Secular Stagnation and Expected Profitability in Europe

Yoichi Matsubayashi
Graduate School of Economics
Kobe University

Taiji Hagiwara
Graduate School of Economics
Kobe University

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Abstract

This study examines changes to expected profitability in Europe during the periods before and after global financial crises. As a proxy for expected profitability, we calculate Tobin`s marginal q using huge firm-level micro data, Estimations results show that in most European countries, marginal q had a tendency to shrink following Lehman shock, leading us to think that secular stagnation due to low investment will continue in Europe. We also found that factors that influence marginal q and notable a factor is uncertainty.

JEL Classification Number: E22, E32, O33
Key word : expected profitability, Tobin's marginal q, productivity, uncertainty

Correspondence to:
Yoichi Matsubayashi
Graduate School of Economics, Kobe University
Rokkodai, Nada-ku, Kobe, 657-8501, Japan
TEL +81-78-803-6852
E-mail myoichi@econ.kobe-u.ac.jp

1 Introduction

Since the 2000s, and even more after the collapse of the Lehman Brothers, private investments have been shrinking in most European countries. In the short and medium-terms, corporate investment exerts important influences on the macro economy via aggregate demand. In fact, the investment to GDP ratio is approximately 20% in the Eurozone. From a long-term perspective, it also has serious consequences for the economic growth and productivity; new investments endogenously determine productivity. It is highly probable that newly installed equipment includes various types of technological progress in production. Depending on the circumstances, strong demand for investments and the rejuvenation of equipment can promote innovation in technology and increase productivity. Therefore, it is crucial to consider the components that affects changes in investment. The key factor affecting investment can be summarized as expected profitability. In this study, to measure expected profitability, we relied on a proxy, which was Tobin's marginal q. Using a large volume of firm-level micro data, we succeeded in estimating marginal q in main European countries from 2005 to 2014. Our estimation results show that in most European countries, the value of marginal q has a tendency to shrink over time, leading us to think that secular stagnation based on lacklustre investment will continue in Europe. In addition, we found that some factors that influence marginal q, notably uncertainty. We investigate the relationship between uncertainty and investment in economically and politically unstable European countries.

The remainder of this paper is organized as follows. Section 2 introduces the concept and methodology of measuring expected profitability and provides a detailed overview of prior studies regarding this topic. Section 3 presents a methodology for measuring Tobin's marginal q. Section 4 describes the sources and processing method of data used in this study. Section 5 provides the various estimation results and investigate the determinants of marginal q. The final section summarizes the conclusions obtained in this analysis.

2 Overview

When a company decides to purchase new machinery and equipment or to build new factories, it has to consider the various kinds of conditions that it will face including future sales, future interest rates and future prices, such as capital goods prices or energy prices. In the long run, a country's economic policies, population growth and level of innovation also

affect investment decisions. All these factors can be summarized as expected profitability. Originally Keynes (1936), in his general theory, introduced the *Marginal Efficiency of Capital* (MEC) which represents discount profits expected from operating the project. A manager arranges all possible investment projects in descending order of their MEC and then accepts the project with MEC higher than the borrowing interest rate. MEC basically depends upon the states of an entrepreneur's future expectations. It may be raised or lowered depending on future economic conditions such as business booms and busts. It is also affected by animal spirits; this implies the importance of confidence and the gut instincts of an entrepreneur on their future prospects. That said, the core of Keynes's MEC theory is based on business expectations and plays a significant role in the theory of investment.

Tobin (1969) and Brainard and Tobin (1968) developed a new index of expected profit, which is the ratio defined as the market value of a firm's assets divided by the replacement cost. It is known as *average q* and is measured using the book values of firm's equity assets, divided by replacement cost of physical assets. To measure average q as an expected profit is popular and tractable because both the numerator and denominator of average q are observable and economists can estimate it using current data. In addition, they can bypass the specification of expectation of future profit because equity assets already contain information about the future profit of the firm. An alternative index of expected profit is known as *marginal q*, defined as the ratio of the incremental market value of the firm from new investments divided by their costs. It is somewhat theoretical and conceptional and it has been regarded as difficult to estimate. However, Hayashi (1982) showed that under certain assumptions such as constant returns to scale, linear homogeneity of adjustment costs functions and perfect competition, marginal q equals average q. In the empirical sense, based on the facility of measurement of expected profit, investment estimation using average q has been popular such as in von Furstenberg (1977), Summers (1981), Lindeberg and Ross (1981), Poterba and Summers (1983), Poret and Torres (1989) and Blundell et al (1992).

Although average q may contain some information concerning future business expectations, in most studies, including the ones above, empirical performances are poor and it is recognized that average q is not a sound measure of the value of investment decisions. The main reason for this is that equity assets contain some kinds of noisy factors such as bubbles and fuds, and these measurement errors do not reflect the entrepreneur's future prospect[1].

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[1] The problem of measurement error in the estimation of investment based on Tobin's q is examined in

As a background to the above empirical difficulties with average q, empirical works began to appear that calculate marginal q. The most serious problem is that marginal q is not directly observable. To overcome such empirical limitations, it is necessary to devise a method that specifies expectations and uses observable variables. Abel and Blanchard (1986), in their pioneering work in this field, estimated directly marginal q. First, they assumed rational expectation for future profit and discount rate. Second, they specified stochastic processes of current profit and discount rate[2]. Based on the above specifications, they measured marginal q using quarterly U.S. manufacturing data for the period 1948 - 1979. Gilchrist and Himmelberg (1995) (1998) applied the methodology developed by Abel and Blanchard (1986) to the panel data covering more than 400 U.S firms for the period 1979 - 1989. Ogawa and Kitasaka (1999) constructed a series of average q and marginal q using quarterly data for the Japanese manufacturing industry over 1969 - 1991. They found that there was a divergence of average q and marginal q in each industry and it did not get narrowed even if imperfect competition in the output market was taken into consideration[3].

Based on the above analysis, we measure marginal q as a proxy for expected profitability. This study differs from the extant literature in three major ways. First, we calculate marginal q using a large European firm-level micro data set. Our research database, Orbis, is the most comprehensive global company database listing over 140 million companies around the world. Large frim-level datasets are more common in European countries compared to other countries. For example, 10,200 in Germany, 150,000 in France and 17,000 in U.K. Using this database, we make a detailed calculation of marginal q that yields useful time series and cross-section information across Europe, before and after the global financial crisis. Especially after the Lehman shock, the level of private investment substantially declined in most European countries. However, in during this phase, no research focusing on the expected profitability or marginal q exists.

