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Contact: Tomasz Rólczyński, redakcja@wsb.wroclaw.pl, +48 71 376 23 43, ul. Fabryczna 29-31, 53-609 Wrocław, Poland

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The effects of monetary policy on house prices in Spain: the role of the economic and monetary union membership in the housing bubble prior to the great recession

Tibor PÁL
AGH University of Science and Technology, Poland

Abstract:

Aim: This paper aims to discover the evolution of monetary transmission in Spain by focusing on the short-term interest rate, credit aggregates and house prices through different stages of economic development and European integration between 1975 and 2008. In addition, the analysis devotes special attention to the interval of the last housing boom, in order to reveal the importance of the interest rate policy of the ECB.

Design / Research methods: The study applies a tri-variate autoregressive model assigned to three overlapping periods outlined by regime shifts in the Spanish economy. The estimation output determines the strength and persistency of the links between interest rates, credit aggregates and house prices. Consequently, the results of the econometric analysis provide proper base for comparison in order to identify the dominating channels of monetary transmissions through a prolonged period.

Conclusions / findings: It is found that the transmission mechanism in Spain essentially altered over time since 1975. At the beginning of the full analysed interval the role of the credit channel was dominant, then its importance gradually diminished. After the EMU accession the traditional interest rate channel became the leading factor with an intensified and more persistent effect on house prices.

Originality / value of the article: While there are numerous researches aimed at estimating the impact of monetary policy on the real economy, empirical studies focusing exclusively on the link between interest rate policy and house prices in Spain are still rare. As the present paper concentrates solely on the Spanish characteristics through extended interval, the study provides country-specific inferences.

Implications of the research: Understanding the mechanism of the monetary policy effects on the housing sector is an essential aspect of designing policy interventions aimed at keeping house price development in check.

Limitations of the research: Despite the significant results of the empirical analysis, the excessively dynamic increase in the property prices suggests that the factor of irrational expectations also played important role in the latest Spanish housing bubble.

Key words: Monetary policy, VAR, ECB, Housing boom, Monetary transmission mechanism
JEL: E52, E58.
1. Introduction

The latest nationwide housing bubble in the United States, which was a crucial conditional factor of the subsequent global financial crisis (GFC) of 2008, was not unique: at that time most advanced economies experienced substantial expansion in the residential investment sector and among them the Spanish housing boom was outstanding.

Fitting into the global economic trend, the accompanying prosperity was also prominent: the country experienced a more than a decade long sustained economic expansion together with a dynamic growth in residential investment, private consumption and credit aggregates.

The exceptional economic prosperity was the fruition of the preceding socio-economic transition along with the European integration from the 1970s onward by passing through multiple regime shifts. After the onset of the democratic transformation initiated by the end of the Franco era from 1975 onwards, the process of European integration was brought forward by joining the European Union (EU) in 1986. Yet, the accession to the European Monetary Union (EMU) in 1999 most certainly represents a milestone in the country’s economic history.

In almost fifty years, from being an underdeveloped country until the mid-twentieth century, Spain reached an important position on the global stage. In 2007 it turned into the 13th largest economy in the world according to its total GDP and it became a member of the 22 countries with the highest output per capita in the world: the GDP at current prices increased from 169.1 billion dollars in 1975 to 1474 billion in 2007, that is, the production multiplied by near 9 times in 27 years (OECD, nd.). Parallel with the progressive growth, the economic environment gradually became more favourable as well: the yearly inflation rate steadily dropped from the modern-time documented highest peak of 27.2 experienced in 1977 to below 10 percent at the time of the EU accession with a further decrease onward to around 3 percent. In addition, the short-term interest rate fell from its historical peak of 26.1 percent recorded in 1978 to below 8 percent in 1994, when the national central bank (Banco de España) became independent and afterwards – due to the scheduled Spanish convergence to the monetary union – the rate dropped below 3 percent in 1999
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(OECD, nd). Graph 1 demonstrates the historical evolution of the inflation level together with short-term interest rates by representing three intervals outlined by the main regime shifts: the ‘Moderation’ accounts for the period from the beginning of the Spanish democratic transition to the EMU accession, the ‘Exuberance’ stands for the interval from the EU accession to the beginning of the GFC and finally the ‘Euro Era’ accordingly focuses solely on the EMU period. It is conspicuous from the illustration that the level of the two indices was steadily decreasing with diminishing volatility through the analysed intervals.

It is important to note that the EMU accession not only entailed the adoption of a common currency and a single monetary policy administered by the ECB but it introduced the country to an integrated financial environment as well, where the obstacles of capital flows became substantially relaxed. As a result, the country experienced a massive capital inflow which also contributed to the domestic housing surge. Furthermore, the gradual deregulation process on the mortgage market from the 1980s onwards extended the space for the intensified housing demand. The introduction of securitization in 1992 by the Law of Securitization Vehicles and the further deregulation in 1998 also improved the mortgage credit activity by allowing banks to finance a large portion of bank lending (Carbó et al. 2011). These improvements with the important landmark of EMU accession also verify the designation of the multiple phases in the Spanish economic progress.

The housing sector in Spain has been traditionally accounted as a leading factor for supporting the economic prosperity. Similarly, the majority of experts argue that the housing demand was the main engine of the latest Spanish economic expansion (e.g. Esteban, Altuzarra 2008; Palomera 2013; Rodríguez 2016; Navarrete 2016).

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1 Cuestas (2017) found evidence for positive relationship between house prices and foreign capital inflow by substituting the amount of mortgage credit by changes in net foreign assets in his VAR model.

2 The mortgage bond issuance had been monopolized by the Spanish Public Mortgage Bank until 1981 when the Mortgage Market Act, which authorized commercial banks to grant mortgages and extended both their length and the maximum legal loan-to-value percentage, gave the first prominent impetus toward the deregulation process (Palomera 2013).

3 Palomera (2013) emphasizes that the credit easing was also promoted by the ECB.
The empirically correlated business cycles with the house price fluctuations\textsuperscript{4} offer a reason for the critical scrutiny of the mechanism of monetary policy in the context of the housing market and the connected intermediate lending activity through this period. Therefore, a systematic analysis of the links between the three variables through the different stages of the European integration can provide a better insight into how the interest rate policy operated in the property sector.

**Graph 1. Historical development in short-term interest rates and inflation level**

![Graph showing historical development of interest rates and inflation level](image)

Source: OECD, own editing.

By focusing on the house price development through the above introduced phases of the Spanish progression, the aim of the article is twofold. First, it attempts to explain the development of the house prices in the context of the monetary transmission mechanism and to measure its responsiveness to the interest rate policy. Second, by focusing solely on the period of the last housing bubble, an estimation is made to discover the role of the European Central Bank’s (ECB) interest rate policy in the Spanish residential boom. To answer these questions, I conduct an analysis.

\textsuperscript{4} The generic causality between asset-market behaviour and the real economy is explored by for example Fisher (1933); Bernanke, Gertler (1995); Bernanke et al. (1996); Higgins, Osler (1997); Case et al. (2001) and Iacoviello (2005).
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using a tri-variate Vector Autoregressive Model (VAR) to expose the multidirectional interlinkage between the main engines of the considerable expansion of the Spanish economy. The econometric approach applied in the study is in line with Goodhart and Hofmann (2008), Bjørnland and Jacobsen (2010), who aimed at discovering the role of house prices and credit growth in the economic activity in European countries. Furthermore, Ciccarelli, Maddaloni and Peydró (2013) estimate the impact of the ECB’s monetary policy on aggregate output through different time horizons including credit aggregates in their model. Although I use a similar econometric methodology, there are some significant differences. On the one hand, the VAR model employed in the study focuses solely on the Spanish economy in order to gain country-specific inferences in accordance with the purpose of the paper. On the other hand, as the central concern of the paper is the impact of monetary policy on house prices, the VAR model excludes the variables connected to output and consumption.

Accordingly, the central research hypothesis can be expressed in the following way. In parallel with the European integration and economic developments, the monetary transmission channels influencing house prices altered and the low interest rate environment brought by the Eurozone accession significantly contributed to the evolution of the housing boom which later transformed into a housing bubble.

The paper is organized as follows. In the next section, a survey on the monetary transmission mechanism with a literature review is performed, focusing on the three variables which constitute the subsequent econometric analysis. In Section 3, the data analysis and the applied methodology are presented together with the VAR outputs. Finally, Section 4 presents the main econometric results harmonized with the connected macroeconomic theories. The article ends with the conclusion.

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2. Overview of the monetary transmission mechanism from the real estate perspective

Before exploring the effects of monetary shocks on the property market in Spain, it is appropriate to put housing in a theoretical and empirical framework of monetary economics developed until today. This section is aimed at summarizing these findings by connecting the interest rate policy (as it represents the primal instrument of monetary policy\textsuperscript{6}) and financial intermediates (as it represents the channels associated with the financial market imperfections applied in non-neoclassical monetarist view\textsuperscript{7}) with house price alterations.

After an extended period with a marked importance on the non-monetary features of business cycles, from the late 1980s onwards academic focus drifted to the evaluation of monetary policy in the short-term course of the real economy. As a result, a broad consensus has been reached: the significant role of the monetary policy in regulating economic activity became apparent (Romer, Romer 1989; Bernanke, Blinder 1992; Bernanke, Gertler 1995; Clarida et al. 1999). Yet, the certain way how monetary policy operates and filters into the real economy is still not universally accepted. Consequently, the academic discourse on the prediction and evaluation of monetary shocks gained a constant ongoing progress and to model the transmission of monetary policy is a crucial subject in a broad spectrum of empirical research. These studies generally revolve around a foundation of two central concepts: the conventional perception (generally corresponds to the neoclassical view) where financial markets are perfect and the more advanced credit view, which grounded on the implications of financial market imperfections.\textsuperscript{8} Despite the evidence that these concepts are, to various extents, operationally connected and possibly reinforce each other, the following section is aimed at an orderly alignment of the relevant theoretical models tied with the most relevant empirical findings.

\textsuperscript{6} As for example Clarida, Gali and Gertler (1999) argue, the conventional practice is designating short-term interest rate as the main monetary policy tool in macroeconomic models. Brayton and Ambrose (1990), McCallum and Nelson (1997), Goodfriend (2007), Taylor (1995) also consider interest rate policy as the key monetary policy instrument.

\textsuperscript{7} Bernanke and Gertler (1995) underline and explain the relevancy of the corresponding credit channels in details.

\textsuperscript{8} Boivin et al. (2010) classify their findings based on the framework of neoclassical and non-neoclassical views.
2.1 Conventional interest rate channels

In conventional theories interest rates and asset prices play the principal role in the course of economic movements induced by central banks’ monetary policies. The most traditional way of monetary transmission mechanism is based on the standard neoclassical model, which is associated with the direct relationship between interest rates and the user cost of capital. (Jorgenson 1963; Bernanke, Gertler 1995; Boivin et al. 2010). Even though in early studies the model was applied prominently to business decisions about investment spending, later findings revealed that households’ spending on consumer durable and housing expenditures also construe investment decisions9 (Mishkin 1996). The connection between the short-term interest rate and house prices through the altered cost of capital implicates further dimensions to be revealed. Firstly, it is the real rather than the nominal interest rate which influence investment decisions (Modigliani 1971). From this aspect, Boivin, Kiley and Mishkin (2010) emphasize that the direct link between nominal and real rates is ensured by the concept of nominal wage and price rigidities, primarily framed by Keynes (1936). Second, as the long-life feature of real estate investments implies extended financial view, it is rather the long-term interest rate which determines these expenditures (Bernanke, Gertler 1995). However, according to the expectation hypothesis which states that the long-term real interest rate is based on the expected future short-term rates, the policy decisions about nominal interest rates eventually determine the real long-term interest rates which have a major impact on residential housing investments (Taylor 1995).

The other influential interpretation of movements in asset prices associated with interest rate changes supported by the model of Tobin (1969). The key nexus in this concept is the ratio, denoted as Tobin’s q, which is originally defined by the market value of firm’s assets divided by its replacement cost. The ratio higher than 1 activates investments as the expected profit of the firm exceeds the cost of assets. When applied to residential investment decisions, the ratio equals the property prices divided by the corresponding replacement cost. Lower interest rate heightens the ratio through decreasing cost of capital represented by lower construction costs.

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9 In this study the term “housing investment” refers to housing purchases made by both firms and households.
Additionally, at the time of house price appreciations, the higher numerator further rises the ratio. Based on these relations the higher ratio stimulates real estate investment activity. From this aspect, Goodhart and Hofmann (2008) emphasise that the increase in property prices relatively decreases the construction costs thus residential investment becomes more profitable. The positive reaction of residential investment on inflated house prices again amplifies housing demand thus augments its price level.

The alternative way to connect Tobin’s q to the cost of capital approach is to discover the link between stock prices and investment spending. The elevated stock prices induced by lowered interest rate implies relatively low cost of new capital hence it triggers new investments (Boivin et al. 2010). This channel, through higher q can make housing investment more attractive and thereby stimulate the residential investment, especially during the time of a housing boom. As Gattini and Ganoulis (2012) emphasize the key role of residential investment in house price development for both new and existing homes, the importance of Tobin’s q cannot be neglected regarding housing booms.

Another appearance of interest rate effect on house prices is the wealth channel. It operates through the intertemporal consumption which is affected by the net wealth condition of households (Hunter et al. 2003). Since the essential component of households’ assets in Spain is housing wealth, a rise in its price level increase their lifetime resources hence it shifts their consumption plans, which may embrace house purchase as well. From this perspective, Boivin et al. (2010) also maintain that standard life-cycle wealth effect is a relevant factor in the monetary transmission mechanism. In their paper they emphasize that lower short-term interest rates can shift demand for housing, thus increasing its price, as lower interest rate implies lower discount rate applied to the income flows related to properties. The following

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10 The connected theory is based on the life-cycle model of consumption first developed by Modigliani and Brumberg (1955) and later advanced by Ando and Modigliani (1963) and also the permanent income hypothesis by Friedman (1957).

11 According to the Spanish Survey of Household Finances (Encuesta Financiera de las Familias) the share of real estates in households’ wealth was 70.9 percent in 2002, furthermore Goodhart and Hofmann (2001) also emphasize the strong wealth effect originated from house price appreciation as housing wealth is an important factor in private sector wealth.

12 For example, Esteban and Altuzarra (2008), and Romero (2014) shows relatively high propensity for second home purchases in Spain.
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increase in aggregate wealth then prompts household consumption. Mishkin (1996) also demonstrates that monetary policy via Tobin’s q together with the wealth channels in relation to housing price can stimulate property market.

Besides the above demonstrated traditional ways of causalities, demand for housing can be influenced by expectations steered by expansionary (or contractionary) monetary policy as well. Trichet (2003) argues, that changes in interest rates can modify people’s outlooks about future economic growth and income expectations which in turn can impact housing expenditures. The elevated property prices are able to reinforce the operation of the expectation channel and give further impetus for house price inflation. The operation of this factor is especially enhanced during the real estate boom as the positive outlook can contribute to the acceleration of increasing house prices.13 Boivin at al. (2010) also demonstrate the importance of expectation in transmission mechanism through several channels. The key link is the impact of monetary policy on expected short-term interest rates which can support the channel of user cost of capital.14 Furthermore, they also underline the role of inflation expectations which together with the expected future course of short-term interest rates influence the real interest rates.15

2.2 Credit channels

Despite Taylor (1995) having proved that the traditional interest rate channels play the leading role in the fluctuation of consumer and investment spending, Bernanke and Gertler (1995) suggest that the driving force of interest rate on investments and consumptions is exaggerated in the conventional estimates. Surprisingly, their empirical results indicate large and rapid inverse response in house expenditures for interest rate policy shifts. Considering that durable investments (such as housing) are more likely to be dependent on long-term interest

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13 The academic research on the role of expectation in housing cycles are considerably broad and it is analysed from different angels, for example Shiller’s various works embrace comprehensive discussion on the relevancy and mechanism of (irrational) expectations during housing booms, also Hunter, William and Kaufman’s (2003) collection of surveys provides excellent orientation on the topic.
14 The key role of expectation in the user cost of capital channel is explained by Case and Shiller (2003).
15 Boivin et al. (2010) argue that it is rather the long-term than the short-term interest rates which drive investments.
rates (Taylor 1995) and the notion that monetary policy should have weaker effect on long-term rates (Bernanke, Gertler 1995), the above findings propose an additional function of transmission mechanism, that is, the *credit channel*.

The perception that credit markets may have an important role in the movement in the real economy is not recent: Fisher (1933) considered the distressed banking system as a leading factor causing severity of the Great Depression. The re-emergence of the subject in the seminal work of Bernanke (1983), which analyses the impacts of the financial crisis on the real costs of the credit markets, opened a new discussion on the role of financial frictions in monetary mechanisms. Bernanke and Gertler (1995) provide a detailed review of the way credit market imperfections can modify the effects of the monetary policy in a real economy.\(^{16}\) In their study they refer to the credit channel as a “set of factors that amplify and propagate conventional interest rate effect”. Therefore, this process is not an independent but rather a complementary factor of the conventional interest rate channel which evolves on two principal ways: *balance sheet channel* and *bank lending channel* (Mishkin 1995).

The source of the *balance sheet channel* is the principal-agent problem, more precisely the adverse selection\(^ {17}\) and moral hazard, which stem from the asymmetric information between lenders and borrowers (Mishkin 1995). According to Bernanke and Gertler (1995) it materialises as an external finance premium (the difference between the cost of external funds and the opportunity cost of internal funds), which reflects the cost associated with the agency dilemma. This problem persists particularly in the mortgage scheme which typically involves high uncertainty by its nature (Ambrose et al. 2016).

There are multiple aspects how balance sheet alteration can be approached, among them the most direct way is represented by the change in the *net worth*. In our setting, net worth corresponds to the price of real estates, used as collateral, which

\(^{16}\) See also paper of Bernanke and Blinder (1992) where their empirical analysis presented substantial evidence that monetary policy has significant impact on loan activity which further influence the real economy, similarly Hubbard (1995) in his survey on credit channel of monetary policy also argues that models based on financial constrains verify the significant effect of monetary policy beyond the conventional interest rate channels and Harris et al. (1994) survey on the credit crunch effect on housing market.

\(^{17}\) For further studies on adverse selection problems see Akerlof (1970) and Stiglitz and Weiss (1981).
The effects of monetary policy on house prices in Spain alters the borrowing capacity through varying the loan-to-value (LTV) ratio. Thus, the extended (reduced) availability of credit stimulate (hamper) not only the aggregate consumption but also housing demand which eventually push upward (downward) house prices. It is important to see that the course of the process may generate a positive feedback loop as the value of the property operates as a collateral in the mortgage activity. This endogenous pro-cyclical course in borrower’s balance sheets can intensify and stimulate housing cycles, as similarly business cycles, a phenomenon termed “financial accelerator”.\textsuperscript{18} Mishkin (1996) also points out that low policy rate implies higher equity prices which increases net worth of firms and again leads to a higher investment spending and aggregate demand. The key motive in the process is the perception that the higher the net worth of firms or households, the less severe the adverse selection and moral hazard problems in lending activity, which implies credit expansion. Ludwig and Slok (2001) also argue that in the case of elevated house prices, the homeowners are able to realize equity in the form of refinancing of the house which has a positive impact on private investments.

