sensitive towards EPU but those with high marketization are more sensitive as per the results. All the interactions of marketization with EPU have shown positive along with significant results in context of the firm's performance.

5. Discussion and Conclusion
5.1. Discussion

The researcher conducted this study with the motive to find the influence that EPU has on the investments made by various firms of Germany and for this purpose, the researcher derived data from the non financial companies regarding their finance activities on quarterly basis for the time span consisting of 20 years. SYS GMM estimation was applied on the gathered data to fulfill the purpose of the study. The major result showed that EPU has important but negative impact on the investments made by the German firms. It can be said that if there are uncertainties in the policies and regulations regarding economy of the country,

then the firms are reluctant to make certain investments as they have high chances of failure. This result has been given by another study that took place in the past by another researcher (Gulen & Ion, 2016). The next result that involves the heterogeneity impact of the firms show that although EFU alone has negative or declining impact on investments but when it is incorporated with the heterogeneity variables of the firm such as return on invested capital, ownership of firm and internal financial activities, the impact of these interactions become positive on the firms' investments. This is because of the reason that these activities support the firms financially and thus enhance the investments made by them. This result can be supported by the evidence taken from the previous literature (Handley & Limao, 2015). The last result including marketization is that there is no much difference in the influence of EPU on firm investment in low and high marketization companies and when the marketization index interacts with EPU, the impact of EPU is more sensitive in case of highly marketized companies as compared to lower ones. All these results have support and evidence that can be found in the similar context past researches and thus the results of this study can be confirmed (Calomiris, Love, & Pería, 2012).

5.2. Conclusion

The major result showed that EPU has important but negative impact on the investments made by the German firms. The next result that involves the heterogeneity impact of the firms show that although EFU alone has negative or declining impact on investments but when it is incorporated with the heterogeneity variables of the firm, the impact of these interactions become positive on the firms' investments. The last result including marketization is that when the marketization index interacts with EPU, the impact of EPU is more sensitive in case of highly marketized companies as compared to lower ones. Thus the conclusion can be drawn that the policy makers must make transparent and favorable policies for the firms in regard of investments. It can also be stated that the firms that have the support of better financial practices face lower negative impact of EPU. Finally, it can be said that the firms must focus on the transparency and stability of the policies because the firms in which high level of maketization is present, face more negative impact of EPU on investments. As, the transparency and investments opportunities produce far better results than other factors. Therefore, the overall study has conclude that firm investment closely link to transparency.

5.3. Implications

This study has the implications for the policy makers of the German firms in such a way that the policy makers can get assistance from the study to make transparent and favorable policies for the firms in regard of investments. It can also guide the firms to improve their financial practices to face lower negative impact of EPU. Finally, it can also guide the firms to put focus on the transparency and stability of the policies because the firms, in which high level of maketization is present, face more negative impact of EPU on investments. The future researches must take large sized data sample and must focus on other countries and regions as well to gain their point of views.

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