Second, we examine the determinants of marginal q. Marginal q is a sufficient statistic for investment in the sense that all of the information to determine the investment decision is included in q. Therefore, it is purposeful to clarify the determinants of qt. In general and context specific terms, to better inform economic policy. For example, productivity is one of the key elements of expected profitability and

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Blanchard, Rhee and Summers (1993), and Erickson and Whited (2000)(2006).

[2] They also assumes particular functional forms for the production function, adjustment cost, and the stochastic discount factor.

[3] Recently, Gala (2015) proposed the alternative methodology for measuring q based on the state space model.

increase in productivity and innovation, are essential for overcoming the stagnation. However, the effect of innovation on q may vary across countries.

Third, we carefully investigate the relationship between uncertainty and investment. As sluggish economic growth persists, uncertainty faced by entrepreneur's increases significantly and they can no longer accurately forecast their future sales and profit. As a result, they reduce investment, which stimulates others to reduce investment and trigger a downward spiral. It should be noted here that there are various types of uncertainties. Entrepreneurs face idiosyncratic uncertainty such as forecasting error in sales and profit, at the same time, they face macroeconomic uncertainties. For example, uncertainty in the financial market is significant in today's global economy. Concerns about policy uncertainty have intensified in the wake of the global financial crisis. Different types of uncertainties and different degrees of uncertainties may differently affect investment via marginal q. We can obtain a deeper, more nuanced understanding of these mechanism s because of our large panel dataset.

3 Methodology and Data

3-1 Construction of marginal q

The discounted stream of future marginal profits associated with the capital stock and is written as follows:

$$Mq_{it} = \frac{1}{p_t^I} E_t\left[\sum_{j=0}^{\infty} \beta_{t+j}(1-\delta)^j \pi_{it+j}\right] \qquad (1)$$

$$\beta_{t+j} = \prod_{i=1}^{j}\left(1 + r_{t+j}\right)^{-1} \quad j = 1,2,\ldots, \quad \beta_t \equiv 1$$

p_t^I: price if investment good (deflated by the general price index)
π_{t+j}: real profit rate
r_{t+j}: discout rate
δ: phsical depreciation rate
$E_t[\ \ ]$: conditional expectation operator upon the information availavle in period t

To operationalize Equation. (1), one has to know the stochastic structure underlying the profit rate and discount factor. Gilchrist and Himmelberg (1995)constructed a series of marginal q based on the multivariate autoregressive specification of the underlying factors in a panel data context. Similar to Gilchrist and Himmelberg (1995), we adopt a multivariate

autoregressive specification, because the profit rate and discount factor, which are calculated using the required interest rate, may mutually determine each other.

The stochastic process for profit rates and the discount factor is specified as in the following panel VAR model:

$$\Delta d_{it} = b_{10i} + \sum_{j=1}^{k} b_{1j}\,\Delta d_{it-j} + \sum_{j=1}^{k} b_{2j}\,\Delta \pi_{it-j} + \epsilon_{1it} \tag{2}$$

$$\Delta \pi_{it} = b_{20i} + \sum_{j=1}^{k} b_{3j}\,\Delta d_{it-j} + \sum_{j=1}^{k} b_{4j}\,\Delta \pi_{it-j} + \epsilon_{2it} \tag{3}$$

$$d_{it} = \frac{1-\delta}{1+r_{it}}$$

When the stochastic process is characterized by Equations. (2) and (3), marginal q can be written as follows[4]:

$$Mq_{it} = \left\{\frac{\pi_{it-1}}{1-d_{it-1}} + \frac{\pi_{it-1}}{(1-d_{it-1})^2}\,c'(1-d_{t-1}M)^{-1}MB_{it-1} + \frac{\pi_{it-1}}{(1-d_{it-1})^3}\,c'(1-d_{t-1}M)^{-1}M\theta + \right.$$

$$\left.\frac{1}{1-d_{it-1}}\,d'(1-d_{t-1}M)^{-1}MB_{it-1} + \frac{1}{(1-d_{it-1})^2}\,d'(1-d_{t-1}M)^{-1}M\theta\right\}\frac{1}{p_t^I} \tag{4}$$

$$B_{it} = \theta + MB_{it-1} + \xi_{it}$$
$$\theta' = [b_{10i}, \ldots, 0, b_{20i}, \ldots, 0\ ]$$
$${B_{it}}' = [\Delta d_{it}, \Delta d_{it-1}, \ldots, \Delta d_{it-k+1}, \Delta \pi_{it}, \Delta \pi_{it-1}, \ldots, \Delta \pi_{it-k+1}\ ]$$
$${\xi_{it}}' = [\varepsilon_{1ti}, \ldots, 0, \varepsilon_{2ti}, \ldots, 0\ ]$$
$$c' = [1, 0, \ldots., 0]$$
$$d' = [0, \ldots., 0, 1, \ldots., 0]$$

[4] The main steps for the derivation in Equation. (4) are as follows. First, Equation. (1) is linearized around the steady-state level of the profit rate and discount factor. Then, Equations. (2) and (3) are substituted into the linearized Equation. (1) and requisites transformations are made.

$$M = \begin{pmatrix} b_{11} & b_{12} & \ldots & b_{1k-1} & b_{1k} & b_{21} & b_{22} & \ldots & b_{2k-1} & b_{2k} \\ 1 & 0 & \ldots & 0 & 0 & 0 & 0 & \ldots & 0 & 0 \\ 0 & 1 & \ldots & 0 & 0 & 0 & 0 & \ldots & 0 & 0 \\ . & . & \ldots & . & . & . & . & \ldots & . & . \\ 0 & 0 & \ldots & 1 & 0 & 0 & 0 & \ldots & 0 & 0 \\ b_{31} & b_{32} & \ldots & b_{3k-1} & b_{3k} & b_{41} & b_{42} & \ldots & b_{4k-1} & b_{4k} \\ 0 & 0 & \ldots & 0 & 0 & 1 & 0 & \ldots & 0 & 0 \\ 0 & 0 & \ldots & 0 & 0 & 0 & 1 & \ldots & 0 & 0 \\ . & . & . & . & . & . & . & \ldots & . & . \\ 0 & 0 & . & 0 & 0 & 0 & 0 & \ldots & 1 & 0 \end{pmatrix}$$

3-2 Data

We calculate marginal q in major European countries using firm-level micro data. Our micro database is Orbis, a globally comprehensive company database.

【 Table.1 】

The number of firms in European countries is summarized in Table.1. Particularly in large European countries such as Germany, France, U.K, Italy and Spain there are more than 40,000 companies. Using this data set, marginal q is calculated based on Equation. (4) and one has to know the stochastic structure underlying the profit rate and discount factor. The profit rate (π_t) is calculated as the ratio of operating profit to real capital stock that is computed using the above procedure. The subjective discount factor (d_t)consists of the nominal discount rate (r_t) and the physical depreciation rate. The nominal discount rate is calculated using the following method: r_t= (interest and discount paid + bond interest expenses) / (short-term and long-term loans payable + bonds payable + notes receivable discounted)[5].