The other alternative direction of interest rate socks implies its direct impact on borrowers’ cash flow. The rising interest rates involves mounting interest expenses in short-term or floating-rate debt contracts which weakening borrowers’ financial positions by reducing their cash flows (Bernanke, Gertler 1995). Mishkin (2010) specifically emphasizes the important role of real estate prices in monetary transmission mechanism. In his paper he demonstrates, that monetary policy by lowering interest rate has a direct effect on housing expenditure by means of decreasing financial costs connected to borrowing. He also underlines that the short-term interest rate is more relevant than long-term since the short-term interest rate has a larger effect on firms’ cash flow. It follows that in this approach the policy rate has a more direct influence on business and consumer behaviour. Boldin (1994) empirically linked house prices and funds rate by a measure of mortgage burden (a ratio of mortgage payments to income) on typical household’s balance sheet in US and found convincing evidence of policy rate effect on house prices. This approach

\textsuperscript{18} For more detailed review on the topic see Bernanke, Gertler and Gilchrist (1996, 1999) also see earlier surveys by Fisher (1933) and Minsky (1964, 1975) identifying financial factors corresponding accelerator processes in the real economy, Kiyotaki and Moore (1997) also emphasize the role of accelerator effect in relation to asset values and lending activity.
provides further explanation why house prices have sharp response to monetary policy changes despite the presumably weak connection between interest rate policy and long-term real interest rate (Bernanke, Gertler 1995). Bjørnland and Jacobsen (2010) in their multi-country analysis found evidence of strong and prolonged impact of monetary policy on house prices which they explain by the cash flow effect on households’ balance sheet as well.

The third way how balance sheet of firms and households can be impacted is the liquidity effects. Mishkin (2001) emphasize the role of liquidity channel in connection with consumer durable and housing expenditures steamed from their illiquid features. The specific nature suggests that as a response for expected financial distress, real estate investments became less desirable, as trading of durable goods in limited time mostly implies additional loss on the seller side. Similarly, housing demand is stimulated when households or firms are more relaxed about the economic prospects as financial position became more secured and menace of financial distress is diminished (Boivin et al. 2010). In contrast, Souse (2010) based on his VAR model concludes that a positive interest rate shocks induce flights toward less liquid but high earning assets. Souse finding suggests that there is a reverse function of liquidity effect on house prices which makes the total effect ambiguous.

Apart from the balance sheet effects, interest rate policy may also shift the supply of intermediate loans, which impact the credit activity thus influence the real economy. In this way of causality, labelled as bank lending channel, monetary contraction can influence banks’ ability to lend (Hubbard 1995). As a result, borrowers reliant on external founds are exposed to higher financial premium or decline in credit flows. Bernanke and Gertler (1995) suggest that the operation of bank landing channel in US mortgage market was more relevant before 1980s\(^{19}\) and assume that it has most likely diminished over time parallel with the trend of financial deregulations and innovations.

\(^{19}\) Prior 1980s ceilings on deposit rates were in effect in US credit market referring the phenomenon called “disintermediation”.
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3. Empirical analysis

Sims (1980) in his seminal work pointed out that at the time the prevailing macroeconometric methodology based on a large system of equations had an inherent instability, rooted in its restrictive identification. To overcome the identification problem, he proposed an innovative solution: the application of vector autoregression (VAR). This approach became a conventional tool for interpretation of macroeconomic movements as a response for policy changes (Sargent, Sims 2011). Blanchard (2000) also argues that VAR models with its limited size deliver more transparent structure which under a minimal set of identification restriction can provide evidence for dynamic effects of economic shocks. One of the chief innovation of VAR approach is the inclusion of expectations as the variables included in the model not only depends on the lagged values of other variables in the set but its own past values as well. This feature of the VAR model given the possibly pertinent function of expectations in the course of housing cycles further strengthen the decision for its implementation. The application of VAR models is supported also by its flexibility and functionality for conducting multivariate time series analysis aimed at discovering dynamic relationships (Sims 1980; Stock, Watson 1994; Brooks 2008). Furthermore Greene (2002) and Bernanke and Gertler (1995) also underlines its efficiency in analysis of effects of policy changes and external impulses.

Due to the above reasons, VAR models are also frequently applied in studies incorporating property prices in relation of monetary policy. Bjørnland and Jacobsen (2010) use VAR models to discover the role of house prices in the monetary policy transmission mechanism in Norway, Sweden and the UK. They demonstrate through VAR impulse response function that house prices react immediately and strongly to monetary policy shocks. Souse (2010) investigates relation between monetary policy and asset market in the Eurozone by VAR. He finds strong and persistent response in housing wealth for monetary policy contraction. Goodhart and Hofmann (2008) explore linkages between money, credit, house prices and economic activity in

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20 Examples of some influential studies see Sims (1992) studied the impacts of monetary policy across five different economies discovering several common features but also some differences, Blanchard and Perotti (2002) analysed the economic reaction on spending, Galí (1999) estimated technology shocks against other shocks through a VAR analysis.
industrialised countries between 1970 and 2006 by a panel VAR. Through a comparison of subsamples, they discover strong multidirectional link between property prices and monetary variables between 1985 and 2006.

In this paper the VAR model is aimed at estimating causalities between interest rates, house prices and credit aggregates furthermore measuring the direction, the strength, the persistence and the timing of the impact on variables as a reaction for shocks occurring in other series. Combining these results with the theoretical base presented in the preceding section, the empirical output is expected to identify the dominating channels of monetary transmission resulting house price developments through different time horizons between 1975-2008. Following the purpose of the study, estimations were made on three different intervals which provide solid base for comparisons and interpretations.

The first analysed interval accounts for the period of 1975 Q1 until the last quarter before EMU accession – 1998 Q4. The interval was titled as “Moderation” (MP) since during this period the short-term interest rate dropped significantly and its volatility lowered. Furthermore, the inflation rate was also following a downward tendency during this time. The second analysed interval covers the period of 1985 Q1 until 2008 Q2. The reason for setting the beginning of the interval to 1985 Q1 is prominently the timing of EU accession but it is supported by the fact that from this time the real values of house prices and credit aggregates begin to increase intensively (Figure 2). Consequently, the period was named “Exuberance” (EP), which also refers to the two housing booms that occurred at the time. The last quarter of the period is set by the beginning of the GFC which also represents sharp structural breaks in the time series. The third analysed period is applied only from the time of Eurozone accession – therefore titled “Euro era” (MU) – till the burst of the housing bubble in the middle of 2008. Since the number of observations is low on a quarterly basis in this relatively short interval, I decided to use monthly data for the estimation in this period. The end of the monthly interval was set to the fourth month of 2008, according to the structural breaks in the series of house prices and the outstanding level of credit as reflected by the beginning of the recession. Figure 2 and Figure 3 demonstrate the development in house prices and the credit aggregates through the analysed interval.
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Graph 2 shows the nominal house price index (HPI) and real house price index (RHPI) together. It is clear that, while the nominal house price index increased continuously until 2008, the deflated value of the index was moving in a relatively narrow interval – except for the boom between 1986 Q1 and 1991 Q4 – until 2001 Q1 when the index started to rise significantly. Graph 3 plots the long-term volume of outstanding credit to the private sector in nominal and real term. The beginning of the notable increase in the real value occurred around the time of Spanish accession to the Eurozone. From this perspective, it is rational to use the values in real terms as this also supports the decision on the selection of the two analysed periods separated by the date of the Euro accession.

**Graph 2. Nominal and real house price index (1975 Q1 – 2013 Q3)**

![Graph showing nominal and real house price index](image)

Source: International House Price Database of Federal Reserve Bank of Dallas, own editing.
Graph 3. The outstanding aggregate nominal and real credit to private sector in million EUR (1975 Q1 – 2013 Q3)

Source: Bank for International Settlements, own editing.

3.1 Data and analysis

The set of data series applied in the empirical analysis comprises short-term nominal interest rates, real house price indexes and real credit aggregates. Except for the short-term nominal interest rate all data have been seasonally adjusted individually using the Census X12 procedure (Findley et al. 1998). The residential House Price Index (HPI) has been collected from the International House Price Database of Federal Reserve Bank of Dallas. The index is deflated by Consumer Price Index (CPI) in order to reach the real term of the values. Since house price data is not available in monthly frequency I used linear interpolation on house price data between quarterly observations for the interval of Euro era. The outstanding

---

21 The short-term nominal interest rate is chosen to capture monetary-policy shocks. For similar reason, Bjørnland and Jacobsen (2010, 2013) use 3-month domestic interest rate (for European economies) and federal funds rate (for US economy) in their VAR model. Gimeno and Martinez (2010) also chose nominal interest rate and stress that the introduction of real interest rate in models with credit aggregates may poses problems.

22 Gimeno and Martinez (2010), Gerlach and Peng (2005) also deflate nominal values in their studies aimed at discovering relationship between nominal interest rate, property prices, and lending activity.

23 The author acknowledges use of the dataset described in Mack and Martinez-García (2011).

24 Following Bjørnland and Jacobsen (2010) who also used CPI for deflating nominal house price.

25 In this procedure I followed the analysis of Ludwig and Slok (2004) where linear interpolation was used to reach quarterly frequency from annual data.
level of aggregate credit to private non-financial sector\(^26\) (CTP) provided by all sectors of the economy (domestic banks, all other sectors and non-residents) on a quarterly basis was taken from the database of Bank for International Settlements (BIS, nd.). The series captures the outstanding amount of credit at the end of the reference quarter. In terms of financial instruments credit covers loans and debt securities. The series of credit aggregates on a monthly basis were taken from the database of Spanish National Statistics Institute (BDE, nd.). Both values are deflated by CPI respectively. The short-term interest rate is measured as the 3-Month or 90-day Interbank Rates and the data was taken from the database of Organisation for Economic Co-operation and Development (OECD, nd.) for the interval prior to the date of Euro accession (1999 Q1). The series is completed with the 1-Month or 30-day deposit rate for the period of 1975 Q1 to 1976 Q4 from the database of BDE (nd.). For the period after Euro accession the 3-Month Euribor rate was used and was taken from the Statistical Data Warehouse of European Central Bank (ECB SDW 2017). Both rates are based on the average of observations throughout the period of corresponding frequency. The series of CPI were taken also from the database of OECD in quarterly and on monthly bases.

### 3.2 Econometric modelling

In this paper I estimate a VAR model (Greene 2002) of the following form:

\[
y_t = \mu + C y_{t-1} + \varepsilon_t
\]

where \(y_t\) is a vector of endogenous variables, \(\varepsilon_t\) is a vector of errors and \(\mu\) is a matrix of fixed effects. \(Cy_{t-1}\) is a matrix polynomial in the lag operator which is set by the multivariate generalization of Akaike’s information criterion (AIC) considering lags up to four in order to determine the appropriate lag lengths. The vector of endogenous variables comprises the log difference of real house price index (\(\Delta rhpi\)), the log difference of the real outstanding aggregate credit to private sector (\(\Delta rctp\))

---

\(^26\) The private non-financial sector includes non-financial corporations (both private-owned and public-owned), households and non-profit institutions serving households as defined in the System of National Accounts 2008.
and the level of the short-term nominal interest rate \((si)\).²⁷

The vector \(y_t\) is therefore given in the following way:

\[
y_t = [si, \Delta rctp, \Delta rhpi]^T
\]

A number of studies also advocate the choice for the VAR model applied to a single country. Jarociński and Smets (2008) applied a VAR model to the US economy solely in order to investigate the root cause of the developments in the housing sector with respect to the output and interest rate. Henceforth Camarero and Ordónez (2002) in their work analysed the monetary policy channels in Spain using a cointegrated structural VAR model and obtained significant results as well. Fernández and Hernández (2006) also estimated the effects of the exogenous fiscal policy in Spain in a VAR framework with relevant inferences.

The structure of the analysis according to Brooks (2008) is based on the following order. Firstly, the properties of the variants together with the diagnostics of the model are summarized. Then, the results of the model are represented: Granger causality, impulse function, and variance decomposition with the examinations of the three intervals respectively.

### 3.3 Time-series properties and diagnostics

In case of all intervals, the Augmented Dickey-Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) statistical tests were conducted for determining stationarity. The ADF test according to Brook (2008) was applied with up to 12 lags. The \(p\) values displayed in Table 1 for both ADF and KPSS tests suggest stationarity at the conventional 10 percent level.

<table>
<thead>
<tr>
<th>Statistical tests/Analysed Interval</th>
<th>Moderation Period</th>
<th>Exuberance Period</th>
<th>Euro era</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times series (\Delta rhpi) (\Delta rctp) (\Delta rhpi) (\Delta rctp) (\Delta rhpi) (\Delta rctp)</td>
<td>(0.0226) (0.0221) (0.0298) (0.0963) (0.0952) (0.0000)</td>
<td>(&gt;0.10) (&gt;0.10) (&gt;0.10) (&gt;0.05) (&gt;0.10) (&gt;0.10)</td>
<td>(&gt;0.10) (&gt;0.10) (&gt;0.10) (&gt;0.10)</td>
</tr>
</tbody>
</table>

Source: Own computations.

²⁷ Goodhart and Hofmann (2008) also include the level of the short-term nominal interest rate in their VAR model, see also VAR models of Aspachs-Bracons and Rabanal (2010) or Dokko et al. (2011) with similar approaches.
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After evidence of stationarity of the time series the Lag Length Criteria was applied on the VAR models to set the number of relevant lags (Table 2). In the third interval, the criteria suggest 2 lag intervals however the LM test indicates autocorrelation at the third lag. In order to resolve this problem, I processed the VAR model with four lags and run the statistical tests again. The choice of four lags also supported by economic plausibility, as shocks in the economy presumably need longer time to unfold its impact. After adjustment in lag intervals there is no autocorrelation in the VAR model. To ensure that there is no serial correlation in the model the Autocorrelation LM test was applied.

### Table 2. Lag length criteria results

<table>
<thead>
<tr>
<th>Criteria/Interval</th>
<th>Moderation Period</th>
<th>Exuberance Period</th>
<th>Euro era</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>FPE</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>AIC</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>SC</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>HQ</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: Own computations.

Lastly the Stability Condition Check shows that there are no polynomial roots, which lie outside the unit circle.

### 3.4 Empirical results

According to the standard Wald Test (Table 3), which is a primal function of VAR models, in the first “Moderation” interval only the credit to private sector Granger causes the house price although it shows slight reverse impact as well. In the second “Exuberance” period the result documents similar structure of causalities however the strength of links is increased. In addition, the combined impact with short-term interest rate on credits became statistically significant. The leading factor remains the credit activity with near zero p value and its mutual effect with the interest rate on the house prices also became more significant. Regarding the “Euro era”, the 3-Month Euribor rate turns into the most relevant driving force in case of
credit and house price developments. The outstanding credit only within the joint effect with the interest rate induces innovations in property prices.

The evaluations of Granger causality tests provide solid orientation about the statistically significant impacts of the variables on the future values in the model. Impulse responses demonstrate the responsiveness of the dependent variables in the VAR to shocks to each of the variables (Brooks 2008). The orthogonalized shocks of the model are based on a simple Cholesky decomposition ordered according to the previously discussed monetary transmission mechanisms. Even though the direction of the impact between credit activity and property prices is ambiguous and can evolve in both ways, I set up the order with preference to the borrowing cost approach – that is, the nominal interest rates primarily inversely affect the households’ and firms’ cash flow thus improving their ability to purchase properties. Runkle (1987) argues that the accurate interpretation of impulse responses is problematic and suggests the construction of confidence bands around the impulse responses. According to this, for each of the graphs, the plus/minus two standard error (95%) confidence bands are applied respectively. As visible on the Graph 4, in each of the periods a shock in short-term interest rates had significant impact on the outstanding credit to private sector. Although its extent decreases chronologically, the responses are more consistent according to the confidence bands. Regarding the responses of credit aggregates to a shock in house price during the “Moderation” period, the reaction is positive but its magnitude is not significant according to the confidence bands. In the “Exuberance” period the power of responses is slightly larger and more relevant but in the Euro era the impact is ambiguous. The direct effects of the shocks on short-term interest rates in the first two intervals are not significant. However, focusing only on the Euro era, the graph displays a significant reverse impact in the first 15 months. While the responses of house prices to shocks in credit to private sector during the “Moderation” and “Exuberance” periods are significant until the fifth quarter, surprisingly in the Euro era there is no obvious relationship between the two variants.
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Table 3. Granger causality test results

<table>
<thead>
<tr>
<th></th>
<th>Modernity (MP)</th>
<th>Exuberance (EP)</th>
<th>Euro era (MU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>1975Q1 1999Q4</td>
<td>1985Q1 2008Q3</td>
<td>1999M01 2008M04</td>
</tr>
<tr>
<td>Included observations</td>
<td>91</td>
<td>91</td>
<td>108</td>
</tr>
</tbody>
</table>

Dependent variable: SI

<table>
<thead>
<tr>
<th>Excluded</th>
<th>Chi-sq</th>
<th>df</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCTP</td>
<td>1.80773</td>
<td>4</td>
<td>0.77110</td>
</tr>
<tr>
<td>RHPi</td>
<td>2.34058</td>
<td>4</td>
<td>0.67340</td>
</tr>
<tr>
<td>All</td>
<td>4.13445</td>
<td>8</td>
<td>0.84480</td>
</tr>
</tbody>
</table>

Dependent variable: RCTP

<table>
<thead>
<tr>
<th>Excluded</th>
<th>Chi-sq</th>
<th>df</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI</td>
<td>5.38012</td>
<td>4</td>
<td>0.25050</td>
</tr>
<tr>
<td>RHPi</td>
<td>7.58343</td>
<td>4</td>
<td>0.10810</td>
</tr>
<tr>
<td>All</td>
<td>11.89693</td>
<td>8</td>
<td>0.15590</td>
</tr>
</tbody>
</table>

Dependent variable: RHPi

<table>
<thead>
<tr>
<th>Excluded</th>
<th>Chi-sq</th>
<th>df</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI</td>
<td>4.57173</td>
<td>4</td>
<td>0.33410</td>
</tr>
<tr>
<td>RCTP</td>
<td>10.92772</td>
<td>4</td>
<td>0.02740</td>
</tr>
<tr>
<td>All</td>
<td>14.18547</td>
<td>8</td>
<td>0.07700</td>
</tr>
</tbody>
</table>

Dependent variable: EURIBOR

<table>
<thead>
<tr>
<th>Excluded</th>
<th>Chi-sq</th>
<th>df</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCTP</td>
<td>7.6493</td>
<td>4</td>
<td>0.10530</td>
</tr>
<tr>
<td>RHPi</td>
<td>15.2824</td>
<td>4</td>
<td>0.00410</td>
</tr>
<tr>
<td>All</td>
<td>23.23305</td>
<td>8</td>
<td>0.00310</td>
</tr>
</tbody>
</table>

Source: Own computations.

Variance decomposition separates the variation in an endogenous variable into the combined shocks to the VAR. Accordingly, the variance decomposition provides information about the relative prominence of each random improvement in affecting the variables in the model. Therefore, the variance decomposition result is a gainful method to supplement the outputs of Granger causality and impulse response. The Graph 5 demonstrates the significant effect of short-term interest rates and house prices on credit aggregates in the first two intervals. However, their degree of contribution is different in the “Exuberance” period compared to the preceding interval. In the first period, the short-term interest rate had more influence over time with a linear increase reaching 20 percent after 12 quarters. The contribution of house prices is around 10 percent at the twelfth period with an increasing influence after the fourth quarter. In the “Exuberance” interval the proportion between the
explanatory variables is changed. The influence of the short-term interest rate become weaker, reaching around 10 percent in the third year. Furthermore, the impact on house prices after one year turns out to be significant and after the sixth period its contribution is larger than that of the short-term interest rate.

Graph 4. Accumulated impulse responses to Cholesky One S.D. Innovations (MP, EP, MU)

Source: Own computations.
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In the Euro era both interest rate and house price have less contribution to the improvement in the credit to private sector aggregate. After 3 years, the variation in the two explanatory variables only explains 10% of the variation in the total amount of credit. The results of variance decomposition of house prices provide interesting information. The development in property prices in both the “Moderation” and “Exuberance” periods is explained primarily by the change in private credit outstanding with milder contribution in the second interval. However, during the Euro era, the short-term interest rate become the major explanatory variable with reduced influence of credit activity. The impact of interest rate emerges in the first half year reaching the level of 20 percent.

**Graph 5. VAR variance decomposition (MP, EP, MU)**

![Graph 5](image)

Source: Own computations.