4 Dynamics of marginal q

First, in Figure.1, we can examine the movements of private investment in major European countries.

【 Figure.1 】

[5] For the estimation of Panel VAR expressed in Equations. (2) and (3), Lag length is set to one.

As can be seen from Figure.1, in most European countries, there are three notable changes during the period 2000 - 2015. In the first half of 2000s, private investment had increased steadily in most countries. In 2008, investment shrunk dramatically due to the Lehman shock. After that, most European countries began to show signs of secular stagnation in investment. A careful examination reveals that investment has worsened further since 2011 due to Greece's economic turmoil.

【 Figure.2 】
【 Figure.3 】

Further, Figure.2 shows the fan chart of marginal q for the period 2005 - 2014 using method which were introduced in Section 3. The darkest line denotes the median value of marginal q in each period: the color of the fan chart lightens, as the distribution frequency decreases. To clarify the movement of marginal q shown in Figure.2, the median value trend in each country are summarized in Figure.3.

From Figures 2 and 3, some common features of movement are evident among countries. Marginal q increased gradually from 2005 to 2007. In 2008, however, it fells sharply due to the Lehman shock. After a slight recovery in 2009, it again shows a declining tendency over the period 2010 - 2013. Like the movement of private investment, marginal q has deteriorated further since 2011, due to the Greek shock. In 2014, there were signs of slight reversal in this downward trend in some courtiers but the recovery failed to gain much momentum. The only exception is the UK. In the UK, there is a continuous growth tendency since 2005. The two which in 2008 and 2011, did not shrink marginal q which remained relatively high in UK, compared to other major European countries, such as Germany and France.

【 Figure.4 】

Also from Figures 2 and 3, cross-country differences can be observed. Figure.4 illustrates the difference of the median value of q in 2014 in the shade. The more color is dark, the more marginal q is high. We found Germany's median q to be around 0.65 in 2014 and France, UK are around the same level. Southern European countries, such as Italy and Spain, the values were lower. In Nordic countries, such as Sweden, Norway and Denmark, the median value is around 1 and shows higher value than that of Germany or France. East European courtiers' marginal q are overall low compared with western and northern European countries.

5 Determinants of marginal q

5-1 Key determinants

As shown in Section 4, marginal q shows a declining tendency in most European countries. It is now worth considering what the key factor of marginal q is. As mentioned in the introduction, marginal q is a sufficient statistic for investment in the sense that all the information required to make an investment decision is included in q. Therefore, it is quite important to clarify what kind of factors exist in each country. For example, productivity is one of the key elements of expected profitability; increased productivity; and innovation are essential to overcome long run investment stagnation. In the empirical literature, Total Factor Productivity (TFP) is the most popular proxy for productivity. TFP is the portion of output not explained by the amount of inputs used in production and it is measured by the Solow residual. In our study, TFP is measured using a firm-level database (Orbis) which was used to measure marginal q in Section 3.

【 Figure.5 】

The median value of TFP from 2005 to 2013 for each country are shown in Figure.5. Especially in large European countries such as Germany, France, Italy and Spain, TFP has been gradually declining since the mid-2000s. In the UK, although there were decline in 2008 and 2011, the upper trend does not change. Nordic countries, such as Sweden, Norway and Denmark shows relatively high values of TFP and also gradual declining tendency.

Now we try to examine the relationship between marginal q and TFP. Here we regress
the median value of marginal q shown in Figure.3 on the median value of TFP shown in Figure.5. Due to possibility of autocorrelation in the disturbance term, we conduct a dynamic panel model (Arellano and Bond difference GMM estimation)

【 Table.2 】

The estimation results summarized in Table 2 shows a strong significant effect of TFP on marginal q. This indicates that the gradual shrinking tendency of expected profitability and investment in Europe is basically due to the decline in productivity.

5-2 Uncertainty and investment

Since the 2000s, European countries have experienced deep uncertainty shocks such as

Lehman shock in 2008, the Greek shock in 2011 and UK's exit from the EU in 2016. In general, uncertainty shocks have a negative impact on investment via expected profitability[6].

Although we recognize that uncertainty plays a significant role in investment decision, it appears to be difficult to measure economic uncertainty. Various proxies of uncertainty have been constructed such as volatility of stock prices, firms' ex-post forecast errors, and the frequency of newspaper articles regarding economic and political uncertainty[7].

In our study, as a preliminary examination, we consider two types of proxies for uncertainty. First, we use the VIX index as a measure of global financial uncertainty. The VIX is a popular measure of global financial market expectations of volatility conveyed by Standard & Poor's stock index option price and is considered a premier global barometer of investors' sentiment and uncertainty. Second, we set the Economic Policy Uncertainty (EPU) index developed by Baker et al (2015). EPU is an uncertainty index based on huge numbers of newspaper articles concerning policy-related economic uncertainty[8].

【 Table.3 】

As shown in Table.3, both types of uncertainty exert a significant negative effect on marginal q. This indicates that financial and political uncertainty shocks occurring since the mid-2000s have shrunk private investment, resulting in secular stagnation.

6 Conclusions

Using firm-level financial data of main European countries, this study measures marginal q as a proxy for expected profitability before and after global financial crises. Our estimations results show that in most European countries, the value of marginal q has

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[6] Recently some research works concerning the relationship between uncertainty and investment have been published such as Arslan et al (2015), Bloom (2009)(2014), Bloom et al (2007)and Bachmann et al (2013).

[7] Jurado et al (2015) conducted comprehensive survey for measuring uncertainty.

[8] Our empirical study is based on firm-level micro data, and it is important to measure the uncertainty index using firms' ex-post forecast errors as developed by Bachmann et al. (2013) Arslan et al. (2015) and Miyao (2009)

had a tendency to shrink over time, leading us to think that secular stagnation based on low investment will continue in Europe. We also found that some factors that influence marginal q, notably productivity and uncertainty. In particular, we could clarify the relationship between uncertainty and investment in economically and politically unstable European countries. Private investment may be weak not only due to financial volatility, but also due to regime uncertainty created by economic policies, as in the cases of the Greek crises and 'Brexit' . Therefore, currently in Europe, political decisions are not the solution for secular stagnation; they may actually be the source of this serious problem.

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References

Abel., A. B. and O. Blanchard, (1986), "The Present Value of Profits and Cyclical Movements in Investments," *Econometrica*, Vol 54, pp 249-273.

Arslan, Y., A Atabek, T Hulagu, and S. Sahinoz (2015), "Expectation Errors, Uncertainty, and Economic Activity", *Oxford Economic Papers*, 67(3): pp.634–660.

Bachmann, R., S. Elstner, and E. R. Sims (2013), "Uncertainty and Economic Activity: Evidence from Business Survey Data", A*merican Economic Journal: Macroeconomics*, 5(2): pp.217–249.

Baker, S.R., N. Bloom, S. J. Davis, (2015), "Measuring Economic Policy Uncertainty," NBER working paper, No.21633.

Barkbu, B., S. P. Berkmen, P. Luckyantsau, S. Saksonovs and H. Schoelermann (2015), "Investment in the Euro Area: Why Has It Been Weak? " IMF Working paper, No.22.

Blanchard., C. Rhee, and L. Summers, (1993), "The Stock Market, Profit and Investment," *Quarterly Journal of Economics*, 108, pp.261-288.

Bloom, N (2009), "The Impact of Uncertainty Shocks," *Econometrica,* 77 no. 3 (May), 623-685.

Bloom, N (2014), "Fluctuations in Uncertainty," *Journal of Economic Perspectives*, Vol. 28, No. 2, pp. 153-176.

Bloom, Nicholas, Stephen Bond, and John van Reenen (2007). "Uncertainty and Investment Dynamics," Review of Economic Studies, 74, 391-415.

Blundell, R., S, Bond, M, Devereux and F, Schiantarelli, (1992), "Investment and Tobin's Q," *Journal of Econometrics* ,51, pp.233-257.

Brainard, W. C and J. Tobin, (1968), "Pitfalls in Financial Model Building," *American Economic Review,* Vol.58 (2), pp.99-122.

Eberly, J. C., S. Rebelo, and N. Vincent, (2012), "What explains the lagged investment effect?" *Journal of Monetary Economics*, 59(4), pp 370-380.

Erickson, T and T. Whited, (2000), "Measurement Error and the Relationship Between Investment and Q," *Journal of Political Economy*, 108, pp.1027-57.

Erickson, T and T. Whited, (2006), "On the Accuracy of Different Measures of Q," *Financial Management*, 35, pp.5-33.

Gala, V. D. (2015) "Measuring Marginal q," AEA meetings.

Gilchrist, S and C. Himmelberg (1995), "Evidence on the Role of Cash Flow in

Investment," *Journal of Monetary Economics*, Vol 36, pp 541-572.

Gilchrist, S and C. Himmelberg (1998)," Investment: Fundamentals and Finance," *NBER Macroeconomics Annual* 1998, volume 13, pp.223-274.

Hayashi, F (1982), "Tobin's Marginal q and Average q: A Neoclassical Interpretation," *Econometrica*, Vol.50, pp.213-224.

Jurado, K., S. C. Ludvigson, and S. Ng (2015), "Measuring Uncertainty", *American Economic Review,* 105(3): pp.1177–1216

Lindenberg, B. and S. A. Ross (1981), "Tobin's q Ratio and Industrial Organization," *Journal of Business* , 54 (1), pp.1-32.

Matsubayashi. Y (2011), "Exchange Rate, Expected Profit and Capital Stock Adjustment: Japanese Experience," *Japanese Economic Review*, Vol.62(2), pp.215-247.

Miyao. R (2009) "Corporate investment in Japan: Role of uncertainty since 1990s,"Monetary and Economic Studies , Vol.28(1), pp.1-22, Institute for Monetary and Economic Studies, Bank of Japan

Morikawa. M (2016), "Business Uncertainty and Investment: Evidence from Japanese Companies," RIETI Discussion paper, 16-E-014.

Ogawa, K. and S. Kitasaka (1999), "Market Valuation and the q Theory of Investment", *Japanese Economic Review*, Vol. 50(2), pp. 191–211.

Poret, P. and R. Torres (1989), "What Does Tobin's q Add to Modeling of Investment Behavior?, " M. Funke, ed., *Factors in business investment*, Springer.

Poterba, J. M. and L. H. Summers (1983), "Dividend Taxation, Corporate Investment and 'q', *Journal of Public Economics* 22, pp.247-273.

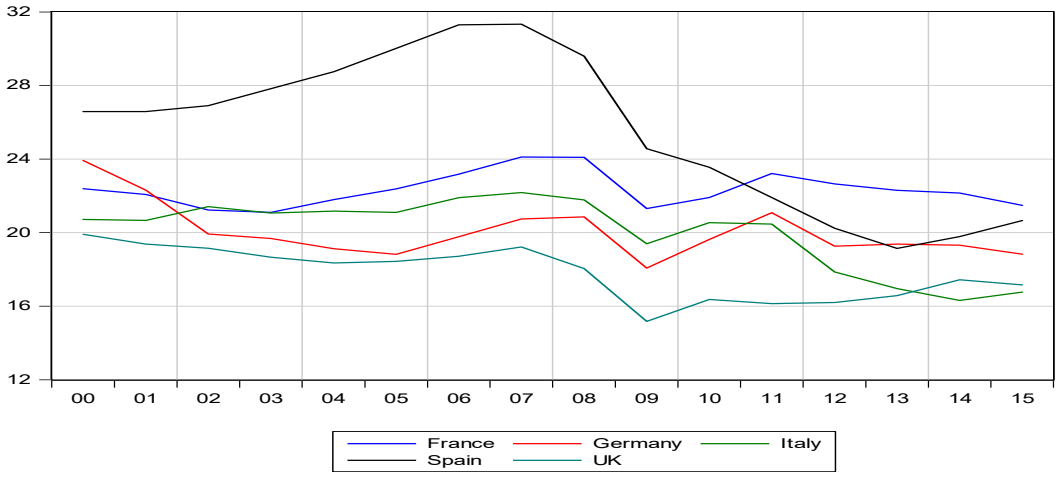
Summers, L.H (1981), "Taxation and Corporate Investment- A q-Theory Approach," *Brookings Papers on Economic Activity* 1, pp.67-140.