**3.5 Extension of the model**

After reviewing the empirical results, the most salient difference between the Euro era and the other intervals is the substantial change in driving forces contributing to house price developments. In addition, according to the impulse response results, the interest rate in the Euro era period has no statistically significant
impact on credit activity. Furthermore, house prices appear to be not dependent from the outstanding private credit any longer. In order to reveal the origin of the significant change in the transmission mechanisms in the Euro era, I decided to replace the time series of real outstanding total credit to private sector by other type of credit aggregate. Since after the Euro accession the country experienced a massive surge in mortgage lending activity partly due to innovations and deregulations on mortgage markets as for example the securitization, its proportion in respect to the total credit outstanding to the private sector had increased prominently (Graph 6). From this perspective, it is reasonable to estimate the model with the real outstanding aggregate mortgage credit.

Graph 6. Mortgage credit to total outstanding credit to private sector

![Graph 6](image)

Source: BDE, own editing.

The modified VAR estimation is based on the following model which comprises the two unchanged variables (short-term nominal interest rate and log difference of real house price index, \(si\) and \(\Delta rhpi\) respectively) and newly introduced log difference of real outstanding total mortgage to private sector (\(\Delta rmort\)).

\[
y_t = [si, \Delta rmort, \Delta rhpi]^T
\]

Wald Test (Table 4) shows that the house price became the explanatory variable and the p value (0.0155) indicates that it Granger causes a change in mortgage credit.
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Table 4. VAR Granger causality/block exogeneity Wald tests

<table>
<thead>
<tr>
<th>Dependent variable: RMORT_SALD</th>
<th>Excluded</th>
<th>Chi-sq</th>
<th>df</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EURIBOR</td>
<td>7.043206</td>
<td>3</td>
<td>0.0705</td>
<td></td>
</tr>
<tr>
<td>RHPI</td>
<td>10.39284</td>
<td>3</td>
<td>0.0155</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>20.04182</td>
<td>6</td>
<td>0.0027</td>
<td></td>
</tr>
</tbody>
</table>

Source: Own computations.

Graph 7. Accumulated impulse responses to Cholesky One S.D. Innovations (Model Extension)
Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Source: Own computations.
In respect to the result of impulse responses, Graph 7 displays that the EURIBOR rate inversely effects mortgage lending. According to the confidence band the impact becomes significant after the ninth month (third quarter) and last until the end of the third year. House price also has a significant influence on the outstanding mortgage credit from the first month until the end of the third year. The response of property prices to the change of mortgage credit also turns out to be significant in the first three months, however, its response function is low.

4. Discussion

This section draws a conclusion from the empirical results obtained in the three analysed intervals with the guideline of the theoretical background discussed in the second chapter. The synthesis expected to identify the most relevant links between monetary policy and house price developments. To this purpose the analysis reconciles the VAR model outputs with the concepts of transmission channels, taking into consideration the time varying peculiarities of the Spanish economy. Since the analysis covers multiple intervals, the evaluation also expected to determine the evolution of the transmission mechanism effecting house price alterations.

On the basis of the empirical outputs, summarized in Table 2, the change of transmission linkage over the analysed interval is evident. At the beginning of the “Moderation” period, which takes place between 1975 and the Euro accession in 1999, the Spanish economy was exposed to a considerably volatile economic setting characterized by relatively high interest rates and a high inflation rate. Throughout the interval, the two indicators had a downward tendency and at the end of the period they moderated substantially with a mitigated fluctuation. The steady improvement in these key monetary factors was accompanied by a gradual advancement in the regulatory environment with an integrative process toward the EMU accession. As the key legislative innovations affecting the funding structure of the financial intermediaries occurred at the end of the period, the prevalent attribute was a rather
immature banking structure where the private banks played a less significant role.\textsuperscript{28} The evaluation of the empirical results suggests that in this interval the credit channel was the primary way of causality between the monetary policy and house prices. Although Bernanke and Gertler (1995) and Kashyap et al. (1993) point to the high practical difficulty involved in conducting an empirical analysis aimed at identifying the exact way of monetary transmission under the credit channel, there are numerous theoretical and fewer empirical studies in the literature which provide support for further specification. Bernanke and Gertler (1995) argue that an economy characterized by a limited bank funding structure and a less liquid and less developed market for bank liabilities mitigates the importance of the bank lending channel. Iacoviello and Minetti (2007) also emphasize that in countries where mortgage securitisation is not developed, the bank lending channel is more relevant. Boivin et al. (2010) underline the importance of the bank lending channel in economies where borrowers are more dependent on bank loans. These features largely fit the Spanish mortgage market in the “Moderation” phase, when the traditional bank lending was dominant and its role was crucial in financing private sector investments and expenditures. In addition, the empirical results of Iacoviello and Minetti (2007) also show the significant function of the bank lending channel in countries where mortgage finance is more bank dependent.\textsuperscript{29} According to the empirical results combined with the theoretical base, the most relevant way of causality on the basis of bank lending channel is the following. The expansionary monetary policy, through rising bank reserves and bank deposits, shifted the supply of credit aggregates. Because many borrowers are dependent on bank loans to finance house purchases, this expansion resulted in house price inflations.

The “Exuberance” period accounts for the interval between 1985 and the onset of GFC in 2008. After 1985 the real values of house prices and outstanding private credits began to rise intensely which corresponds to the twice experienced housing bubbles (1987-1991 and 1996-2007). The VAR outputs show that the monetary

\textsuperscript{28} Until the end of 80s a public institution, the Spanish Mortgage Bank was dominating on the mortgage market (Palomera 2014).

\textsuperscript{29} Iacoviello and Minetti (2007) tested a credit channel with distinguishing bank lending and balance sheet channels in four European countries’ (Finland, Germany, Norway and the UK) housing market by VAR approach.
transmission mechanism associated with the credit view was prevailing as well, while their connections became stronger. Referring to the impulse response function, the impact of a short-term interest rate on credit activity became more persistent but with a weaker effect. Interestingly, the contribution of house prices to credit activity became more robust than the influence of a short-term interest rate. It suggests that the cash-flow channel played a more important role than the bank lending channel.

Table 5. Summary of the empirical findings

<table>
<thead>
<tr>
<th></th>
<th>Exuberance</th>
<th>Euro era</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Moderation</strong></td>
<td>SI → RCTP → RHPI</td>
<td>SI → RCTP → RHPI</td>
</tr>
<tr>
<td></td>
<td>SI → RCTP</td>
<td>SI → RHPI</td>
</tr>
<tr>
<td></td>
<td>RHPI → RCTP</td>
<td>SI → RCTP</td>
</tr>
<tr>
<td><strong>Exuberance</strong></td>
<td>SI → RMORT</td>
<td>RHPI → RMORT</td>
</tr>
<tr>
<td></td>
<td>SI → RMORT</td>
<td>RMORT → RHPI</td>
</tr>
</tbody>
</table>

Source: author’s own elaboration

The combined view of the findings connected to the two intervals shows that the key transmission mechanism effecting house price developments was the credit channel in the Spanish economy. The increasing strength of responses with longer persistency in relations and the appearance of a significant collateral effect in the second interval suggest that the factor of expectations and feedback loops became more pertinent. Since these intervals partly overlap, it is hard to make precise implications regarding the change of the transmission mechanism focusing on the period followed by the EMU accession. For this purpose, the empirical estimation, focused solely on the Euro era, provides a more accurate base for further inferences.

The evaluation of the estimation results in the Euro era offers an essentially different view. The main driving force turned out to be the direct impact of a short-term interest rate on house price inflation. According to the VAR impulse function the response of house prices for interest rate innovation is sharp and lasts over 2 years. The reconciliation of the result with the theoretical base suggests that the traditional interest rate channel became the major link between the monetary policy and house prices in the Euro era. There are multiple ways in which the traditional
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interest rate channel materializes in house price inflations. However, considering the low level of the real interest rate – which was negative during the most intense surge in property prices before 2006 as a result of the low ECB’s policy rates, apparent in Graph 1 – the cost of capital approach appears to be the leading factor in the transmission causalities. Regarding the credit channel, the transmission mechanism appears to be weaker. Although the short-term interest rate influenced private lending, its impact became significant only after 6 quarters, suggested by the impulse response function, with a relatively short persistence. To further explore the credit channel, the empirical results do not indicate any significant impact on the property prices from the private lending activity. This implication corresponds with Edwards and Mishkin (1996), proving that the decline of traditional bank lending made the banks’ role less important in credit markets, which eventually rendered the bank lending channel less effective. In addition, the collateral effect also seems to be weaker, only the impulse response suggests positive causality but its extent is insignificant. Considering the modernization progress in the Spanish economy, it is reasonable to conclude that the development in the structure of financial intermediates, especially after the Euro accession, was the main reason for the decreasing importance in the bank lending channel. This finding is in line with the suggestions of Bernanke and Gertler (1995) and Blanchard (2000), as the deregulation process implies a declining relevancy of credit channel.

The substantial changes in the structure of the Spanish credit markets, especially in the mortgage market – occurring primarily during the Euro era – propose a complementary approach as demonstrated in the subsection of model extension. In this manner, the monetary mechanism was analysed with the outstanding mortgage credit. The empirical results suggest that the credit channel is more relevant by focusing solely on mortgage lending activity but its importance is still lower than before the EMU accession. The short-term interest rate effect on mortgage lending appears earlier with more persistency comparing to private credit. In addition, the response of house prices for changes in mortgage credit remains moderately weak with a low degree of persistency. However, the collateral effect was stronger on mortgage lending, which suggests that the channel of balance sheet and wealth effect of households were also relevant during the boom. The result is in line with Souse’s
(2010) empirical finding, which found that monetary policy shocks have a very persistent effect on housing wealth as there is a flight towards assets that are less liquid and earn higher rates of return.

5. Conclusion

Considering the reoccurring distortion and adverse economic implications triggered by housing bubbles throughout history, it is crucial to recognise the manner in which this phenomenon evolves and how it is connected to the monetary policy in a given economy. Defining the structure of transmission processes between interest rate policy and house prices is the foremost step for constructing policy interventions aimed at controlling house price developments.

This study discovers the relevant transmission channels between short-term interest rates, credit aggregates and house prices between 1975 and 2008 by applying VAR models. The analysis devotes special attention to the last housing boom, occurring after the accession to the EMU, in order to reveal the importance of the interest rate policy of the ECB in the latest Spanish housing boom.

The theoretical discussion demonstrates that a monetary policy unfolds its effects in various ways in the housing sector, where multiple channels operate simultaneously to various extents. The estimation output of the empirical analysis determines the strength and persistency of the relations between interest rates, credit aggregates and house prices. By reconciling the results with the theoretical models, the study identifies the most dominant channels of the transmission mechanism through multiple phases of the Spanish integration and modernization process. The synthesis reveals that the monetary transmission mechanism in Spain has changed substantially over time since 1975. At the beginning of the full analysed interval the role of the credit channel was dominant, then, after the development of the credit markets, its importance gradually diminished. After the EMU accession the traditional interest rate channel became the leading factor with an intensified and more persistent effect on house prices. Accordingly, the low interest rate environment played a significant role in the house price expansion during the last
The effects of monetary policy on house prices in Spain

Spanish housing boom. Thus, the hypothesis of the study is supported: the overly accommodating ECB monetary policy contributed to the emergence of the housing boom which later formed into a bubble. The strong direct linkage between the interest rate and the house prices in the Euro era implies that a more reactive adjustment in the ECB’s policy rate could have reduced the magnitude of the Spanish housing bubble.

Despite the significant results of the VAR models, the extraordinarily dynamic expansion in the property prices suggests that the factor of irrational expectations also contributed to the ensuing housing bubble, which was based on the common belief that house prices can increase over a substantial long term with a high rate of increase. However, in the study the empirical analysis underlines that the interest rate policy substantially influences the house prices. Thus, by giving a higher relevance to the house price movements in monetary policy construction, the interest rate policy can support strategies aimed at curbing speculative bubbles in the housing sector.

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Impacts of regional energy markets on decentralised energy supply

Jens MAIWALD, Tino SCHÜTTE
University of Applied Sciences Zittau/Görlitz, Germany

Abstract:

Aim: This paper aims to describe an approach to develop a simulation model for investigating regional energy markets. Therefore the so called Cellular Approach is combined with the approach of Agent-Based Modelling.

Design / Research methods: The model is built as a bottom-up approach for integral load management. Thus, supply factors such as limitations in generation are integrated directly and display flexibility. Thereby each market participant has its own economic interest. By the use of specific behaviour patterns and learning effects each agent in the model can act individually. This enables the market model to simulate how actors behave in changing situations.

Conclusions / findings: The model shown in this paper provides an alternative to considerations of energy supply systems via equation-based optimization models. The combination of these two approaches enhances to observe two central aspects of the German energy turnaround, decentralisation and the consumers changing role at the energy market.

Originality / value of the article: The Cellular Approach offers potential benefits for integrating renewable energy sources in regional power supply. Often discussed on a technical level, this paper focuses on the economical side of this topic. Moreover, differing to other research activities usually using optimization techniques, an Agent-Based Model is formulated to simulate a regional energy market. In the combination of a supply system primarily based on renewable energy sources and enhanced with different types of energy storage it is possible to simulate a supply system of the future.

Keywords: Energy Markets, Renewable Energy Sources, Agent-based Modelling, Cellular Approach

JEL: P18, P28, Q41, Q42
1. Problem description

1.1 Brief overview of the German electricity system

Caused by the Energiewende (energy turnaround) the German energy supply system is subjected to tremendously alterations which will affect all market participants and their behaviour. Forced by the German government the share of renewable energy sources (RES) in electricity consumption should be 80% until 2050. Consequentially this will push conventional power plants out of the market by law over the upcoming years. Furthermore, this omission means a loss of secured capacity for the German supply system which will be substituted by more and more RES.

Key technologies for substituting conventionals will be photovoltaic (PV) and wind power (WP). Today about 60% of the electricity generated from RES are from PV (20%) and WP (43%) (AGEB 2016; BMWi 2016: 9 f). A big issue is the fluctuating feed-in of these power plants. Solar radiation and wind intensity are given by nature and not controllable in any way. Due to high quality forecasts, operators are able to utilise the given potentials at the best possible rate. Nevertheless, the share of PV and wind power in overall installed capacity in Germany is 21% respectively 24%. In fact the share in electricity generation is just 7% respectively 15% (Fraunhofer ISE 2017; Fraunhofer ISE 2016). This fact clearly shows the dependence on certain weather conditions.

1.2 Electricity prices

Błąd! Nie można odnaleźć źródła odwołania. shows the development of average electricity prices on EPEX spot market and for private households (HH) in Germany over the last seven years. What hits the eye first are the opposed trends of these graphs. While prices on spot marked dropped by 2.13 ct/kWh prices for HH increased by 6.73 ct/kWh.
**Figure 1. Electricity prices on EPEX spot market (left) and for households (right) [ct/kWh]**

Source: Authors’ own elaboration, Data Source: BMWi 2015: 74; Bundesnetzagentur, Bundeskartellamt 2016: 212

**Figure 2. Merit-Order-Effect**

Spot market prices decrease because of the merit-order-effect. The merit order is an ascending order of marginal costs from all power plants that are offering to generate a certain amount of electricity. The marginal costs of the last power plant that is needed to fulfil the demand reflect the market clearing price for electricity. RES especially solar, wind and even water are characterized by relative high...
investment costs but low marginal costs close to zero. As a result increasing shares of RES effect a shift to the right of the merit order (see ).

Electricity prices for HH consist of three main components that are affected differently, as shown in table 1. Whereas the average costs for generation and sales decreased, the average costs for grid fee and metering increased but both in a slightly manner. The big increase in HH electricity prices mainly results from the third price component taxes, levies, and apportionments including the so-called EEG-apportionment. This apportionment goes back to the German Renewable Energy Sources Act (EEG) and is part of the fixed feed-in EEG-remuneration which was intended as an initial funding for compensating cost benefits from conventional power plants over RES.\(^1\) Over the last seven years this apportionment increased from 2.05 to 6.354 ct/kWh (BDEW 2016: 7 f) because of higher shares of RES.

### Table 1. Components of household electricity prices [ct/kWh]

<table>
<thead>
<tr>
<th></th>
<th>Generation</th>
<th>Grid fee</th>
<th>Taxes, levies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>8.16</td>
<td>5.86</td>
<td>9.67</td>
</tr>
<tr>
<td>2016</td>
<td>6.11</td>
<td>7.07</td>
<td>15.51</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration, Data Source: BDEW 2016: 11

1.3 Profitability of RES electricity

In comparison to conventional power plants renewables own relative high levelized costs of electricity (LCOE).\(^2\) At the energy exchange the obtainable contribution margin results from the difference between electricity price and marginal costs of the particular asset. As marginal costs of RES are close to zero the contribution margin is almost equal to the electricity price and reflects the whole earnings of the particular asset. In other words, the achieved electricity price can be entirely used to cover the LCOE.

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1 The EEG-remuneration is paid to operators of RES power plants. The remuneration is a fixed amount which is financed by two parts. The first part are earnings from selling electricity at the energy exchange. The difference between the amount of remuneration and earnings is compensated by the EEG-apportionment which is paid by the consumers.
2 LCOE are calculated as the net present value of all costs over the lifetime of the power plant divided by its total electrical energy output.
The approach of LCOE as a long-term consideration reflects the costs respectively the earnings which has to be obtained over the useful life of the asset on average. In short-term considerations earnings could fall below this limit. *As it is depicted in a high share of renewables leads to a drop of the electricity price at the energy exchange causing a smaller contribution margin for all market participants. Today a cost-covering operation at the market (without promotion) is mainly not feasible for RES. Only a few hours per year with high price peaks enable profitable business.*

*Table 2* shows the average price of electricity at the Day-Ahead Market in comparison to the minimum and maximum LCOE of PV and wind (onshore).

<table>
<thead>
<tr>
<th>Electricity price Day-Ahead [ct/kWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>Summer</td>
</tr>
<tr>
<td>Winter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LCOE of RES [ct/kWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV</td>
</tr>
<tr>
<td>Min</td>
</tr>
<tr>
<td>Wind (onshore)</td>
</tr>
<tr>
<td>Min</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration, Data Source: KFW 2016: 1; Use My Energy 2017

Recent incidents on the market show the evolution of costs for RES and give a contrary but promising picture. Since 2017 the Federal Network Agency issues tenders (pay as bid) to determine the amount of promotion for new assets. The operators bid on a fixed value they want to earn at the energy exchange. This highly competitive approach leads to a massive RES cost degression. *Table 3* displays the results of the last two tendering procedures of PV and wind onshore. In comparison to *table 2* the results show that under certain conditions the operation of onshore wind assets can be competitive at market prices and that the operation of open-site PV systems at least tend to become competitive at market prices.

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3 For further information see chapter '1.4 Marketing of electricity out of RES'.
4 The tendering for wind offshore yield that operation of these assets is feasible without any kind of promotion under certain conditions.
Table 3. Results of tendering procedures 2017

<table>
<thead>
<tr>
<th>Month</th>
<th>PV biddings</th>
<th>Wind (onshore) biddings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>June</td>
<td>October</td>
</tr>
<tr>
<td>Volume</td>
<td>200 kW</td>
<td>200 kW</td>
</tr>
<tr>
<td>Lowest bidding</td>
<td>5.34 ct/kWh</td>
<td>4.29 ct/kWh</td>
</tr>
<tr>
<td>Highest bidding</td>
<td>5.90 ct/kWh</td>
<td>5.06 ct/kWh</td>
</tr>
<tr>
<td>Volume-weighted average</td>
<td>5.66 ct/kWh</td>
<td>4.91 ct/kWh</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>November</td>
</tr>
<tr>
<td>Volume</td>
<td>1013 MW</td>
<td>1000 MW</td>
</tr>
<tr>
<td>Lowest bidding</td>
<td>3.50 ct/kWh</td>
<td>2.20 ct/kWh</td>
</tr>
<tr>
<td>Highest bidding</td>
<td>4.29 ct/kWh</td>
<td>3.82 ct/kWh</td>
</tr>
<tr>
<td>Volume-weighted average</td>
<td>4.28 ct/kWh</td>
<td>3.82 ct/kWh</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration, Data Source: Bundesnetzagentur 2017

Considering the merit order, (see ) it is probable that the obtained contribution margin of renewables could increase in future years. Plausible reasons for this have a regulatory background, like increasing marginal costs of conventional power plants because of increasing prices of CO₂ emission certificates and the phase out of nuclear power plants until 2022 what will have an increasing impact on electricity prices. Besides this decreasing investment costs for RES power plants will have a further beneficial effect on cost recovery. Not proven right now is in which way fuel costs for conventional power plants will change. Nevertheless, several literatures do not clearly state whether the expectable spread will be fully cost-covering or not. The long-term prediction of energy pricing is very insecure. Thus, no exorbitantly increasing or decreasing electricity prices can be assumed.

1.4 Marketing of electricity out of RES

The perhaps most distressing issue within the Energiewende concerns the self-financing of RES in a long-term view. Today there are two main possibilities for selling electricity out of RES-based power plants over the EEG. The first one is via fixed feed-in remuneration, what means that the operator gets a fixed amount of money for each kWh of electricity depending on the year of commissioning of the power plant guaranteed for the next 20 years. Furthermore, the Transmission System Operator (TSO) has the duty to purchase the whole amount of electricity. The level of the remuneration is decreasing over the next years and phases out. This fact will influence future investment decisions negatively.
The second possibility is a direct marketing. Thereby the power plant operator sells the generated electricity directly on the energy exchange. However, because of the low market prices this alone would not be as economically attractive as the fixed feed-in remuneration today. Therefore, a market premium is granted to the operator to compensate the difference between the fixed feed-in remuneration (in the year of commissioning) and the monthly average market price. As this approach allocates the amount of earnings to the value of the fixed feed-in remuneration, the earnings will decrease as the fixed feed-in phases out. To recoup the higher organizational effort of this marketing strategy a management premium is granted in addition. Especially because of the opportunity to take advantage of price peaks at the energy exchange direct marketing is nowadays chosen more and more.

As mentioned above the Federal Network Agency now issues tenders to determine the market premium for new assets. Thus, the allocation is no longer connected to statutory remunerations it is bounded to market competition. The bidding is axiomatic and includes the whole earnings operators want to obtain. In other words the amount of the market premium depends on the monthly average electricity price (see figure 3).

**Figure 3. Dependency of market premium on electricity price**

![Figure 3. Dependency of market premium on electricity price](image)

Source: Authors’ own elaboration
2. Modelling regional electricity supply and demand

2.1 Current challenges

As written in the former chapters, there are two main problems. First, consumers bear the biggest part of the financial burden of the Energiewende; however, they are not able to benefit directly from decreasing prices at the energy exchange. On the other hand, most of the existing RES assets are not able to operate cost covering without promotion in a long-term view, what strains the consumers in the end. A further open question that touches the above presented issues is how to deal with the increasing decentralisation in energy generation and the resulting necessity for grid expansion.

This research aims to examine the importance of regional energy markets in the context of the Energiewende. The specific objective is to provide new insights whether regional energy markets deliver a valuable contribution for solving or at least mitigate the presented issues.

This paper presents the methodological approach taken for this study. It is a mixed methodology based on the so-called Cellular Approach (CA) for developing supply systems and the approach of Agent-Based Modelling (ABM) for simulating each market participants own economic interests.

2.2 The Cellular Approach and Agent-Based Modelling

The Cellular Approach as a method of endorsing decentralisation offers a broad range of potential benefits for integrating renewable energy sources in regional power supply and enhancing sustainability. Fundamental components in this approach are energy cells. Typical kinds are private households (HH), trade, commerce and services (TCS), industry companies (IC) as well as traffic. Each cell has its own ability to supply, consume and store energy. All of these cells are connected among each other via energy grids and communication systems and build up superordinate energy cells in turn. The basic idea behind this approach is to equilibrate the generation and consumption of energy on the lowest possible level of these cellular structures (VDE 2015).
Referring to the VDE the CA can have a significant impact on the expansion respectively the upgrading of existing grids as well as on power plant new constructions concerning future energy sources. The study concludes: Autarkic supply of energy cells is only feasible for households and certain TCS whereas more energy-intensive cells like bigger TCS cells or industry necessarily need interconnection at least on a regional level (VDE 2015: 51). Based on this conclusions the CA covers the given issues in the introduction and represents a suitable framework for the further investigations.

The German electricity grid is sectioned in four different voltage levels (see table 4). As the highest voltage level is used to transport electricity over far distances, high, medium and low voltage levels are for the regional and local distribution of electricity. Assets based on RES are basically connected to the lower two voltage levels as well as the main part of the consuming entities HH, TCS, and IC. That means generation and consumption of electricity are mainly located on the same grid level. The CA connects all market participants on these voltage levels in a regional context.
For shedding light on the consumers impact on the energy market it is important to reproduce a broad range of individual interests and behaviour patterns. A key benefit of ABM is its ability to deal with heterogeneity (Hamill, Gilbert 2016: 30; Genoese 2010: 24). These models can portray an economic system in which orderly behaviour can emerge as a result of interaction between heterogeneous agents, none of whom has any understanding of how the overall system functions (Howitt 2012 in Hamill, Gilbert 2016). By this ABM is the most suitable instrument for dealing with the given issues in the description and the purpose of the model.

3. The REM-model

3.1 Purpose of the model

The following model description is inspired by the ODD (Overview, Design concepts, Details) protocol (Grimm et al. 2006).

The model is made for simulating the economical side of a future electricity supply system primarily based on RES. The focus is on inspecting a regional energy market and to examine its possible impacts on a sustainable decentralised energy supply. Supplementary the economic efficiency of plant operations plays a role to analyse the short-term as well as the long-term self-financing of RES-based electricity generation.
3.2 Entities and scales

The models entities are geared to the main actors of a real energy supply system. The model covers the four major components: consumers, producers, grids, and storages.

The entities in the model representing the consuming sectors are HH, TCS, IC and storage systems. The e-mobility sector, furthermore, is modelled out of a system operators view. Therefore, it is treated as a storage system which is only able to store and consume energy, but not feed in back into the net in the first stage. The bidirectional load scenario for e-mobility will be a model extension.

For generating electricity out of RES PV, wind (onshore), biomass and water power plants are regarded in the model. Storage systems can act as a producer as well as a consumer, depending on its state of charge. Conventional power plants connected to the distribution grid are captured as separate producing entities.

The distribution grid is not regarded as an independent agent in the classical meaning. However, it plays a role as a connecting entity for the interconnection of consumers and producers. The transmission grid is also not reflected as an independent agent, but it is integrated as a single entity for gaining the opportunity of interregional load balance. Moreover the potential for generating electricity of large conventional power plants, like coal-fired or nuclear power plants, is implemented in the transmission grid entity too. Due to the fact that these assets are primarily connected to the transmission grid, they play a subordinate role in the bottom up modelling of a regional and decentralised energy market.

The model simulates the market in a one-hour resolution for a required time scale, for instance 8760 hours as described in this paper. Later on the model will be upgraded for investigations of the long-term effects covering several time horizons. This model will include additional facts such as changing fuel prices for conventional units, decreasing investment costs and technologically advanced constructions of RES power plants.

The term region means a defined distribution grid area. Thus, the biggest superordinate cell of the CA will be a distribution grid. Potential resulting edge problems of several entities located on the models edge can be countered by granting the opportunity of regarding the model as a sphere.
3.3 Model overview and design concepts

The technical feasibility of the CA as the models basis is proven by a widely accepted technical study (VDE 2015). The model is built as a bottom-up model for integral load management. Thereby each market participant has its own economic interest. By the use of specific behaviour patterns and learning effects, each agent in the model can act individually.

The first period under review embraces a short-term time scale. Therefore, it is probable that consumers may change their behaviour slightly in the temporal aspect of electricity demand but not in the total amount of purchased electricity. In other words, the total amount of demanded electricity will remain steady for this time scale but the point in time when electricity is demanded from the net gets more flexible. The entities embodying storage systems will strengthen this behaviour. Thus, the overall electricity demand is set as one of the models major input parameters.

As shown in Table 1 the electricity price for consumers on the German energy market consists of three components. This modality is transferred to the model. The electricity price is embedded as a variable as it is described in the following. The first component, generation and sales, results similar to the day-ahead market and the merit order procedure. The second component, grid fee and metering, results from within the model. Therefore, the distance between the producing entity and the consumer is crucial. The further the distance, the higher the fee. The third component is assumed as a graduated variable covering taxes, levies, and apportionments claimed by the legislation. That means the higher the purchased amount of electricity, the lower gets the amount that has to be paid per kWh. By this price mechanism, each consuming entity has its own individual price. Thus, each entity can decide by itself whether it wants to enhance its personal situation by changing its behaviour or not.

Besides this mechanism including a market-clearing price that is set at the energy exchange, peer to peer trading is also possible for the models entities. Each consuming entity is able to buy electricity as a kind of OTC transaction from generating entities. The price that has to be paid is negotiated between the entities, but as it is in reality this price will be orientated at the price at the exchange.
The selling and buying entities have two main objectives: one quantitative and one monetary. Producers (sellers) want to gain as much profit as possible. That means they want to achieve a high utilisation of their power plants whenever the price is at least cost-covering. Differing the consumers (buyers) want to fulfil their demand for energy while spending a minimum of money. In conclusion, the quantitative objectives promote each other, whereas the monetary objectives oppose.

Additional to the issue of individual objectives some entities act with preferences. Producers are impartial. They do not prefer to whom they are selling the electricity as long as this entity is able to pay for it. However, consumers act quite different. The behaviour of HH and TCS entities depends on their personal rating of three criterions: (1) price, (2) energy source, (3) locality. That means for some of them the price of electricity matters the most. It does not matter where the power plant is located or from which energy source the electricity is generated. Others decide primarily by the energy source and secondarily by price and locality. Others prefer to be supplied by the local utility company, plus electricity price and RES. Hybrid forms of these preferences are also possible.

The preferences for consuming entities are set up as shown in table 5. For short-term investigations the initial states for all consumer categories are the same and will vary later on.

Table 5. Preferences of consumers [%]

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Source</th>
<th>Locality</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH</td>
<td>50</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>TCS</td>
<td>70</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>IC</td>
<td>90</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Authors’ own elaboration

For IC entities the crucial criterion is the price of electricity probably. Only a few IC entities would choose the supplier by energy source. Locality plays a minor role in their decisions.
3.4 Details of initialisation and input data

A schematic overview of the models entities and their interdependencies is presented in figure 5 and figure 6. Further details are explained in the following.

The electricity consumption of the HH and the TCS sector is predefined as the German standard load profiles $H_0$ and $G_0$. As mentioned, the behaviour in consumption will not change significantly in short-term considerations but because of the ability to store energy temporally. The basic consumption of IC is not standardized in Germany. Therefore, an assumption of a small- to medium-sized IC in a two-shift operation is implemented in the model. Further, it is assumed that the IC entities can shift a certain share of their full capacity for a certain period. Both, share and time, are embedded as variables.

Some consuming entities are in control of their own small storage system. For short-term considerations it is assumed that these systems are primarily used for storing electricity while price drops. The state of charge of the small-scale storage systems is treated as 50% of their full capacity at the beginning of each simulation.

Additional to the small storage systems a major regional battery storage system, considered as one big battery power plant, is implemented. This battery storage is a separate entity of the model and can be used bidirectional. In other words, it can be used to store-in (as a consumer) and to store-out (as a producer) electricity. The initial state of charge is predefined as 50% of full capacity. A constraint for a maximum or minimum limit to store-in or store-out per time unit is not considered in the model. As mentioned in the introductory part of this the chapter, e-mobility is implemented out of a system operators view. In other words, it is assumed as a storage system.

The specifications of the producing entities are implemented analogous to those of the consumption sector. Each generating entity has its own specific load profile. The generation of PV and wind depends on the nominal capacity of these power plants in combination with the local weather conditions regarding global radiation respectively wind speed. Thus, the characteristic fluctuating feed-in of these

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5 Please note that these screenshots are made before the simulation was started. Furthermore, both screenshots do not display the final state model, but a processing state.

6 This assumption is based upon the mean value of the load profiles from ten different, comparable small- to medium-sized industry companies of eastern Germany.
technologies is reflected. The feed-in of biomass and water is assumed as constant and adjustable. Costs are implemented as LCOE and variable costs of each generation unit.

**Figure 5. Screenshot from the models interface**

![Screenshot from the models interface](image)

Source: Authors’ own elaboration

Although the transmission grid entity plays a subordinate role in the model, it has two functions. First, compensating regional imbalances that cannot be stored respectively cannot be compensated by the storage systems. Second, provide the opportunity to supply those consumers with electricity who are not interested in being supplied regional from RES. In other words, this entity represents large conventional power plants, which are connected to the transmission grid, out of the models view. The distribution grid plays also a subordinate role. Both grids are implemented with no further constraints or limitations in the first stage. Constraints for the amount of electricity that can be transferred from the distribution to the transmission grid for compensating regional production overcapacity caused by a high share of RES will be a model extension.
4. Conclusion

Prices for electricity at the energy market are presently decreasing. In a paradoxical manner, electricity prices for consumers are increasing instead. This trend arises due to higher financial burdens caused by increasing shares of RES.

Despite a nationwide largely positive attitude to benefit from advantages of RES, opinions differ locally because of the local disadvantages for citizens.\(^7\) Achieving a high share of RES is therefore not only a technical issue, but also a question of public acceptance and the willingness to pay for it. Both are improvable by participation of citizens in a regional context (Walter et al. 2011; VDE 2015). Consumers will be one of the key factors for future supply systems. Their role in the energy market will change from passive to active.

\(^7\) For example, noise pollution, blinking lights or impairment of landscape. For further information see (Schröter 2017: 6 f; Walter et al. 2011)
The approach shown in this paper provides an alternative to considerations of energy supply systems via equation-based optimization models. By combining the CA with ABM it enhances to observe changing conditions of future supply systems concerning two central aspects of the German Energiewende, decentralisation and the consumers changing role into prosumers. This model will show whether regional energy markets will be beneficial to gain not only maximum profit for energy suppliers but also for increasing the personal value of the citizens.

The current legal situation in Germany is not aligned for regional trading of green electricity. This approach can offer a valuable contribution for rethinking and prove the usefulness of regional energy markets for a sustainable energy supply.

Based on the implemented price mechanism and the behaviour patterns of the consumers several impacts of future energy supply system concerning factors can be tested. It can be stated whether consumers can benefit from the current price situation and if their active role can be a leading incentive for increasing decentralisation and gaining high shares of RES. Furthermore, the model can provide insights how market outcome will change in the course of increasing shares of renewables and whether low or high shares are beneficial for short- and long-term self-financing of power plants based on RES. The model calculations might also explore whether regional trading of electricity would lead market participants to a more grid-friendly behaviour and if it would pose a valuable contribution to minimise grid expansion.
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IMPACTS OF REGIONAL ENERGY MARKETS ON DECENTRALISED ENERGY SUPPLY

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Analysis of cost structure of international road transport operators in West Pomeranian voivodship in the years 2008-2014

Błażej SUPROŃ
West Pomeranian University of Technology Szczecin, Poland

Abstract:

Aim: The analysis of the cost structure and the factors determining these costs constitutes an important subject that is applied for both strategic planning of the company’s activity and the evaluation of the actions taken before. The aim of the study was to analyze the structure of the costs incurred by transport enterprises operating in the territory of West Pomeranian Voivodeship in the period from 2008 to 2014, as well as the factors which determined cost variations.

Design / Research methods: Literature research provided an introduction to the discussion along with an analysis of the secondary sources concerned with the subject of the study. Achieving the goals required the analysis of financial reports compiled by the enterprises examined for 2008-2014. The methods of descriptive statistics were used for collecting the data. Considering the fact that the study included more than half of the target group the results obtained can be referred with considerable caution to all other economic operators of this kind in the West Pomeranian Voivodeship.

Conclusions / findings: The results found that the costs of the enterprises examined were to the largest extent influenced by macroeconomic factors, such as interest rates, fuel prices, as well as the situation on the job market. Micro-enterprises were the most vulnerable to the changes in these factors. The study showed that there is a significant correlation between the expenses borne and the economic situation on the EU market.

Originality / value of the article: While the majority of the compilations concerning transport enterprises focuses on their general situation, the results of this study provide a thorough analysis of the internal situation of the entities examined and indicate the influence of the individual factors on the market situation of these entities. It is the first compilation focusing on transport enterprises which undertakes the analysis of the costs they incur applying such a broad aspect.

Implications of the research (if applicable): The results may be used by individuals who manage transport enterprises in order to track, within the framework of an ex post analysis, the factors influencing the costs, as well as their future optimization. From the scientific perspective, the findings may be applied for further considerations concerning the road transport sector and its market situation.
Limitations of the research: The main limitation of the study is the incomplete picture of the situation of all transport enterprises in West Pomeranian Voivodeship. Due to the lack of comparability of the financial data, as well as the difficulties in obtaining them, the study did not include the companies which are not required to publish financial reports and those keeping tax records. Another limitation is the lack of the data on enterprises which did not submit their reports to the relevant registers despite being obligated to do so.

Key words: costs, transport enterprises, cost structure
JEL: R41

1. Introduction

Costs represent a significant element in the activity of a company. The analysis of their structure and value is necessary for a sound management, strategic planning as well as decision-making as to the operations of the entity. The operations of transport companies are characterized by their highly capital-intensive nature and cost variations.

The income obtained by transport operators is the surplus between costs incurred and revenues obtained by performing transport orders. Even minor changes in terms of unit costs bring about reduced income. The costs also exert influence on the company’s competitiveness. Generating lower costs not only fosters more income, which can translate into investment activity, but also contributes to having the unit price of a service reduced, thereby affecting the possibility of accepting a greater number of orders.

Thus, every manager of a transport company ought to analyze thoroughly the costs incurred so as to be able to correct the directions of the company’s activity accordingly.

The development of an entity which involves continuous striving for better management effectiveness requires improvement in terms of the level as well as structure of costs. They determine the profit level. In general, in companies of the SME sector there is much flexibility relating to the trend towards cost reduction, efficient use of resources and greater importance of economies of scale, whose characteristic feature is that of falling unit costs together with an increase in their size.

The cost analysis allows one to answer a number of important questions, including the identification of factors impacting the individual cost categories. The
aim of the study was to analyze the structure of costs incurred by the enterprises investigated over the period of 2008-2014, as well as the factors which determined changes in their costs.

2. Transport company costs and their determinants

Costs represent a direct factor affecting the prices of transport services. Providing transport services whose price does not cover variable costs is unviable. That is why the key question to validity of transport performance is the question as to the costs generated (Ledkewicz 2014: 145).

As the research carried out by K. Witkowski and K. Tanon shows, the main costs incurred by the companies in the road transport sector are those relating to the consumption of materials and energy (fuel), external services (lease costs) and costs of salaries, fees and taxes (including road toll rates) (Witkowski, Tanona 2013: 412).

Moreover, G. Zimon maintains that the transport company management policy clearly shows a downward trend in terms of salaries. He further argues that there is a fall in the fuel costs produced by renewing transport fleet, which, on the other hand, results in an increased share of lease and rental costs (Zimon 2015: 350-351).

J. Waśkiewicz draws attention to the increase in the costs arising from the toll system. His study demonstrates that in 49.6% the costs per 1 km are influenced by the costs of fuel and consumables, in 18.2% by drivers’ pay, and in 3.9% by the costs of lease and 1.9% by toll rates (Waśkiewicz, Balke 2012: 8-9).