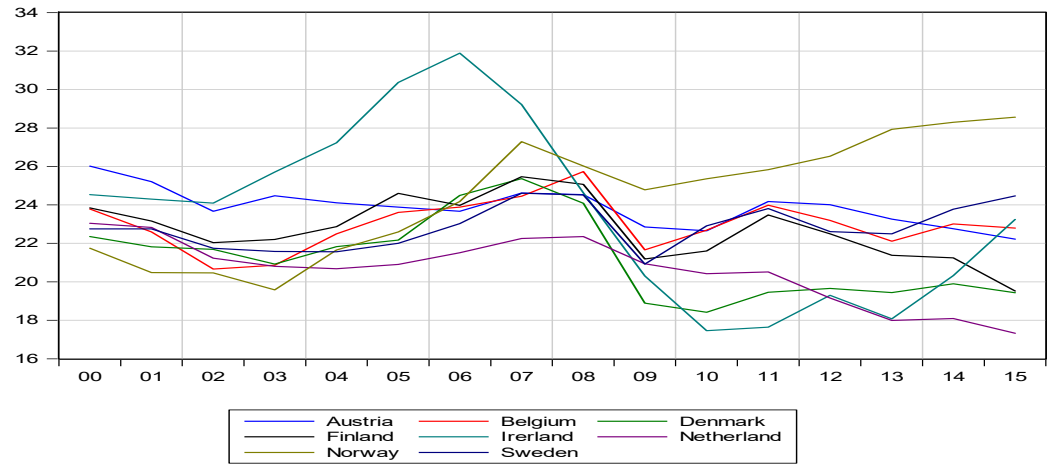
Tobin. J (1969), "A General Equilibrium Approach to Monetary Theory". *Journal of Money, Credit and Banking*. 1 (1), pp.15–29.

Von Furstenberg, G.M (1977), "Corporate investment: Does Market Valuation Matter in the Aggregate," *Brookings Papers on Economic Activity* 2, pp.347-408.

Figure.1 Change of investment in Europe

2000-2015





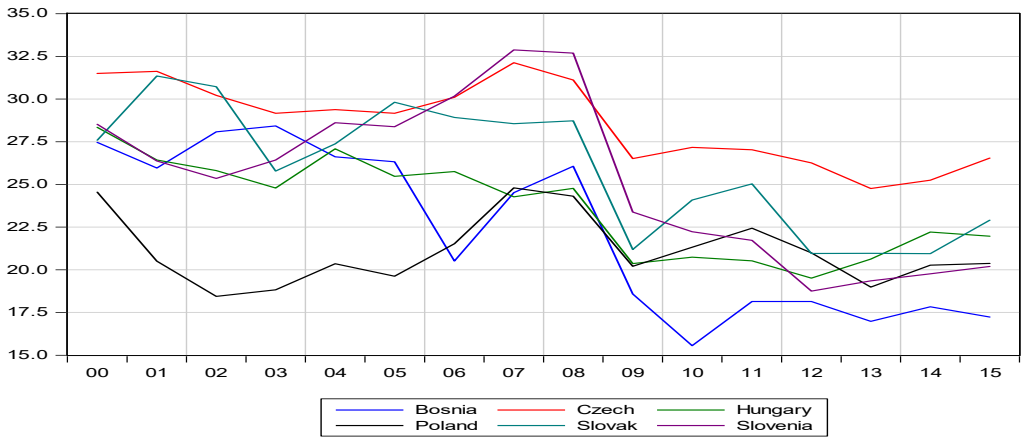
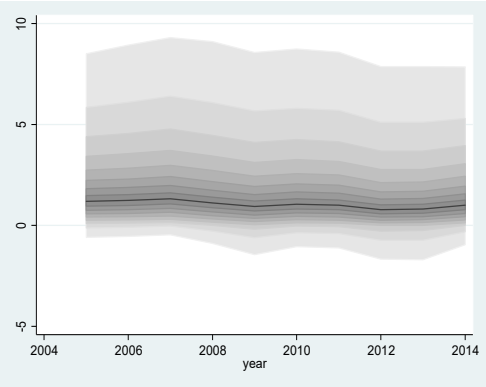
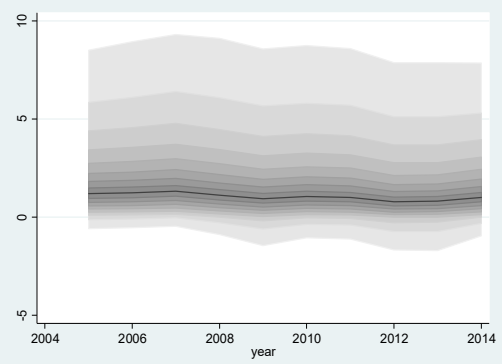


Figure.2 Fan chart of Marginal q in major European countries:
2005-2014

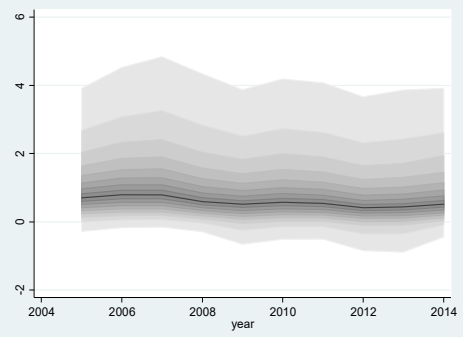
German(DE)



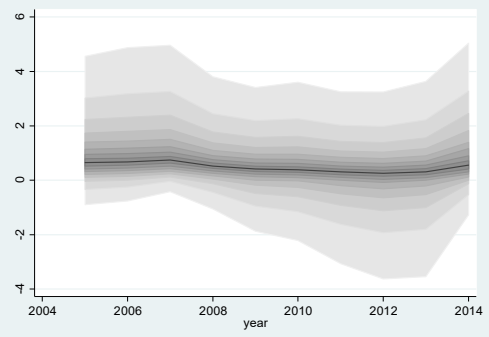
France (FR)



Italy (IT)

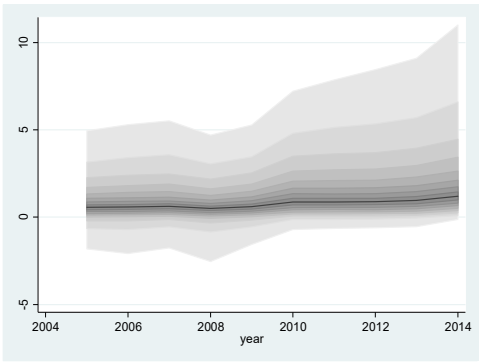


Spain (ES)

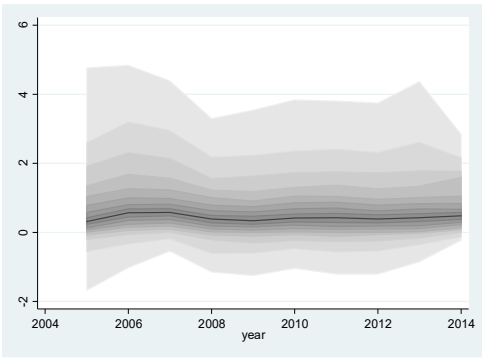


United Kingdom (GB)