Drawing on the research findings cited earlier, one could argue that the main component of costs and thus of the price of transport services is the fuel price. The fuel market is subject to an ongoing fluctuation of prices. The analysis of fuel prices presented in Figure 1 for the period of 2008-2014 shows that the range of these fluctuations is very substantial. At the start of 2008 the wholesale net price of 1 liter fuel was at PLN 3.09, while at the end of 2014 it was PLN 3.91 per one liter. The year 2012 saw the highest increase in the prices, with the average price per one liter standing at PLN 4.66. Moreover, the difference between the lowest and the highest fuel price in the period in question was PLN 2.22.
Another price-determining factor in transport enterprises indicated in the previous studies is the salary of drivers, who represent the basic personal factor used in the process of the service performance. The driver’s salary is comprised of several components, such as:

- overwork allowances
- allowances for working in difficult conditions,
- allowances related to the posting of workers.

The salary amount is also linked to the situation on the labor market. In Poland over the period of 2008-2014 there was a downward trend in terms of the number of professional drivers while the demand for workers grew which was the result of an increase in the number of transport companies along with that of the fleet used by transport operators.

In conducting the analysis of drivers by their competences and age one notices that the main age group in the C+E category (truck with trailer) is made up of persons at the age of 45-54. The data show that the period of 2008-2014 saw visible aging of the staff. Furthermore, among all persons entitled to drive trucks, young people up to 24 years old represented the smallest group. During the subsequent years, although the overall number of drivers increased, the number of young people showed a downward trend, which is illustrated in Figure 2.
The analyses of the labor market in the road transport are unambiguous in showing that this is an employee market. The key problem when estimating the exact situation of the labor market of professional drivers is the lack of studies conducted within this scope. According to the data of sector-specific services, the estimated annual demand for drivers in Poland is about 25 thousand – 35 thousand people.

That there is a shortage of drivers is further attested by the data of the Labor and Social Welfare Ministry which estimate the ratio of the labor supply shortage. This ratio is made up of the relation between the number of registered unemployed persons in the occupation indicated and the number of job offers for a particular occupation. If the ratio shows that the occupation concerned is in shortage, this signifies that the demand on the labor market is greater than the number of people looking for a job in this profession (Kocór et al. 2015: 8-9).

The value of the ratio over the period of 2008-2014 is presented in Figure 3. For drivers, this ratio showed a general link with the economic and transport situation. Moreover, its value over the entire period in question showed a shortage of drivers becoming increasingly acute especially since 2012.
Among the main reasons behind the insufficient number of drivers on the market the following should be highlighted:

— high costs of obtaining licenses which are often beyond the reach of young people,
— a significant percentage of persons of near-retirement age which makes employees going into retirement in large numbers,
— difficult working conditions linked to numerous inconveniences and staying outside place of residence.

Besides the human factor, transport operators also use the means of transport in order to produce transport services. Using them involves generating a variety of costs. The most important costs associated with fixed assets owned by the companies in the transport sector include:

— prices of the means of transport,
— depreciation,
— rental, tenancy or lease costs,
— taxes and fees arising from using the means of transport.

The main form by which the fleet of the transport companies is financed has for years been a lease or a bank loan. A lease is a special form of financing investments
which enables the company to obtain fixed assets needed by using them in exchange for payment. In practice this means concluding a contract according to which the owner of asset items authorizes the company to use those items over a definite period in exchange for a payment made in installments.

The loan, on the other hand, is a kind of a contract concluded with a bank under which the bank undertakes to grant a certain amount of money for a specified period earmarked for a specific purpose. The borrower is obligated to use the money in the manner specified in the contract, i.e. to repay the loan including interests on scheduled repayment dates and to pay commission (Andrzejczak 2012: 33).

However, as Angelika A. Kędzierska-Szczechaniak and K. Szczepaniak point out, the bank loan is a more advantageous source of financing investment than operating lease if one takes into account the varying time value of money. On the other hand, the lease can be more viable owing to such factors as tax preferences, lower initial capital or lesser financial requirements of lessors. These determinants have the effect that the lease (apart from one’s own capital) is the only achievable form of financing a fleet (Kędzierska-Szczepaniak, Szczepaniak 2014: 21-23).

Moreover, Z. Witaszek suggests that the tax payment rules and simplified procedures of processing applications have a particular impact on the attractiveness of lease. Its advantage is lease flexibility in that the initial payment is specified and so is the payment schedule with the payments varying depending on the lessee’s financial possibilities. The most common reason for choosing the lease is tax shield and transparent procedures (Witaszek 2008: 187-188).

The costs associated with choosing one form of financing over another play also an important role for many companies. Both loan installments and lease installments are estimated based on WIBOR rates. It can also happen that transport operators decide to borrow or lease in a foreign currency. Then the main indicator of costs will be LIBOR or EURIBOR rates. Depending on the contract, the costs of a lease or loan can change over the time of vehicle use.

Still, for many transport operators bearing the costs of external financing is very often the only possibility. That lease is very popular among transport companies is reflected in the numerical data. Over the period of 2008-2014, lease funds reported, with the exception of 2008, a rapid increase in the number of leased road tractors and
semi-trailers (Chart 4). It is worth noting that 98,221 vehicles were leased during the period under study. Moreover, Polish transport operators applied for the international license for the total of almost 41,000 new vehicles over the period of 2008-2014. Thus, a significant portion of the fleet was leased.

Moreover, the analysis of the currency structure of leases shows that during the period in question on average 22.6% of operating leases of vehicles and on average 45.4% of leases was financed in foreign currencies.

Chart 4. The number of road tractors and semi-trailers leased in Poland over the period of 2008-2014

A transport company, just like any other economic entity, is required to bear tax burdens. Taxation is an extremely complex social, economic, political and institutional as well as legal phenomenon requiring to be considered from various points of view. A direct effect of taxes paid by economic entities is the transfer of funds from companies to the state budget. The structure of a tax system may affect the actual decisions on the size of investment, type of assets to be invested in, and what place to choose for the investment location. It can also change financial decisions concerned with the way in which investment will be financed and the proportion of distributed income (Podstawka, Deresz 2008: 127-128). The most significant taxes borne by transport operators include the following:

- taxes on income (PIT and CIT),
- indirect taxes (VAT and excise),
- taxes on wealth,
road taxes in the form of toll.

Income taxes are directly linked to income obtained by companies. As such they do not burden current operations, yet nevertheless they need to be taken into account for the company’s economic outcomes. They can also change the financial decisions on the way investment will be funded and on the proportion of profit distributed to partners.

VAT, on the other hand, in general tends to be neutral for the company, since it can deduct input tax during the provision of its services. Also, companies which provide services for foreign customers do not pay taxes on transactions as providing cross-border transport services is VAT exempted.

Tax on the means of transport is one of the two levies, next to property tax, to be paid on account of assets owned. Legislator tied establishing and extinguishing tax obligation with the very fact of owning a carrier. This tax can be a considerable burden on transport companies holding a large fleet of vehicles (Goettel et al. 2011: 372).

Within the scope of local taxes, transport operators are also subject to property tax. The impact of this tax arises mainly from the fact that, apart from the place where the business is run, the entity, based on the provisions of the Road Transport Law, is supposed to have an operating center.

The impact of the costs of property tax on the activity carried out by the entity tends to be a disputable issue among those involved in the research on entrepreneurship. D. Renelta demonstrates the lack of correlation between the set of fiscal instruments and the stimulation function of taxation (Levine, Renelt 1992: 942-943). In their analyses, E. Engen and J. Skinner go as far as to argue that there is a negative impact of the changes in taxation on the previously set non-fiscal goals. Moreover, given that the positive effects of tax stimulation occur occasionally and fluctuate between 0.2 and 0.3 of GDP annually, with equal, or even higher, costs of obtaining them, the authors consider them too weak to be used in an effective boost of socio-economic development (Engen, Skiner, 1996:618)

Drawing on Polish experiences in this respect, the studies conducted by T. Skic should be mentioned, which show, on the basis of empirical data recorded within the scope of tax stimulus impact, that there is a very weak correlation between the
reduction of maximum rates of local taxes and the parameters describing the socio-economic development of the local communities (Skica 2008).

Another category of costs are road charges. Since 2008, with the introduction of electronic devices for determining the road toll to be paid, a particularly dynamic development of the toll system has been visible. Next to fuel, the road toll is the most heavy item in the cost accounting. It can affect directly the transport operators’ profitability and financial stability, for it influences the level of margin a transport operator receives per one kilometer covered. In a situation when there is much competition and raising prices is hardly possible, the road toll limits substantially the companies’ profit.

3. Research methods

The study included the analysis of costs incurred by the transport sector companies in the West Pomeranian Voivodeship over the period of 2008-2014. The choice of the time horizon was dictated by having to compare the changes unfolding over time and to exclude circumstantial trends. In addition, numerous and important changes for international road carriers took place over the years 2008 to 2014. These include:

— Changes within the scope of pursuing the occupation of a road transport operator in 2009 through the introduction of Regulation 1071/2009/EC.
— Road toll system extension in Germany in 2009-2011.
— Allowing Polish road carriers to carry out cabotage transport operation across the European Union in 2009.

The selection of companies was purposive in nature and was carried out on the basis of the data base made available by the Road Transport Office comprising companies holding international load transport license. A list of companies was generated from the data base which fulfilled the selection criteria in the form of the following requirements:

- The companies were in business for at least five years during the period
under study.

- The companies held international freight transport license.

The outcome of the analysis was a list containing 705 companies which made up 36.3% of all the companies holding license in 2014. The final study was carried out on a group of 103 transport operators for which it was possible to obtain complete financial data for the period examined. The data was obtained through InfoVerti database and the National Court Register in the form of financial statements. The information on the submission of financial statements was obtained through notices of Court and Business Gazette.

Those qualified included companies with share capital and partnerships required to submit financial statements during the period in question. Given the lack of comparability arising from keeping, in the majority of cases, tax records, and also fiscal secrecy, obtaining data on natural persons and civil law partnerships was abandoned. A detailed description of the companies examined is presented in Table 1

**Table 1. Description of entities examined**

<table>
<thead>
<tr>
<th>Legal form</th>
<th>Companies qualified for the study</th>
<th>Companies covered by the study</th>
<th>Share (%) of companies covered by the study in all the companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural person</td>
<td>506</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Joint-stock company</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Civil law partnership</td>
<td>28</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Partnership</td>
<td>39</td>
<td>23</td>
<td>59.0</td>
</tr>
<tr>
<td>Limited partnership</td>
<td>3</td>
<td>2</td>
<td>66.7</td>
</tr>
<tr>
<td>Partnership limited by shares</td>
<td>1</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td>Sp. z o.o. sp.k. (Limited partnership born with a limited liability company)</td>
<td>2</td>
<td>1</td>
<td>50.0</td>
</tr>
<tr>
<td>Limited liability company</td>
<td>126</td>
<td>76</td>
<td>60.3</td>
</tr>
<tr>
<td>Total</td>
<td>705</td>
<td>103</td>
<td>14.6</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results.
In order to carry out the study and arrive at final conclusions a vast body of material had to be collected encompassing financial statements of 103 companies spanning the period of 2008-2014, which gave in total 618 balance sheets, profit and loss accounts and other information included in those items. The companies were assigned to individual size classes based on the guidelines of the European Commission recommendation of May 2003, 2003/361/EC.

The methods of descriptive statistics were used to prepare the data, which is linked to non-randomness of the sample with the results referring to the entities examined. In the production of results, statistical methods were employed as well as elements of economic and financial analysis. The information was combined with the financial data, processed using a data base created by MS EXCEL program and Power Query append. The results were produced using MS EXCEL 2013 and Statistica version 12.5 programs.

4. The study results

The average level of costs per one company under study constituted the basic measure allowing the changes unfolding to be assessed in nominal terms. In the years 2008 to 2014 this indicator was higher than for all the companies registered in Poland and in sector H of PKD (Polish Classification of Activities). During the period in question there was an increase in costs in Poland by 22.1% in the private business sector. Moreover, the costs in the group studied grew by 40.6% over the same period, of which the highest increase occurred between 2010 and 2011 (by 16.2%). Chart 5 presents a detailed characterization.
Figure 5. Average costs in the companies examined, in all the companies in Poland and in PKD H sector in the years 2008-2014

![Graph showing average costs](image)


From the perspective of the size class, medium-sized enterprises showed the highest cost ratio with the micro-ones recording the lowest ratio (Table 2). Analyzing the growth rate involved in cost variations, it needs to be emphasized that over the period of 2008-2014 the highest increase was recorded in micro-enterprises (average annual growth 137.3%), followed by a group of enterprises defined as small (107.8%) and medium (101.8%).

Table 2. The costs incurred by enterprises under study in the years 2008-2014 by category and legal form

<table>
<thead>
<tr>
<th>Items</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-enterprises</td>
<td>1735</td>
<td>2277</td>
<td>3876</td>
<td>5510</td>
<td>7095</td>
<td>8370</td>
</tr>
<tr>
<td>Wd</td>
<td>-</td>
<td>131.2</td>
<td>170.2</td>
<td>142.2</td>
<td>128.8</td>
<td>118</td>
</tr>
<tr>
<td>Small enterprises</td>
<td>7796</td>
<td>8023</td>
<td>8755</td>
<td>11034</td>
<td>11701</td>
<td>12214</td>
</tr>
<tr>
<td>Wd</td>
<td>-</td>
<td>102.9</td>
<td>109.1</td>
<td>126</td>
<td>106</td>
<td>104.4</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td>27915</td>
<td>28366</td>
<td>29256</td>
<td>33148</td>
<td>33505</td>
<td>31464</td>
</tr>
<tr>
<td>Wd</td>
<td>-</td>
<td>101.6</td>
<td>103.1</td>
<td>113.3</td>
<td>101.1</td>
<td>93.9</td>
</tr>
</tbody>
</table>

Wd – growth ratio (previous year = 100 %)

Source: self-reported data based on the study results.
In order to gain insight into how individual costs affect the overall costs incurred by an enterprise, the analysis of the structure is most frequently used. In the period under study external services made up the largest portion of costs. Their share ranged from 28.2% in 2009 to 31.0% in 2010 (Fig. 6). In the standard chart of accounts transport operators classify the costs of loading and unloading, services provided within outsourcing and lease as external services.

Another cost making the largest portion of the total costs were expenses relating to the consumption of materials and energy. Their portion ranged from 29.3% in 2009 to 31.0% in 2012. These expenses are mainly comprised of the costs of fuel, AdBlue solution, tires and parts relating to the operation of vehicles.

The third cost in terms of the cost share was made up of all other costs classified by type which on average varied between 17.4% and 23.4%, depending on the year. In applying the standard approach, a transport operator classifies the costs of insurance and travel expenses of employees as belonging to this category. The latter ones, in particular, represent substantial expenses for transport operators, making up the portion of the real payment for work done.

**Figure 6. The share of individual costs in the companies in the years 2008-2014.**

Source: self-reported data based on the study results.
The first cost in the chart of accounts by type is depreciation relating to the progressive use of fixed and intangible assets. In terms of its share, depreciation did not represent a substantial percentage of the costs of companies examined. Its average value was at a level ranging from 3.3% in 2010 to 3.8% in 2013 and 2014 (Table 3).

### Table 3. Depreciation share in the costs of the companies in the years 2008-2014.

<table>
<thead>
<tr>
<th>Items</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3.8%</td>
<td>3.7%</td>
<td>3.3%</td>
<td>3.4%</td>
<td>3.6%</td>
<td>3.8%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td>4.1%</td>
<td>4.0%</td>
<td>3.9%</td>
<td>3.7%</td>
<td>4.3%</td>
<td>4.8%</td>
<td>4.0%</td>
</tr>
<tr>
<td>Small enterprises</td>
<td>2.7%</td>
<td>2.7%</td>
<td>2.5%</td>
<td>2.7%</td>
<td>2.1%</td>
<td>1.9%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td>4.7%</td>
<td>4.4%</td>
<td>3.6%</td>
<td>3.9%</td>
<td>4.4%</td>
<td>4.6%</td>
<td>5.3%</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results

The small share of depreciation in the total costs indicates that the companies analyzed did not have a significant number of the means of transport classified as such in the fixed asset register. This is the result of the commonly used practice of financing the fleet by way of a lease. Vehicles to be leased based on the most widespread form of lease – operating lease – are depreciated by the lessor (lease fund).

The share of depreciation in the costs was the biggest in the medium-sized enterprises, which in general had more assets not only in the form of vehicles but also buildings and equipment, thus making the share of depreciation larger than in micro-enterprises. In addition, their financial basis was big enough to receive a loan and purchase the fleet using their own funds.

This is confirmed by the analysis of the sources of investment financing which was determined based on the notes to the financial statements. For the entities investigated, the most popular proved to be a loan (43.3%) and lease (42.7%). Only 12.4% of enterprises used their own funds to finance investments (Table 4).
Another cost category recognized in the profit and loss account are the costs of the material and energy consumption which ranked as the third largest share in the total costs of the companies examined. The level of the costs in this category is mainly linked to the following factors:

- world market oil prices,
- foreign currency exchange rates, including in particular, the US dollar against Polish Zloty,
- wear and tear of fleet affecting the frequency of repairs,
- age of vehicles, which affects the consumption of motor fuels.

An increase in oil price on the world markets brings about, according to the effect of prosperity transfer, depreciation of the national currency against the US dollar. The growing prices of imported oil coupled with the low price elasticity of domestic demand lead to increased payments for raw material imports and the external deficit of the importer’s economy, which makes the national currency weaker. Next, an increase in the exchange rate of the national currency against the US dollar and in the global price of raw material causes an increase in the price of oil expressed in national currency.

In addition to the effects exerted by the factors relating to the situation on the oil world market in 2008-2014, the level of excise duty and fuel surcharge varied as well, with the surcharge also determining the wholesale and retail price at gas stations. In 2008 the producer paid PLN 1 048.00 on excise duty and PLN 93.69 of fuel surcharge per every 1000dm3 of diesel oil. In 2010 the excise duty remained stable, yet the fuel surcharge was raised up to PLN 233.99. In 2012 the excise duty grew up to PLN 1 196.00 while the fuel surcharge up to PLN 249,92. In 2013 and 2014 the excise duty stayed at the level from the previous year, unlike the fuel
surcharge which grew by PLN 10.00 and PLN 2.60 respectively. Figure 7 illustrates the extent to which the average price of diesel in a given year affected the share of the costs of material and energy consumption in the companies analyzed.

The costs of material and energy consumption made up the largest portion in the costs of micro-enterprises (from 30.3% to 34.5%), while enterprises with over 50 employees saw the smallest share (between 26.6% and 28.2%). The relationship indicated is primarily linked to the range of costs incurred by the individual firms.

Figure 7. The correlation between oil prices and the share of material and energy consumption costs in the companies in the years 2008-2014

![Figure 7](source-url)

Source: self-reported data based on the study and average wholesale fuel prices of Lotos Group S.A. [source-url], [15.12.2016].

Since small economic operators, seeking to economize in a number of areas, incur additional costs to a lesser degree, the costs of fuels and repairs influence considerably their expenses. Medium enterprises, on the other hand, having larger resources and factors of production incur higher costs also in other areas of their business. Moreover, larger economic operators enjoy a better market position in terms of oil price negotiations and discounts received on account of a much bigger fleet. A detailed description is presented in Table 4.

The costs of external services made up the biggest percentage of the costs borne by the companies examined. As already indicated before, these costs, apart from telecommunication, property rental and accounting expenses, also include lease payments which largely determine the level of these costs.
Table 4. The share of material and energy consumption costs in the costs borne by the companies in the years 2008-2014

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>29.0%</td>
<td>28.2%</td>
<td>29.4%</td>
<td>31.1%</td>
<td>32.3%</td>
<td>30.3%</td>
<td>30.2%</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td></td>
<td>31.3%</td>
<td>30.3%</td>
<td>34.5%</td>
<td>34.0%</td>
<td>32.8%</td>
<td>31.9%</td>
<td>31.5%</td>
</tr>
<tr>
<td>Small enterprises</td>
<td></td>
<td>30.8%</td>
<td>30.0%</td>
<td>29.1%</td>
<td>31.1%</td>
<td>32.9%</td>
<td>31.0%</td>
<td>30.8%</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td></td>
<td>28.2%</td>
<td>27.6%</td>
<td>27.9%</td>
<td>27.4%</td>
<td>27.4%</td>
<td>27.1%</td>
<td>26.6%</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results

Lease costs are largely determined by the level of interest rates. A lease is a form of credit with calculations being carried out on the basis of WIBOR rate, which depends on the reference rate of National Bank of Poland (NBP). Raising interest rates by the Monetary Policy Council is to the disadvantage of the companies for it affects the lease cost. Cutting interest rates, on the other hand, should benefit the companies as it plays a role in reducing the installment paid.

The findings show that there was a relationship between the NBP average reference rate and the share of external service costs in the total costs over the period analyzed. The decline in interest rates caused a slight reduction in the companies’ outlays and their share in all the costs, which is particularly visible in 2011-2014. The share of the costs was still at a high level because of the growing number of vehicles whose purchase was largely financed by a lease (Fig. 8).

Figure 8. The correlation between the share of external service costs in total costs and the NBP reference interest rate in the years 2008-2014

Source: self-reported data based on the study results
As showed before, the share of external service costs in the companies varied over the course of the period under study. Until 2013, they fell mostly on the costs borne by micro-enterprises, whereas since 2013 they affected the costs of small enterprises to a larger degree. For medium enterprises, these costs made up on average from 21.2% of the costs in 2009 up to 27.4% in 2011 (Table 5).

Table 5. The share of external service costs in the costs borne by the companies in the years 2008-2014

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>30.0</td>
<td>28.8</td>
<td>28.2</td>
<td>31.0</td>
<td>30.9</td>
<td>29.3</td>
<td>28.5</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td></td>
<td>31.3</td>
<td>30.3</td>
<td>29.1</td>
<td>34.0</td>
<td>32.8</td>
<td>29.4</td>
<td>28.4</td>
</tr>
<tr>
<td>Small enterprises</td>
<td></td>
<td>30.6</td>
<td>29.0</td>
<td>28.8</td>
<td>31.6</td>
<td>32.9</td>
<td>31.6</td>
<td>30.7</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td></td>
<td>28.0</td>
<td>27.2</td>
<td>26.6</td>
<td>27.4</td>
<td>27.1</td>
<td>26.8</td>
<td>26.4</td>
</tr>
</tbody>
</table>

Source: self-reported data

Taxes and local fees made up on average 3.9% of all the costs borne by the companies. Their level depends on such factors as the standard of exhaust emission, the number of kilometers driven on tolled roads and the number of vehicle axles. Their burden fell mostly on small enterprises (on average 4.0%), with micro-enterprises being the least burdened in this respect. Their share in the costs grew from 0.9 percentage points compared to 2008 (Table 6). This was due to the changes in the tax rates on the means of transport and the implementation of the electronic toll system (e-toll).

Table 6. The share of tax and toll costs in the costs borne by the companies in the years 2008-2014

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>3.1%</td>
<td>3.8%</td>
<td>4.3%</td>
<td>4.1</td>
<td>4.0</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td></td>
<td>3.0%</td>
<td>3.9%</td>
<td>4.6%</td>
<td>4.3</td>
<td>3.8</td>
<td>3.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Small enterprises</td>
<td></td>
<td>2.7%</td>
<td>3.6%</td>
<td>4.3%</td>
<td>3.9</td>
<td>4.2</td>
<td>4.4</td>
<td>4.6</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td></td>
<td>3.6%</td>
<td>3.9%</td>
<td>3.9%</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results
Owing to the upgrading of the companies’ fleet, the share of these costs did not show an excessive growth during the six-year time frame of the research. Since 2011 the number of vehicles meeting the emission level EURO 5 and above started to increase. In 2008 the companies used only 210 vehicles with EURO 5 type-approval, which made up 11.2% of the entire fleet, in 2011 the number of this type of vehicles grew up to 480 (21.8%), with 2014 seeing that number at 1084 vehicles (37.4% of the fleet).

Moreover, the number of vehicles with emission level EURO 3 and below declined. In 2008 vehicles of this type made up 60.8% of the fleet used, while in 2014 it was only 26.2%. Nevertheless, a substantial number of the companies still used vehicles EURO 3 and EURO 4 (43.4%) in 2014. However, even in those companies one could observe a downward trend. In addition, there was a clear increase in the number of most advanced vehicles meeting level EURO 6. In 2008 none of the companies owned such vehicles, while in 2014 they made up as many as 16.7% of all vehicles (Fig. 9).

**Figure 9. The number of vehicles by their emission level used by the companies in the years 2008-2014**

Source: self-reported data based on the study results
Another category of costs analyzed was the one covering salaries and social security contributions paid by employers on account of the salaries. These costs are linked with each other and depend on:

- the minimum wage level in the country in a particular year,
- the average wage level in the given sector of enterprises,
- situation on the labor market.

As already indicated before, the period under study saw an increase in the salaries paid in the transport sector, especially those of drivers, who represent the key workforce resource of transport operators. The declining number of professional drivers made the shortages on the supply side of the driver labor market grow, while the demand kept on growing as the result of the increase in the number of vehicles in transport undertakings. Moreover, social security paid by employers grows proportionately to the increase in salaries.

The share of salaries in the costs in the companies examined represented on average 10.6% over the period analyzed, with small enterprises incurring the biggest share (on average 11.4%), while medium enterprises’ share in this respect was the smallest (on average 9.9%). Further to that, these costs were stable in medium enterprises during the period in question. This is related to the higher wage level, and thereby lesser vulnerability to the changes of minimum wage (Table 7).

High labor costs sometimes induce employers (in particular, small firms) to look for new “alternative” forms of employment – not always entirely legal. One of such forms involves hiring employees on a part-time basis or for a lower than actual pay and paying the worker a portion (not infrequently the larger one) of his salary without it showing on the payroll, that is, without formal confirmation as to the salary amount received.

That this practice is wide-spread is mentioned in the report of the Civil Development Forum. According to it, this problem concerns almost 2 million workers with their salaries being paid by employers in the shadow economy. The report cites the GUS data which state that as many as 57% of workers in micro-enterprises officially earn the minimum wage, whereas in companies employing over 9 persons this percentage was below 5% (Shadow Economies in the Baltic Sea Region 2015: 19). Such huge discrepancies suggest that only a portion of salaries is
paid in micro-enterprises, which seeking to cut down on costs are willing to pay salaries under the table. The analysis of the data gathered shows that it was the micro-enterprises which were most vulnerable to the changes in the minimum pay, and thus the costs relating to its rise.

Table 7. The share of salary costs in the costs of the companies in the years 2008-2014

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Total</td>
<td>8.1%</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td>6.7%</td>
</tr>
<tr>
<td>Small enterprises</td>
<td>9.2%</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results

Social security itself did not represent a substantial share in the costs of the economic operators analyzed – on average 1.8%. Its burden tended to be the highest in medium enterprises (on average 2.2%), the lowest in micro-enterprises (on average 1.3%) – Table 8. This is linked to the relationship indicated above in line with which bigger companies are willing to pay higher contributions, paying salaries to a lesser extent beyond the shadow economy and therefore their burden incurred on account of salaries is higher.

Table 8. The share of social security and other allowances costs in the costs of the companies in the years 2008-2014

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Total</td>
<td>1.5%</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td>1.1%</td>
</tr>
<tr>
<td>Small enterprises</td>
<td>1.8%</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results

Other costs by types in transport companies are primarily related to insurance and travel costs of employees. Over the period of 2008-2014 the following changes
ocurred in the external environment in terms of these costs:

- changes in the rates of motor TPL insurance for car vehicles,
- change in 2013; Ordinance of the Minister of Labor and Social Policy of 29 January 2013 on payments due to an employee of a state or a self-government unit financed with the state budget in connection with a business trip, which introduced higher payments also for private undertakings,
- delivery of the Supreme Court judgment (Ref. No II PZP 1/14) which adopted an interpretation that was unfavorable to carriers with respect to the provisions on payments for accommodation for the night in the driver’s cabin.

Over the period under study the market for motor insurance was characterized by a progressive reduction of basic insurance policy prices, which was caused by the growing competition between insurers. However, the nature of the amount of premiums is not uniform as to be able to show that it has a direct impact on the cost level, given that insurance companies apply multivariate algorithms for their calculations. Plenty of enterprises which lease vehicles have the possibility to add insurance premiums to lease rental payments. If this is the case, the premium is most likely not to be recognized as a separate cost item.

The level of this category of costs was predominantly affected by the expenses relating to business trips. Allowances represent a form of partial payment of salaries in many firms with their advantage being that it is not necessary to make deductions on account of income tax and contributions to social security. Thus, they reduce the level of costs incurred by the economic operator which arise from the real amount of pay.

Until 2014 the general interpretation of the provisions of law in this respect provided enterprises with freedom in terms of setting their rates depending on the internal provisions of labor law legislations. In 2014, in line with the new interpretation of the legislation issued by the Supreme Court, transport operators were required to pay a lump sum for accommodation for the night in the driver’s cabin according to the amount set out in the Ordinance of the Minister of Labor and Social Policy of 29 January 2013.

The remainder of the costs by type grew in all the categories. In particular, their
share began to increase since 2013. Moreover, economic operators employing a workforce of over 50 had the largest share of these costs in their total costs (on average 25%), with micro-enterprises having the smallest share (17.4%). A detailed description is presented in Table 9.

Table 9. The share of other costs by type in the costs of the companies in the years 2008-2014

<table>
<thead>
<tr>
<th>Items</th>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>23.4%</td>
<td>22.5%</td>
<td>21.5%</td>
<td>18.5%</td>
<td>17.4%</td>
<td>19.5%</td>
<td>20.3%</td>
</tr>
<tr>
<td>Micro-enterprises</td>
<td></td>
<td>22.6%</td>
<td>18.9%</td>
<td>16.3%</td>
<td>13.1%</td>
<td>13.9%</td>
<td>17.8%</td>
<td>18.9%</td>
</tr>
<tr>
<td>Small enterprises</td>
<td></td>
<td>22.2%</td>
<td>22.4%</td>
<td>22.3%</td>
<td>17.4%</td>
<td>14.4%</td>
<td>16.5%</td>
<td>17.2%</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td></td>
<td>25.3%</td>
<td>26.2%</td>
<td>25.8%</td>
<td>24.9%</td>
<td>24.0%</td>
<td>24.2%</td>
<td>24.8%</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the study results

5. Conclusions

The decisions made by enterprises may substantially affect individual costs incurred by companies in running their business. An ongoing analysis of the individual costs enables an entity to react quickly to the changing market conditions. Therefore, the optimization of finances of transport companies should be subject to an ongoing managerial supervision.

At the same time, the findings obtained allow the impact of the individual macroeconomic factors on the costs incurred by companies to be analyzed. In this paper the focus was mainly on the general determinants with the analysis of the micro-factors being omitted. This results largely from having to engage greater outlays in the form of conducting a survey.

The majority of the factors which had an impact on the cost variations was beyond direct influence of the transport operators analyzed. Still, if reacting accordingly, the individual companies could implement an adaptation process aimed at alleviating the changes taking place in their environment. The two most important cost determinants in the transport sector include the labor market which during the period under study led to the decline in supply of qualified staff, thus contributing to
increased salaries, and fuel price which is dependent on oil production. However, it should be emphasized that the taxes and fees subject to the budget policy also exerted influence on the burden borne by the companies. Moreover, micro-enterprises were more vulnerable to the impact of external factors having less room for maneuver in terms of negotiations as well as having limited capital resources.

The increase in the overall level of costs indicated over the period of 2008-2014 does have an impact on competitiveness of the companies under study. Higher costs result in the Polish transport operators having smaller advantage over the competing companies from Western Europe. This process which is very much connected with increased salaries will surely lead to a decline in profits in the upcoming years.

While in 2008 Polish companies could take advantage of the lower fuel prices and lower wages compared to the countries of the “old” Union, the changes that occurred over the period examined suggest that this advantage grew smaller. There is no doubt that the managers of transport companies should look for new opportunities to penetrate the market in that they should improve the quality of their services as well as retain contracts for regular services.

Considering that the findings gathered pertain in their majority to limited liability companies and limited partnerships, referring them to enterprises in general may be done, yet with considerable caution. Moreover, the study is general in its nature having exhausted not all the factors determining the costs in the road transport of goods, in particular, the external factors. One should, therefore, conclude that in order to explore more extensively this topic, it would be advisable to carry out an analysis focusing, in particular, on companies of natural persons as they represent the most numerous group of economic operators in this sector.

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Implementation of the Sustainable Development Goals as an opportunity for greater socio-economic integration within the European Union

Emilia BAMWENDA  
Richard GIRLING  
University of Wroclaw, Poland

Abstract:

Aim: The aim of this article is to discuss the global and European concepts of sustainable development and how they can enhance European integration.

Design / Research methods: The analysis of statistical data will show positive and negative trends in Europe. In addition, barriers to the implementation of the sustainable development strategy will be indicated, as well as areas in which the EU should put more effort into achieving its ambitious goals.

Conclusions / findings: European Union countries stand out in the international arena for their high standard of living, made possible by a high level of economic development and extensive social welfare systems. However, at the turn of the 20th and 21st centuries it became clear that maintaining these high standards in the face of fundamental changes – both externally and internally – would require a significant reorientation of the current development policy. Euroscepticism, European integration, globalization and the increasing competitiveness of the rapidly growing Indian and Chinese economies, the IT revolution, the rise of the importance of knowledge and innovation, the prospect of depleting non-renewable natural resources crucial for modern development (combined with the associated risk in prices) are all becoming increasingly prominent in the list of challenges which Europe faces.

Originality / value of the article: The article discusses the current statistical data of the whole concept of sustainable development rooted in the Europe 2020 program in contrast to other, studies, which in the majority focus on one issue of European programs.

Implications of the research: This analysis complements the discourse regarding the Europe 2020 strategy.

Key words: Sustainable Development, European Union, European initiatives, integration, GDP.  
JEL: Q01, F15
1. Introduction

It can be argued that the European Union (EU) is in a state of crisis. Its ability to implement national reforms and its position as a global power are seriously undermined by internal forces within Europe and the risk that the EU will fall apart. Euroscepticism and populism are abundant; Reactions to the refugee crisis suggest that solidarity between Member States is poor; The euro crisis has deepened social tensions and economic divergences across the continent. Europe urgently needs a new and positive narrative for its future development which resonates with Europe’s citizens and positions the EU as a constructive force for sustainable national and global development. This is even more urgent in the light of increasingly blurred boundaries between national and external agencies. It is not possible to promote Europe’s sustainable development, nor its own interests, without considering the aspirations of emerging and developing countries. In addition to this, due to the size of its market and economy, European development decisions significantly affect the sustainability of other countries for better or worse. In 2030, the Sustainable Development Agenda with its 17 Sustainable Development Goals (SDGs) set the stage for national interdependence international policy making. Plan 2030 is a plan of action for people, planet, peace and prosperity that reflects fundamental European values and interests: it is crucial for Europe and the rest of the world.

This article will analyze statistical data from Eurostat and the resolutions of the Europe 2020 strategy, showing both positive and negative impacts on the economy and standard of living. Through this analysis, barriers to the implementation of the strategies become apparent, mainly consisting of the widening gap between rich and poor, which creates anti-European narratives. Today’s European societies face many challenges related to sustainable development, from unemployment to aging populations, climate change, pollution, sustainable energy and migration. Europe must face the current challenges and strive to position itself for the future, bearing in mind the speed and complexity of changes in the era of globalization. In order to preserve European values and deepen integration, it is necessary to invest in social cohesion by investing in youth, social inclusion, sustainable growth and combating inequalities. In order to preserve and further develop the economy, changes in
emissions, strong involvement in research and innovation, as well as the creation of new jobs are necessary. The integration of the Union requires ensuring coherence and cooperation between its various departments, as well as coherent actions between adopted policies. As part of the current trend, sustainable development is included in all key projects and development and integration initiatives.

2. The history of sustainable development

Sustainable development, as defined by the World Commission on Environment and Development in 1987, is a process aimed at satisfying the developmental aspirations of the young generation in a way that allows for the same aspirations for the next generations (The World Commission on Environment and Sustainable Development 1987: 41-42). The concept of sustainable development is - put simply - a concept that aims to improve economies through more efficient usage of natural resources, thereby simultaneously creating more environmentally friendly conditions and increasing the competitiveness of economies (Norgard 1995: 435).

The concept of sustainable development first came to light in 1968 during UNESCO’s International Conference of Scientific Experts, devoted to the interconnectedness of the environment and development. The UN Secretary General’s report, published in 1969, played a significant role in the international discourse on the risks of inappropriate resource management (Płachciak 2011: 239-241). The breakthrough was the United Nations Conference on the Human Environment in Stockholm in 1972, where the Declaration of the United Nations Conference on the Human Environment was published, and environmental protection was established by the State (Mebratu 1988: 500-502). World environmentalism in the eighties began to focus not just on awareness about environmental protection, but also on the need to develop methods for solving ecological problems (Kośmicki 2007: 194).

An important global point in the development of the concept of sustainable development was the Earth Summit in Rio de Janeiro in 1992. It was adopted by 180 countries in the world Rio Declaration and Agenda 21. The first document included rules covering both the rights and duties of states (United Nations Conference on
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Environment & Development 1992). The second document is aimed at presenting the goals of shaping and protecting areas of the environment. Through appropriate and effective management of the implementation program of sustainable development, “Agenda 21” was to become a global blueprint setting out the directions of activities related to environmental management (United Nations Conference on Environment & Development 1992: 3). Agenda 21’s Ambition is a safe and just world in which every living being will be able to maintain its dignity (UNESCO 2006).

The next step towards sustainable development was The United Nations Millennium Summit in 2000, which saw the creation of the Millennium Development Goals. These were to be implemented by 2015 and among them were the goals of “Reducing extreme poverty and hunger by half; halving the number of people whose income does not exceed 1$ per day; achieve universal primary education; provide for all people opportunities to complete a basic education; promote gender equality and empowerment of women; reduce child mortality – reduce by 2/3 mortality rate of child under 5 years of age; improve maternal health; limit the spread of HIV/AIDS, malaria and other diseases; sustainable management of natural resources; and create a global partnership for development” (Sachs, McArthur 2005: 347-348).

The next important step to develop the resolutions of the 2020 Strategy was The World Summit on Sustainable Development in Johannesburg In 2002, where the Action Plan and Political Declaration documents were adopted. The main element of this summit was the signing of the Action Plan, which obliged the signatories to strengthen the three main elements of sustainable development regarding social, economic and environmental development, which were to remain independent but mutually reinforcing pillars (Kimball et al. 2002: 3-13).

At the next Rio Earth Summit, Rio + 20, issues of global problems were taken into consideration, highlighted by demographic changes in the world. The conclusion of the negotiations was the formal acceptance of the “The State of the Future We Want” document, which highlighted in particular the problem of poverty in the world. During the conference, member states also agreed to the “Sustainable Development Goals after 2015”, which were modeled after the “Millennium
Implementation of the Sustainable Development Goals …

Development Goals”, incorporating both their strengths and weaknesses (Sanchez, Croal 2012: 46-48).

3. European concepts for sustainable development

Sustainable development is the primary and overarching objective of the European Union – an objective which the EU has actively worked on since the formulation of global initiatives discussed in the previous section. The EU’s task simultaneously revolves around economic development, environmental protection and social justice, which will result in deeper integration within the EU structure. The area of European activities is visible in the Amsterdam Treaty, the 2001 European Union Sustainable Development Strategy with subsequent amendments and revisions that complement the Lisbon Strategy, and the Europe 2020 Strategy.