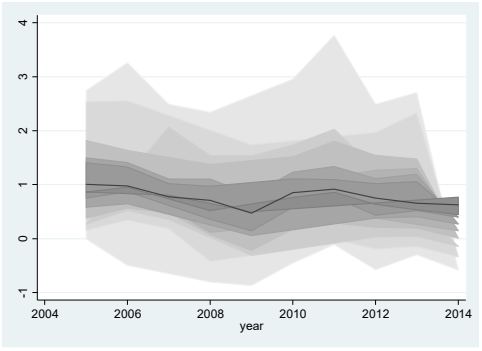
Ireland (IE)



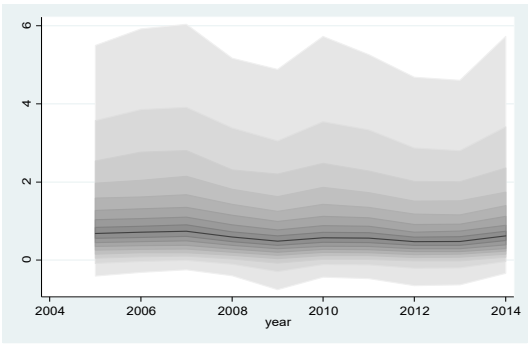
Denmark (DK)



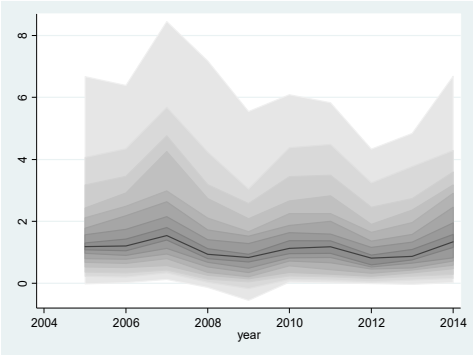
Belgium (BE)

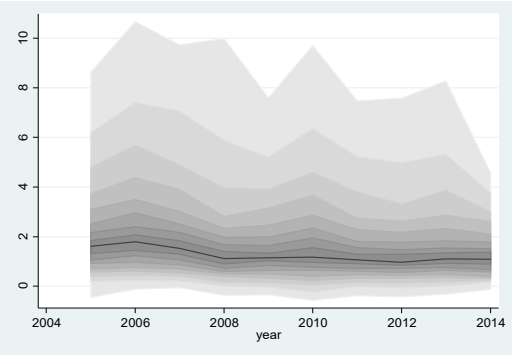


Sweden (SE)

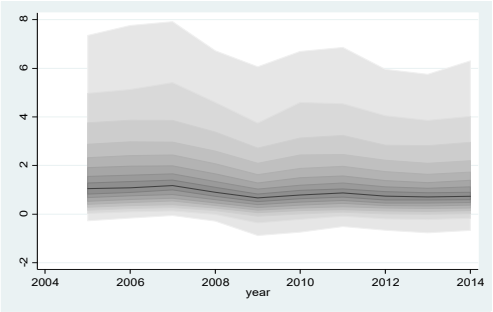


Norway (NO)



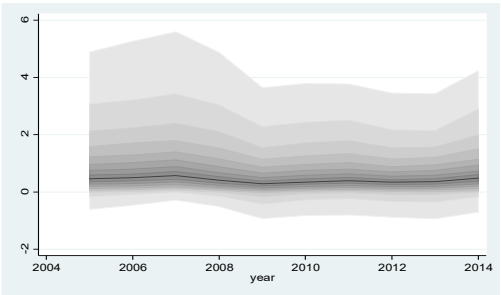


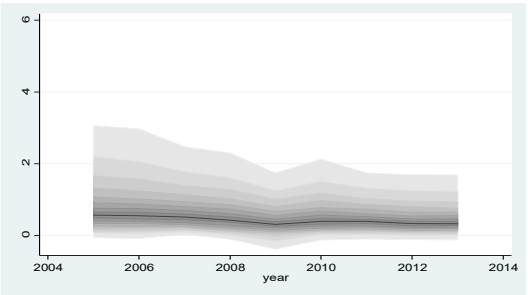
Finland (FI)



Czech Republic (CZ)

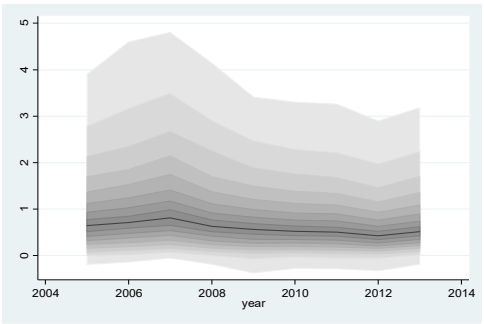
Slovak Republic (SK)

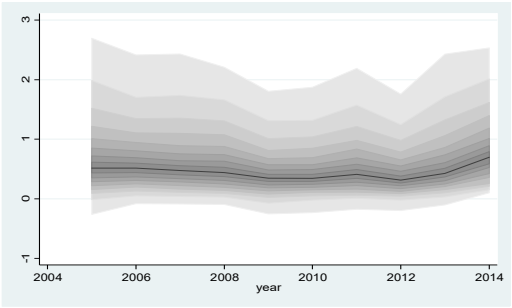




Poland (PL)

Hungary (HU)





Slovenia (SL)

Serbia (RS)