With regards to the integration of sustainable development into the EU strategy, the first step was taken in 1997. This happened with the adoption of the Treaty of Amsterdam. The changes introduced to the Treaty were primarily related to the strengthening of the EU’s federal form and the power of the European Parliament. The agreement has had an important impact on European politics as a whole, including the area of sustainable development. (Van Calster, Deketelaere 1998: 14).

The treaty defined common European values and set a common path for all member states. The Treaty of Amsterdam formalized the social dimension of sustainable development and included it in the legal framework binding all member countries (Sozański et al. 2002: 90-93). With regards to sustainable development, it was a landmark legal act in the history of EU documents. Therefore, sustainable development is in line with the basic values adopted by the European Union, which created the opportunity to develop the entire process of European integration.

Differences in global development have mobilized the union to embrace a new path. The EU’s ambition to be the leading competitive economy in the world was to be completed by 2010. In 2000 in Lisbon, a social and economic development plan was developed by implementing economic legislation. The assumption of this concept was an economy capable of sustainable economic growth, based on a
knowledge-based economy (Kok 2004: 8-11). The provisions of Lisbon, in the newly adopted European policy, corresponded to the social dimension of sustainable development.

4. European initiative for sustainable development

At the summit in Gothenburg, European leaders debated about the vision for European sustainable development. The culmination of these deliberations was the adoption of the strategy for the sustainable development of the European Union, which was based mainly on proposals put forward by the European Commission. It was divided into two parts, the first of which dealt with the objectives of EU policy which currently oppose the idea of sustainable development. The second emphasized the need for changes in the process of creating European plans and policies in order to ensure the compatibility of economic, environmental and social policies. The provisions of the European Commission regarding the coherence of the strategy were to act as a catalyst, which would be a factor influencing the behavior of decision-makers as well as a society that is consistent with the idea of sustainable development (CEC 2001: 2-4).

Global changes and the identification of new challenges facing sustainable development have led to the need for a targeted strategy, transparent breakdown of responsibilities, effective monitoring and management. The new development strategy was to be a single, coherent strategy for fulfilling the European Union’s commitment to address the challenges of sustainable development. In this version of the strategy, the importance of cooperation with partner countries outside the European Union was stressed, especially developing countries, and global solidarity in addressing the issue of sustainable development (Dalal-Clayton 2004: 15-20).

The Lisbon Agenda has been replaced by the Europe 2020 Strategy, which was adopted on June 17, 2010. From this moment, sustainable development was carried out within its framework with the intention of creating an economic and social plan that would significantly reduce social exclusion. Europe 2020 was also a plan to overcome the economic crisis and economic threats related to the prosperous
IMPLEMENTATION OF THE SUSTAINABLE DEVELOPMENT GOALS …

development of Asian countries. The crisis in Europe affected society above all, in which 23 million people were unemployed in 2009. The deepening integration of countries also affected economic and economic instability. These factors have led to radical action and narrowing cooperation between Member States (Sulmicka 2011: 171-173). The assumptions of the Europe 2020 strategy, apart from creating measures to overcome the crisis, had much broader provisions allowing for creating a stable foundation for a sustainable future of the Community’s development. It was to be a program that gives the opportunity to stabilize sustainable European development, using the strongest assets that Europe has.

4.1. Europe 2020 goals

The Europe 2020 strategy was designed to accelerate economic growth and employment by embracing the three main priorities. The first of these was intelligent growth, under which it is necessary to invest in a more innovative and knowledge-based economy (Sulmicka 2011: 172). The result was to be a modern society with a large number of high technology enterprises. The result would be benefits for entrepreneurs as well as for the entire economy. The next priority was sustainable growth characterized by a low-carbon economy, which at the same time increases its competitiveness. Environmentally-friendly activities were to be rewarded with the promotion of micro, small and medium-sized enterprises that are more competitive. The last priority was development based on reducing social exclusion. Within this priority, the economies with high employment rates were to be supported, which at the same time ensures social, economic and territorial cohesion. All these priorities are consistent with each other, and only introducing them at the same time guarantees achievement of the intended success (EC 2010: 11-13). For better monitoring of the implementation of changes, decision-makers created specific objectives that were to be adapted to the realities of each country. The first goal was to increase the employment rate aged 20-64 from 69% to 75%. The next objective is to maintain the current expenditure on research and development at 3% of GDP, reduce greenhouse gas emissions by 20% compared to 1990 levels. Another objective is to reduce the rate of early school leaving to less than 10% and increase the number of people with higher education from 31% to 40%. The fifth objective
was to reduce the number of Europeans living in poverty by 25%, or around 20 million people). The final goal is to reach 20% of the total energy consumption from renewable sources and increase energy efficiency by 20%.

The Europe 2020 strategy was aimed at the inclusion of Member States with the stated goals and directions of development. They were part of the main idea of intelligent and sustainable development. Monitoring of the progress of this plan implementation was to be presented in the form of data that is reliable and measurable. The above goals indicate considerable consistency. An advantage of the Europe 2020 project is the adaptation and individual treatment of countries, taking into account their existing differences in their level of development. The current competitiveness of the European Union is based on the import and export of goods for the whole world. European actors, however, are aware of the increasingly stronger position of “Asian tigers”, which may cause a decline in the competitiveness of Europe itself. Therefore, sustainable development is to contribute also to the external dimension of increasing competitiveness through better efficiency and maintaining the first position on environmentally friendly technologies markets (Sulmicka 2011: 179).

4.2. Analysis of the achievement of the objectives

Employment and other issues related to the labor market are the foundation of social and political debates. Employment is necessary to improve the quality of life and citizens’ satisfaction. In addition, it contributes to economic growth as well as social inclusion as the basis for socioeconomic development and wellbeing. The Europe 2020 strategy, through its integration of economic growth, has set job creation as one of the five objectives and to raise employment rates of people between 20 to 64 years to 75%.

As indicated in the above table, the distance to the 75% target decreased from 2010 to 3.9 percentage points. About 71.1% of the European population were employed in 2016 compared with 70.1% in 2015 and 68.4% in 2012, although it still remains slightly above the level of 2008. It is worth noting that in the case of men, this indicator reached the assumed level as early as in 2015. However, in comparison with other world economies, the EU is still lagging behind. It should
also be noted that within 4 years from the creation of the strategy, this performance indicator was two times lower than in the year of its development. When considering the data in Table 1, it can be assumed that Europe may have a problem with achieving its objectives in this area. The employment of women is increasing steadily, but not fast enough to reach the set ceiling within four years. According to the Europe 2020 Strategy goals, the total employment rate for men and women is to be equal, which may raise concerns about the negative impact of this target on the fertility rate in an aging Europe. Thus, in the current situation, stimulating fertility may be equally as significant as reducing the high employment rate.

Table 1. Goal: 75% of the population aged 20-64 should be employed

<table>
<thead>
<tr>
<th>Indicator/Unit</th>
<th>Year</th>
<th>Aim Europe 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of population aged 20-64</td>
<td>70.3</td>
<td>68.6</td>
</tr>
<tr>
<td>Male</td>
<td>77.8</td>
<td>75.2</td>
</tr>
<tr>
<td>Female</td>
<td>62.8</td>
<td>62.1</td>
</tr>
</tbody>
</table>

Source: The authors own work based on Eurostat data.

Research on development and innovation is another Europe 2020 goal. The key element of activities in this area is the development of innovative products and services, not simply contributing to achieving the objectives of smart growth, but above all to sustainable development and integration. It is key to providing scientific and technical solutions that meet global social problems. In addition, they will bring new economic opportunities, sources of growth and jobs, and increase competitiveness, which will allow Europe to strengthen areas of cooperation between partner countries (EC 2010: 8-9).
Table 2. Goal: 3% of the EU’s GDP should be invested in R&D

<table>
<thead>
<tr>
<th>Indicator/Unit</th>
<th>Year</th>
<th>Aim Europe 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross domestic expenditure on R&amp;D / % of GDP</td>
<td>2008</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>1.93</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>2.01</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>2.02</td>
</tr>
<tr>
<td></td>
<td>2014</td>
<td>2.03</td>
</tr>
</tbody>
</table>

Source: The authors own work based on Eurostat data.

In the period of a slight increase in 2009-2014, research and development expenditures reached 2.4%. As shown in Table 2, however, this progress was slow, and the latest data shows that since 2014 there is stagnation, moving the EU away from the 3% target. The intensity of research and development has been slowly increasing after the EU crisis in connection with the increase in public funding in research and development in many member states. Also in this area, the EU is lagging behind global leaders. In order to achieve the Europe 2020 target, the EU must drive growth in R&D funding by at least 0.17 percentage points. In addition, the R&D expenditure ratio is related to the theory of endogenous growth, combining knowledge stemming from research and development activities with a permanent acceleration of economic growth. According to this theory, current investment in research is the main condition for accelerating future growth. One should not expect a quick effect, but one can expect a positive correlation with the time-shifted indicators that indicate long-term dependence. An additional problem also appears in the adopted index, which is a typical indicator of inputs, and yet the strategy is primarily about the effects. Despite the widespread use of such simplification, with regards to policy assessment, the EU generally distinguishes between indicators of inputs and effects.

The next education and training goal is the basis of the Europe 2020 strategy, the implementation of which will contribute to growth and employment. Europe in recent years has had to overcome the economic crisis and the aging population problem, which affects all other economic indicators. On the other hand, the area of education helps increase productivity, innovation and competitiveness. In addition, this objective is closely linked to other Europe 2020 strategies and, above all, to the
above mentioned R&D objective, as investments in the R&D sector are associated with demand for highly qualified employees.

**Table 3. Goal: The share of early school leavers should be under 10% and at least 40% of 30-34 years old should have completed a tertiary or equivalent education**

<table>
<thead>
<tr>
<th>Indicator / Unit</th>
<th>Year</th>
<th>Aim Europe 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early leavers from education and training / % of population aged 18-24</td>
<td>14.6</td>
<td>13.9</td>
</tr>
<tr>
<td>Male</td>
<td>16.6</td>
<td>15.8</td>
</tr>
<tr>
<td>Female</td>
<td>12.6</td>
<td>11.9</td>
</tr>
<tr>
<td>Tertiary educational attainment / % of population aged 30-34</td>
<td>31.2</td>
<td>33.8</td>
</tr>
<tr>
<td>Male</td>
<td>28.9</td>
<td>30.3</td>
</tr>
<tr>
<td>Female</td>
<td>34.4</td>
<td>37.3</td>
</tr>
</tbody>
</table>

Source: The authors own work based on Eurostat data.

As the above table indicates, the level early school leaving has been steadily decreasing since the year of the strategy development. This decrease applies to both women and men. In 2016, only 7 percentage points remain between the current and target level, which means that a large number of Member States have already achieved national targets. This objective also includes one more indicator referring to the completion of the third level of education. In this area, you can also see the progress which was to achieve state of 40%. For 2016, the data already indicated the number of 39.1%, which means that an increase by almost 6% was noted. It is also evident that in this case the goal was achieved by women who exceeded the 40% target already in 2012. This means that the goal is very likely to be achieved by 2020. However, the adopted indicators are typical quantitative indicators, qualitative factors like the quality and structure of education are also important. For example, the shortage of staff with technical education is significant, because European students are reluctant to choose more technical courses, in contrast to students from outside of Europe.
The next priority is to prevent a spiral of social exclusion and poverty that creates more inequality which can in turn contribute to a permanent decline in the economic performance. The inability to lead a dignified life increases the risk of poverty. Therefore, effective development of education, health care, social systems, employment or tax breaks, may result in a risk of poverty passed down from generation to generation.

Table 4. Goal: Reduce poverty by drawing 20 million people from the risk of poverty and social exclusion

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>People at risk of poverty or social exclusion</td>
<td>Millions</td>
<td>118</td>
<td>122.9</td>
<td>121</td>
<td>119</td>
<td>117</td>
</tr>
<tr>
<td>People living in household with very low work intensity</td>
<td>Thousand</td>
<td>-</td>
<td>39711</td>
<td>41945</td>
<td>39839</td>
<td>38811</td>
</tr>
<tr>
<td>People at risk of poverty after social transfers</td>
<td>Thousand</td>
<td>-</td>
<td>83953</td>
<td>85926</td>
<td>86752</td>
<td>87016</td>
</tr>
<tr>
<td>People severely materially deprives</td>
<td>Thousand</td>
<td>-</td>
<td>49449</td>
<td>48034</td>
<td>44441</td>
<td>40361</td>
</tr>
</tbody>
</table>

Source: The authors own work based on Eurostat data.

The number of people living in poverty in 2010 was over 121 million. After 2013, the European economy started recovering after the crisis, but despite this, every fourth person living in Europe is affected by social exclusion or poverty. The decrease by 1 million compared to 2008 from 2016 is related to the EU economic problems which in 2012 caused regression in terms of reaching the Europe 2020 target. To increase the chances of meeting the target, the number of poor or socially excluded people must still decrease by 22.9 million, which may be difficult to achieve. After the presentation of the above objective, there were voices about the low probability of implementing such an ambitious strategy, in particular taking into
account the failure of the implementation of the Lisbon Strategy, which did not bring any effects in the area of poverty reduction or social exclusion. Moreover, the method of calculating poverty adopted by Eurostat is quite controversial. 60% of the median national average equivalent income means a completely different financial situation between low income countries and rich countries.

Table 5. Goal: Reduce greenhouse gas emissions by 20% compared to 1990 levels. Attain a renewable energy rates of 20% of total energy consumption. Improve energy efficiency by 20%

<table>
<thead>
<tr>
<th>Indicator / Unit</th>
<th>Year 2008</th>
<th>Year 2010</th>
<th>Year 2012</th>
<th>Year 2013</th>
<th>Year 2014</th>
<th>Year 2015</th>
<th>Aim Europe 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse gas emission / Index 1990=100</td>
<td>90.61</td>
<td>85.73</td>
<td>83.2</td>
<td>-</td>
<td>77.39</td>
<td>77.88</td>
<td>80</td>
</tr>
<tr>
<td>Share of renewable energy in gross final energy consumption / %</td>
<td>11.0</td>
<td>12.5</td>
<td>12.9</td>
<td>15.0</td>
<td>16.1</td>
<td>16.7</td>
<td>20</td>
</tr>
<tr>
<td>Primary energy consumption /% of saving</td>
<td>2.8</td>
<td>5.7</td>
<td>9.4</td>
<td>11.9</td>
<td>16.1</td>
<td>16.7</td>
<td>20</td>
</tr>
</tbody>
</table>

Source: The authors own work based on Eurostat data.

The goal of reducing greenhouse gas emissions by 20% has already been implemented between 2013 and 2014. The keys to reducing emissions can not only revive innovation but also create new jobs which is closely related to the goal of research and development as well as reduction of poverty and social exclusion. Quick progress has mobilized the EU to set a more demanding goal by 2050, in which the EU is to become a low-carbon economy reducing greenhouse gas emissions by as much as 80-90%. Steady progress has been noted for all of these goals which, if it continues, may result in achieving the 2020 targets. In this matter, there is a risk associated with reducing CO2 emissions. Member States whose energy is based largely on coal face an escalation of energy costs and a subsequent decrease in competitiveness of production, which will result in an increase in unemployment.
5. Concluding remarks

The EU Action Plan shows the way to a long-term vision of sustainable development. Economic development, social cohesion and environmental protection are to become mutually complementary elements, which in the understanding of European strategies are to be monitored in a transparent and easy way. However, in order to be effective it is not enough to just set a specific action plan, monitored by selected entities. It’s necessary to also develop a management system, requiring Member State to implement controls and requirements in their policies. It is necessary to adapt the Europe 2020 targets individually to each Member State, taking into account their current level of social and economic development. The creation of a proper system of sustainable development indicators may better guide the implementation of the plan’s objectives by 2020. The assessment of progress presented in this article indicates that positive changes are visible primarily in terms of employment indicators, greenhouse gas emissions and the use of renewable energy. However, there has been a lack of progress in terms of poverty and social exclusion. All of the aforementioned goals share a common problem: Namely, that the numerical goals set were all arbitrarily assigned. Another important issue is the insufficient involvement of Member States in the policy of sustainable development. Often, sustainable development takes a back seat to the main policies in which national actors mainly focus on the promotion and growth of their own economies.

Additionally, there is a lack of readiness among Member States to bear the related financial and political costs of implementing some of the objectives. The dynamics of the internal integration processes of the European Union are significantly influenced by a number of factors. The most important factor affecting the transformation of the European Union is the adoption of sustainable development objectives, specifically increasing the international competitiveness of the EU, as well as strengthening cooperation within the EU and creating social and economic conditions for the European Union. It is therefore necessary to move away from the traditional model of European integration shaped on the original concept of the Schuman plan. In order to adapt to an increasingly globalized world, EU Member States must act as a whole, adapting to coherent concepts. As one body, the
European Union is able to influence the challenges of globalization and influence economic, social and technological issues.

For many supporters of the European project, the EU has entered a period of stagnation and even regression. Many experts and scientists believe that a probable EU disintegration is inevitable, and – even in the event of survival – the shape and nature of European integration will be questioned. On the other hand, there is also some optimism that these crises, in the face of the EU, can bring about beneficial reforms and ultimately make the Union more effective and coherent. The enlargement of the Union has highlighted the existing discrepancies between Member States, hence the need to apply modern mechanisms to support integration processes adapted to each member country. The sustainable development discourse has been discussed many times during the debates of the European institutions, as well as within the framework of various strategies for adapting it to European conditions. Therefore, the concept of sustainable development can play an important role in the activities of the European Union, representing a new form of integration.

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Internet source:


Application of Kano questionnaire to assess the level of teaching staff’s quality from the student's point of view

Anna SZELIGA-DUCHNOWSKA
WSB University in Wrocław, Poland

Mirosława SZEWCZYK
Opole University of Technology, Poland

Abstract:

Aim: The aim of the paper is to present the possibility of using Kano method by a student to assess teaching staff's quality level.

Design / Research methods: The research method encompassed the analysis of the subject-specific literature and the authors’ own research employing Kano questionnaire. The survey was carried out in November 2016. The lecturer characteristics from the student's point of view have been diagnosed, including their prioritization, which allowed for determining the teaching staff's quality level and student satisfaction with lecturers. The qualities requiring further development were indicated.

Conclusions / findings: The study shows that university authorities should primarily provide lecturers with good theoretical knowledge and capable of defining clearly the student's obligations.

Originality / value of the article: The authors recommend that higher education institutions use Kano questionnaire instead of traditional surveys for evaluation of teaching staff by students.

Implications of the research: Kano questionnaire can be applied in a variety of branches and can relate to various products and services, with the aim to point to their qualitative characteristics which should be developed in particular and those which are immaterial to the customer.

Limitations of the research (if applicable): The selection of elements for the sample was of a non-random character. Because of the subject matter dealt with by the authors in this paper, as well as due to limitations of space, only some of the results obtained were presented – the evaluation of lecturers. The survey also included other categories which – in the students’ opinions – are decisive regarding the quality of educational service, such as: organization of study courses, seminar timetable, facilitations, and infrastructure.

Key words: Kano method, quality, student, satisfaction, lecturer
JEL: L8, L83, L15
1. Introduction

As the major determinants in terms of the development of the higher education system in the long term one could cite the changes in birth rates and in the age structure of the population. The decline in the number of candidates for tertiary education observed over the last years has necessitated alterations in the way postsecondary education institutions function. Universities compete with one another to win the client – student. When faced with a strong competition, not only winning clients but retaining them becomes a key issue. This in turn puts a demand on higher education institutions to evaluate the level of student satisfaction with a view to obtain information on the changing needs, preferences and expectations.