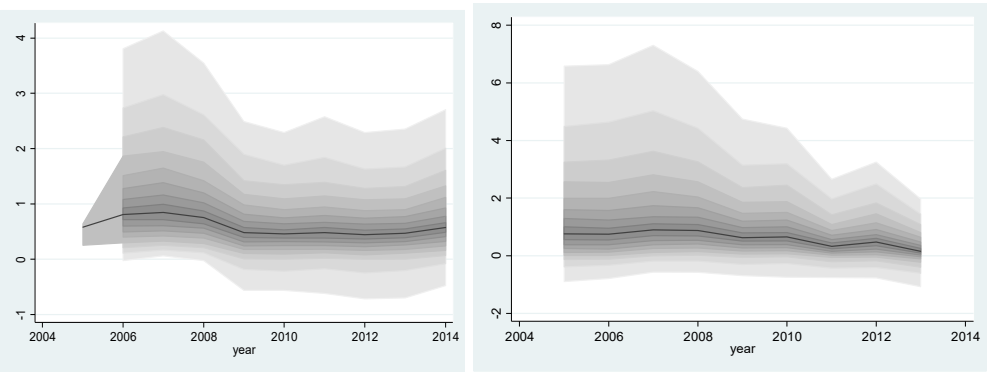
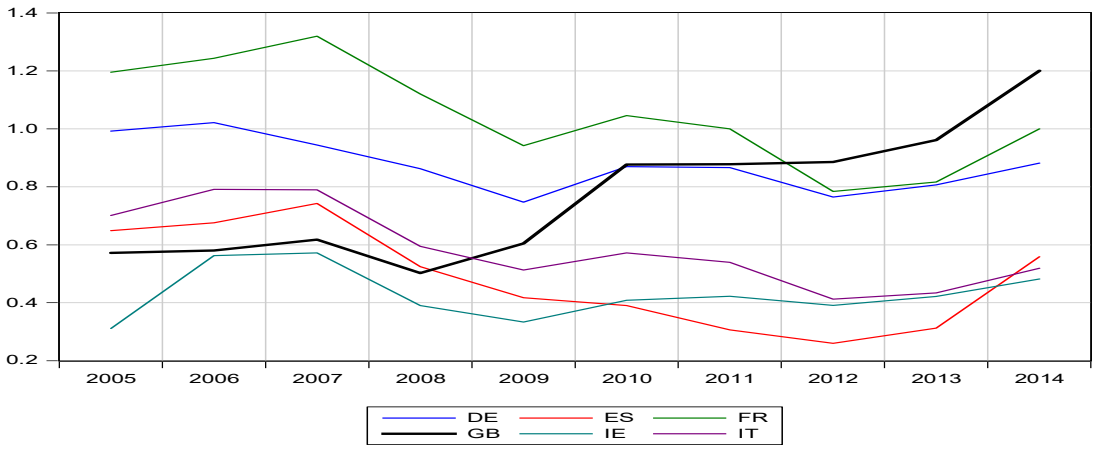
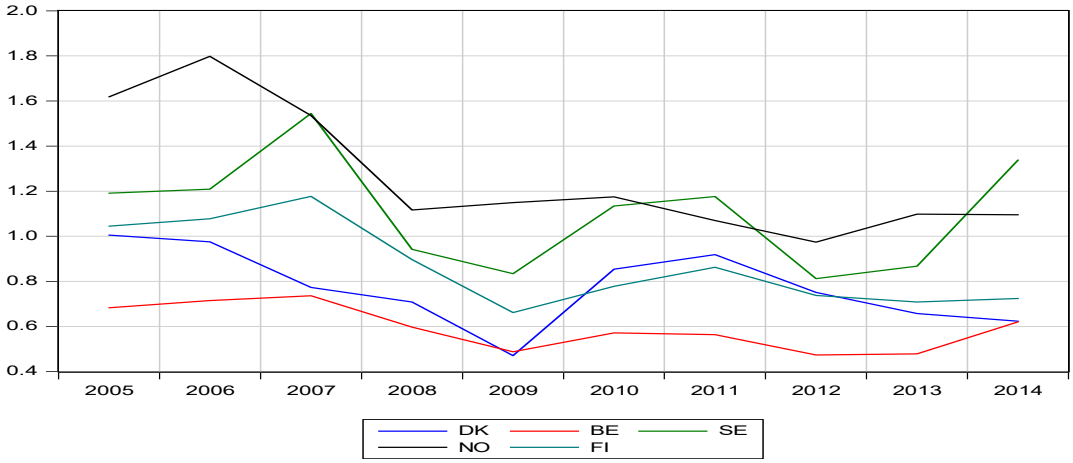


Figure.3　Change of marginal q

2005-2014





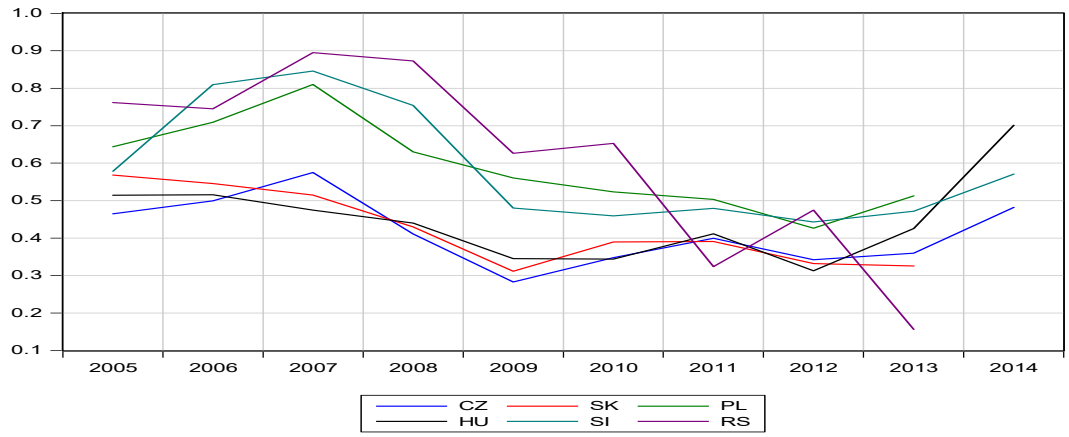


Figure. 4

Distribution of marginal q in Europe

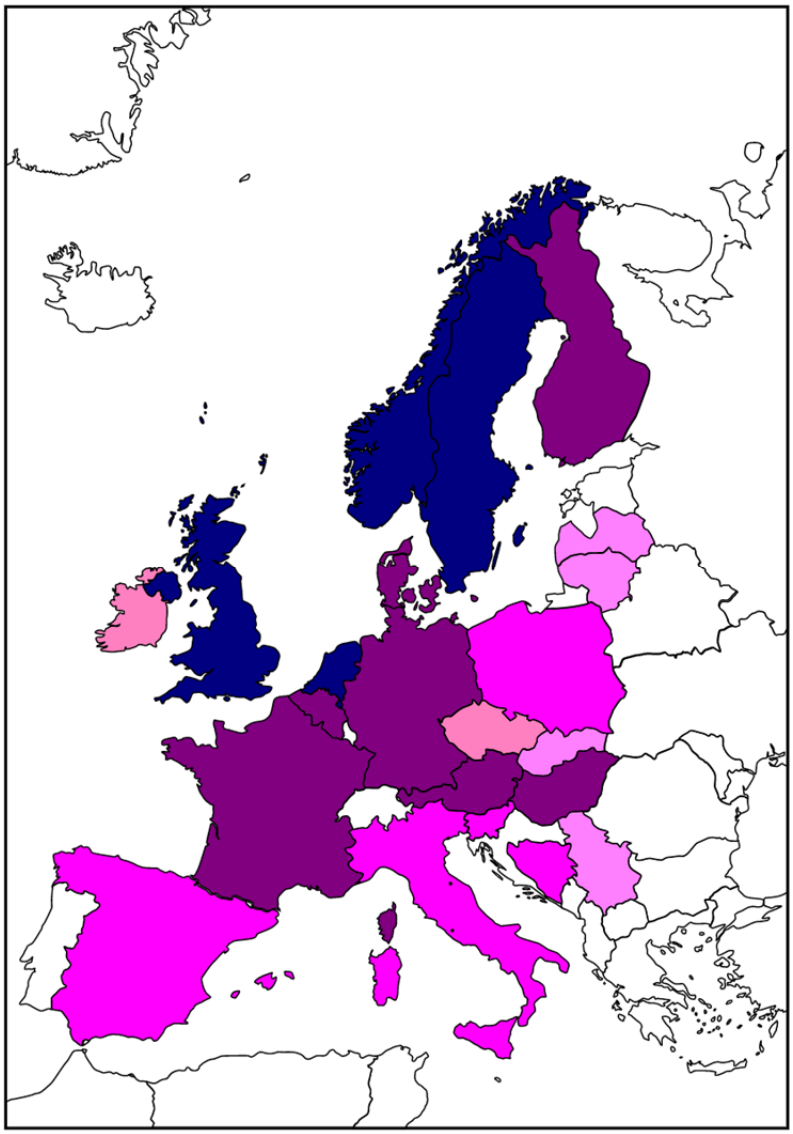
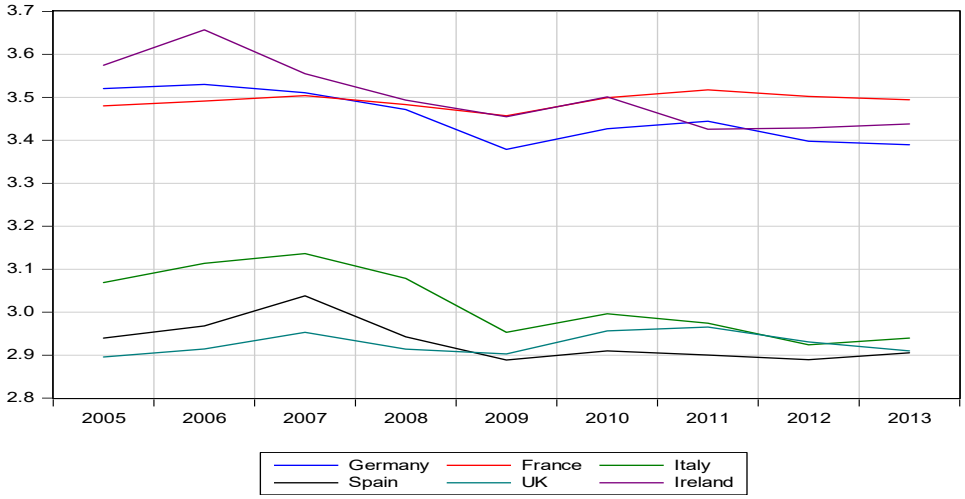
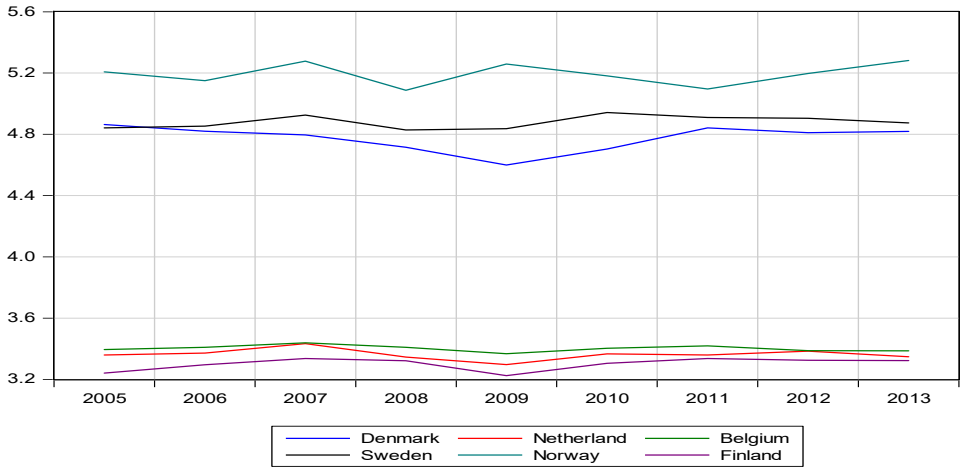


Figure.5
Change of TFP in Europe
2005-2013





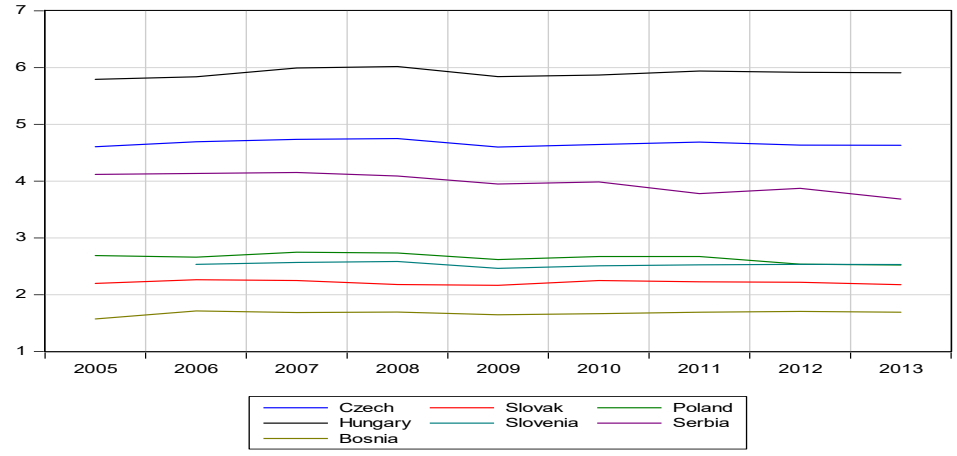


Table. 1

Number of Companies

Country	number	Country	number
Germany	10181	Sweden	276
France	151021	Norway	413
Italy	104349	Finland	5194
Spain	197448	Czech Republic	9560
United Kingdom	16900	Slovak Republic	912
Ireland	1220	Poland	5576
Denmark	10181	Hungary	2677
Netherland	324	Slovenia	2637
Belgium	6433	Serbia	2975

Table. 2 marginal q and productivity

2005-2014

Mq(-1)	TFP	J statistics	Instrument
0.436	1.041	16.670	Const, Mq(-2)
(6.624)	(21.997)		
0.360	1.249	17.521	Const, Mq(-3)
(12.854)	(24.488)		

The values of parentheses are t-value

Table. 3 marginal q, productivity and uncertainty

2005-2014

Mq(-1)	TFP	VIX	EPU
0.507	0.978	-0.004	
(49.687)	(19.550)	(-21.885)	
0.288	0.940		-0.001
(9.569)	(8.352)		(-13.875)

The values of parentheses are t-value