It is broadly agreed that there is a positive relationship between well-conducted classes and the client’s – student’s- satisfaction. A good and experienced teacher is highly appreciated by students (Xiao, Wilkins 2015: 98-110; Drule et al. 2014: 827-840). Studies conducted on a group of students attending economic universities in Upper Silesia showed that didactic and subject-specific skills were one of the most important attributes of universities ensuring the quality of education (Ratajczak 2012: 182). Moreover, a study carried out on a group of students among those studying at the University of Economics of Poznań which focused on the weights of specific characteristics of the University found that a good teaching staff was of extreme importance to students (Fazlagić 2012: 77-85).

The aim of the paper is to present the possibilities of the application of Kano method for the evaluation of the teaching staff quality. To this end, the analysis of literature and Kano questionnaire were employed, with the usefulness of Kano questionnaire in this type of research being verified in numerous publications (Grudowski, Dembowski 2012: 77-87; Malinowska 2010: 467-477; Arefi et al. 2012:347-353; Sia, Muthusamy 2012: 230-235; Malinowska et al. 2014: 235-247; Bauk et al. 2014; Dominici, Palumbo 2013: 87-96; Mayers, Jones 2012: 5-18; Taifa, Desai 2016: 569-582)
2. The essence of Kano method in the light of literature

The prominent Japanese lecturer and expert in management systems, professor at Tokyo University of Science – Noriaki Kano devised the “theory of attractive quality” and the Kano model described for the first time in 1979 (Detyna 2011: 60-61) (see Fig.1).

**Figure 1. Kano Model**

Kano proposed to see the quality of a product (make, service) at the three levels of requirements which define the following (Kano et al. 1984):
- basic qualities – required by clients, marked as “M “(must be),
- expected qualities – so called performance, marked as “O” (one-dimensional),
- attractive qualities – so called excitement, that is those qualities which the client does not expect, marked as “A” (Attractive).

Products or services must be characterized by certain basic qualities – without them the product is not what it is supposed to be. According to Kano model, the basic qualities in themselves exert a limited influence on the client’s satisfaction. For instance, a service in the form of an academic lecture without basic qualities will not render the client/student satisfied.

For the client to feel satisfied, the product/service must additionally contain qualities which the client expects (e.g. a car in a certain class must have some specific parameters; a university teacher must run classes at a certain level). In the Kano model, it is assumed that the client’s satisfaction level is proportional to the number of the expected qualities (distinguished in the product and noticed by the client). The highest quality is offered by the products which have the features which other products on the market (similar) do not have, in other words, this is a group of attractive qualities, causing excitement (the client does not expect them to come up). The excitement qualities are those characteristics which distinguish our products from those produced by the competition and (a necessary requirement) have influence on clients’ increased satisfaction. Their task is to exceed the client’s expectations. However, one needs to improve this group of qualities continuously as over time they are no longer up-to-date – they are by then commonly used by the competition, becoming a basic or desirable quality, e.g. seminars on-line may be attractive for some time for listeners/students but as time goes by the excitement derived from the opportunity to study in this way is likely to diminish.

The Kano model shows that meeting merely the basic needs can only make clients accept a product (the curve describing the client’s satisfaction level does not cross the neutral zone). In order for the client to be delighted about a particular product, it has to fulfill certain criteria associated with performance and attractiveness.

Apart from the categories such as “basic”, “expected” and “attractive”, the Kano questionnaire should encompass additional categories, i.e. (et al. 1984):
APPLICATION OF KANO QUESTIONNAIRE TO ASSESS THE LEVEL OF TEACHING …

- “questionable”, marked as “Q” – occurs when the client on the one hand shows satisfaction with one particular quality/characteristics, yet, on the other hand, he/she is not sure of this and shows dissatisfaction
- “indifferent”, marked as “I” – when the client finds the quality completely indifferent
- “reverse”, marked as “R” – occurs when the client likes the fact that this quality is present or he/she does not like the fact that it is present.

With the method thus outlined, Kano devised a questionnaire on its basis with a view to identify individual features of a particular product and to assign them to one of the groups indicated above. In the questionnaire, the respondent is asked to answer the questions in two dimensions: the positive one – when a given quality is present and fulfills its task correctly and the negative dimension – when a specific feature does not exist or if it does, it is not in a satisfactory way. Kano questionnaire tends to be created based on the questions which are developed according to the model indicated in Table 1.

Table 1. The structure of questions and answers in Kano questionnaire

<table>
<thead>
<tr>
<th>Questions</th>
<th>Positive dimension</th>
<th>Negative dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you feel when a specific quality is present?</td>
<td>How do you feel when a specific quality is not present (or it is defective)?</td>
<td></td>
</tr>
<tr>
<td>Questions</td>
<td>Answers</td>
<td>Answers</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>A. I like it</td>
<td>A. I like</td>
<td>B. It must be that way</td>
</tr>
<tr>
<td>B. It must be that way</td>
<td>C. I am neutral</td>
<td>C. I am neutral</td>
</tr>
<tr>
<td>C. I am neutral</td>
<td>D. I can live with it that way</td>
<td>D. I can live with that</td>
</tr>
<tr>
<td>D. I can live with it that way</td>
<td>E. I dislike it</td>
<td>E. I dislike it</td>
</tr>
</tbody>
</table>


Placing the questions in the structure indicated above has the effect that every quality of a product/service is attributed with two answers, which in turn gives as many as 25 correlation variants, since there are five possible answers for each question. The results collected through the application of the Kano questionnaire are
presented in the table specifying the quality type in certain determinants (Wolniak, Skotnicka 2008: 143-144) (see Table 2).

Table 2. The quality type in Kano method

<table>
<thead>
<tr>
<th>Quality</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Like</td>
</tr>
<tr>
<td>Satisfied</td>
<td>Q</td>
</tr>
<tr>
<td>Must be</td>
<td>R</td>
</tr>
<tr>
<td>Neutral</td>
<td>R</td>
</tr>
<tr>
<td>Live with</td>
<td>R</td>
</tr>
<tr>
<td>Dislike</td>
<td>R</td>
</tr>
</tbody>
</table>


One category (A, M, O, R, Q, I) is defined based on the highest number of indications within one quality. In order to avoid anomalies/distortions which may arise on account of questions posed in the wrong way and their negative reception by respondent/client, the following rule should be applied:

If (A+M+O) > (R+Q+I), then we denote the category as A or M or O, with the highest value;

If (A+M+O) < (R+Q+I), then we denote the category as R or Q or I with the highest value.

The next stage consists in sorting out the qualities according to the following rule: M>O>A>I, if the quality of a particular category is not present, one should move on to the next one, omitting the qualities from the group Q and R. This kind of sorting out shows the most important qualities of a product, that is, the qualities required by the client and in need of further development (Sauerwein et al. 1996: 313-327).

By conducting the analysis of the results obtained, one can evaluate the influence of individual qualities of a product on the extent of total satisfaction (CSI). To this end, one investigates the extent of satisfaction (SI) and of dissatisfaction. To obtain the overall satisfaction evaluation (CSI) one has to sum up the extent of satisfaction (SI) and of dissatisfaction (DI) (Berger et al. 1993: 3-36; Bilgili et al. 2011: 829-846).
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Extent of satisfaction \( SI = \frac{A+O}{A+O+I+M}, \quad SI \in [0,1] \)

Extent of dissatisfaction \( DI = \frac{(-1)(O+M)}{A+O+I+M}, \quad DI \in [-1,0] \)

Overall satisfaction \( CSI = SI + DI = \frac{A-M}{A+O+I+M}, \quad CSI \in [-1,1] \)

where:
- \( A \) - attractive qualities
- \( O \) – expected qualities
- \( M \) – basic qualities
- \( I \) – indifferent qualities

The higher approximation of SI result to value 1 for a particular requirement, the higher is the influence of this requirement on the client’s satisfaction (in the case it is fulfilled). The higher approximation of DI result to -1, the greater is the influence of the unfulfilled requirement on student dissatisfaction. The higher approximation of SI and DI results to zero, the smaller is the influence of the requirement on student satisfaction or dissatisfaction.

3. Sample description and result analysis

In November 2016, a survey was conducted whose aim was to specify the qualities which should characterize an educational service from the recipient’s – student’s - point of view. The sample selection was non-random in its nature. The survey included 218 (76%) of students of the first year of the part-time, second-cycle studies at WSB University of Wrocław, Faculty of Economics in Opole – lecture participants within the framework of one of the mandatory subjects. Students were asked to evaluate the organization in terms of the study, seminar timetable,
facilitations, and infrastructure, as well as to characterize the lecturer (according to the recommendations of the Kano method).

Table 3 presents the prioritization of the client’s/student’s requirements in relation to the lecturer according to the recommendations of the Kano method.

Table 3. The lecturer characteristics (n=218) – requirement prioritization according to the Kano method

<table>
<thead>
<tr>
<th>Requirement category</th>
<th>Number of indications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>the lecturer shows good theoretical knowledge</td>
<td>M</td>
</tr>
<tr>
<td>the lecturer clearly defines the student’s obligations</td>
<td>M</td>
</tr>
<tr>
<td>the lecturer answers questions professionally</td>
<td>M</td>
</tr>
<tr>
<td>the lecturer is communicative</td>
<td>M</td>
</tr>
<tr>
<td>the lecturer provides good practical examples</td>
<td>M</td>
</tr>
<tr>
<td>the lecturer has a friendly attitude towards students</td>
<td>O</td>
</tr>
<tr>
<td>the lecturer covers the material to prepare students for coping with everyday problems</td>
<td>O</td>
</tr>
<tr>
<td>the lecturer facilitates discussion during classes</td>
<td>O</td>
</tr>
<tr>
<td>the lecturer is available to students after classes (e.g. on duty, per e-mail)</td>
<td>O</td>
</tr>
</tbody>
</table>

Source: the authors’ own calculations based on the survey results

It can be gleaned from the table above that among the requirements relating to the lecturer’s qualities which students perceive as necessary to satisfy the basic needs (“M” category) the following were included: a clear definition of students’ obligations, good theoretical knowledge, the ability to provide good practical examples, the ability to answer questions “professionally” and communication skills. There are four requirements which students viewed as functional and desirable (“O” category). These were the following: the lecturer covers the material to prepare students for coping with everyday problems, a friendly approach to students,
facilitating discussion during classes, as well as the lecturer’s availability after classes.

Next, those elements were indicated which proved to be the most important in terms of exerting influence on students’ satisfaction and dissatisfaction (see Table 4, Chart 1)

**Table 4. The lecturer characteristics (n=218) – satisfaction evaluation**

<table>
<thead>
<tr>
<th></th>
<th>Satisfaction extent (SI)</th>
<th>Dissatisfaction extent (DI)</th>
<th>Total satisfaction (CSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>the lecturer shows good theoretical knowledge</td>
<td>0.37</td>
<td>-0.53</td>
<td>-0.16</td>
</tr>
<tr>
<td>the lecturer clearly defines the student’s obligations</td>
<td>0.41</td>
<td>-0.44</td>
<td>-0.03</td>
</tr>
<tr>
<td>the lecturer answers questions professionally</td>
<td>0.45</td>
<td>-0.44</td>
<td>0.01</td>
</tr>
<tr>
<td>the lecturer is communicative</td>
<td>0.48</td>
<td>-0.42</td>
<td>0.06</td>
</tr>
<tr>
<td>the lecturer provides good practical examples</td>
<td>0.49</td>
<td>-0.40</td>
<td>0.09</td>
</tr>
<tr>
<td>the lecturer has a friendly attitude towards students</td>
<td>0.51</td>
<td>-0.43</td>
<td>0.08</td>
</tr>
<tr>
<td>the lecturer covers the material to prepare students for coping with everyday problems</td>
<td>0.55</td>
<td>-0.32</td>
<td>0.23</td>
</tr>
<tr>
<td>the lecturer facilitates discussion during classes</td>
<td>0.52</td>
<td>-0.25</td>
<td>0.27</td>
</tr>
<tr>
<td>the lecturer is available to students after classes (e.g. on duty, per e-mail)</td>
<td>0.65</td>
<td>-0.25</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Source: The authors’ own calculations based on the survey results

The above list shows that the requirements exerting the most substantial influence on the student’s satisfaction (the value of satisfaction ratio near 1) include the following: the lecturer’s availability after classes (+65), the lecturer covers the material to prepare students for coping with everyday problems (+55), and the lecturer facilitates discussion during classes (+0.52). Their presence increases the level of the client’s satisfaction more than any other requirements. With respect to the client’s dissatisfaction, we can conclude that: the highest level of dissatisfaction among students was caused by the lecturer’s lacking theoretical knowledge (-0.53).
The two following items were ranked as the second *ex aequo*: the lecturer clearly defines the student’s obligations (-0.44) and the lecturer provides professional answers (-0.44). These requirements yield a high level of dissatisfaction when they are not met, since the students take their presence for granted.

A graphic depiction of the evaluation of satisfaction from the requirement met and the evaluation of dissatisfaction from failing to fulfill the requirement is presented in Chart 1.

**Chart 1. Lecturer characteristics (n=218) – evaluation of satisfaction from the requirement fulfillment, evaluation of dissatisfaction from failing to fulfill the requirement**

![Chart showing lecturer characteristics](chart1.png)

Source: The authors’ own calculations based on the survey results

During the next stage it was indicated which elements are the most important from the student’s point of view in relation to the overall satisfaction (see Table 4, Chart 2).
The requirements which exert the highest influence on the student’s total satisfaction include the following: the lecturer’s availability after classes (+0.39), facilitating discussion during classes (+0.27) and covering the material to prepare students for coping with everyday problems (+0.23). Seven qualities were present in the group of requirements whose fulfillment resulted in a satisfaction that was higher than dissatisfaction from failing to meet the requirements.

In the group of requirements which when not met cause dissatisfaction higher than the satisfaction from fulfilling the requirements two qualities were present:
lecturer shows good theoretical knowledge and lecturer clearly defines the student’s obligations.

4. Concluding remarks

The determination of the requirement categories in the light of the Kano method can be used in defining the way forward by University authorities. In summing up the results of the survey conducted by the authors the recommendation for a given university within the category “teaching staff quality” is to provide teaching staff who shows good theoretical knowledge and ensures that students’ obligations are clearly defined. These two requirements are necessary for the basic needs to be satisfied (“M” category), while failure to fulfill them results in higher dissatisfaction than the satisfaction from the requirement fulfillment.

The above analysis of the subject-specific literature and the survey has found that the Kano model allows for finding out the answer to the question how students assess a lecturer and indicates the most important characteristics to be improved in terms of teaching staff quality.

The Kano questionnaire can serve as an excellent (insightful, precise and specific) tool in the evaluation of teaching staff by students/clients of a higher education institution, being an alternative to the traditional survey questionnaires. The findings obtained through the Kano questionnaire are valuable feedback both for lecturers and university authorities in terms of the information which qualities of the teaching staff should be developed in particular and which are of no significance to students.
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EU rules on corporate governance as means to promote sustainability?

Izabella SCHIFFAUER
WSB University in Wrocław, Poland

Abstract:

Aim: As part of the recent economic and financial crisis management in the EU new regulatory measures have been adopted which are of relevance for company law and corporate governance. Although the modalities of corporate governance are primarily determined by companies themselves, the establishment of basic national and EU level rules is required so that minimum standards are respected in the public interest. With regard to EU competences, they pertain to full implementation of and safeguarding proper functioning of the EU internal market (Article 3(3) TEU and Articles 26-27 TFEU). The purpose of this paper is to analyse EU regulatory measures in the field of corporate governance with a view to their potential positive impact on sustainable functioning of European companies, notably in the financial sector, and thus also the stability of the financial system at large.

Design / Research methods: The applied research methodology includes a combination of theoretical and analytical methods. The paper is based on a review of relevant literature and an analysis of EU regulatory measures pertaining to inter alia new capital requirements for financial institutions, shareholder’s involvement and risk management.

Conclusions / findings: It is submitted that, at least in theoretical terms, the analysed regulatory measures have a potential of improving sustainability of single companies, thereby translating into improved reliability of the whole financial system, also by way of reducing the risk of moral hazard of failing banks counting on public money injections.

Implications/ Limitations of the research: The real impact on sustainability may, however, only be assessed once the dis-cussed EU measures have been fully implemented or, as the case may be, where and on condition that they are fully endorsed by the companies themselves. In that regard, the theoretical and analytical methods applied in this research prove insufficient to provide a fully satisfactory answer to the research question, with the real impact of the discussed measures on sustainability being a potentially interesting field of study on the basis of a sample of system relevant financial institutions in the years to come.

Key words: EU corporate governance framework; risk management; financial institutions, sustainability
JEL: G3, G01, K2, H12
1. Introduction

The EU company law has been devised with a view to establishing and safeguarding common commercial and competition rules for the functioning of the internal market (Article 3(1) of the Treaty on the Functioning of the European Union, TFEU). As an integral part of the internal market, harmonised EU company law facilitates freedom of establishment of companies within the Union and fosters legal certainty for their activities. At the same time, foundations for best corporate governance practices are provided for within the EU framework, the aim of which is to enhance companies’ competitiveness and sustainability. In its Green Paper of 5 April 2011 (EC 2011: 2), the European Commission points to corporate governance and corporate social responsibility (CSR) as key elements in building people’s trust in the single market and contributing to the competitiveness of European business, since well-run and sustainable companies are indispensable in order to achieve the ambitious growth targets set by ‘Agenda 2020’ (see EC 2010). It is noteworthy that the EU economic and monetary policy is not limited to the pursuit of sound and sustainable public finances and price stability (cf. Allemand, Martucci 2012: 47). It is also oriented towards improving the efficiency of Member States economies with a view to enhancing the favorable environment for growth, high employment and social cohesion (CEU 1998: point 7). With respect to creating favorable environment for growth, emphasis is placed inter alia on promoting entrepreneurship and facilitating access to markets and financing, notably for small and medium-sized enterprises (CEU 1998: point 8).

The experience of the most recent financial and sovereign debt crises clearly showed that efficient and responsible corporate governance is of vital importance not only for the sound operation of individual enterprises, but also the stability of financial markets and the economy at large. In particular the developments in the banking sector proved that a self-regulatory market approach based exclusively on non-binding recommendations does not provide for a sufficient guarantee of sound corporate governance. In the light of the above, good corporate governance should not be construed exclusively as an end in itself, but a means to support economic efficiency, sustainable growth and financial stability (G20/OECD 2015).
Consequently, while the modalities of corporate governance are first and foremost the responsibility of companies themselves, the establishment of fundamental national and EU level rules is justified so as to ensure that minimum standards are respected in the public interest. Regarding EU competences in this area, they pertain to full implementation and safeguarding of proper functioning of the EU internal market (Article 3(3) of the Treaty on European Union (TEU) and Articles 26-27 TFEU).

The purpose of this contribution is to analyse EU legal provisions pertaining to corporate governance with a view to their potential influence on sustainable operation of companies. First the concept and scope of EU corporate governance framework is explained, followed by a diachronic analysis of the development of relevant EU company law and corporate governance framework. The EU regulatory activity in the field shortly prior as well as in response to the most recent financial and sovereign debt crises is most relevant from the perspective of sustainability. The applied research methodology includes a combination of theoretical and analytical methods.

2. The concept, scope and legal basis of EU corporate governance framework

For the sake of clarity, under the EU corporate governance framework we should understand both legislation in areas such as corporate governance statements, transparency of listed companies, shareholders’ rights and takeover bids as well as ‘soft law’, i.e. non-binding recommendations concerning e.g. the role and the remuneration of companies’ directors (EU 2012: 2, note 10). As to corporate governance, it consists in a set of relationships between a company’s management, its board, its shareholders and other stakeholders (OECD 2004: 11). In simple terms, it determines the manner in which companies are managed and controlled, thus constituting an important criterion for their existence and competitiveness (cf. Vogel 2007: 217). Corporate governance should therefore provide for an arrangement whereby the objectives of the company are set, and the means of attaining them as well as monitoring performance to that end are determined.
The scope of EU company law, including corporate governance, covers the protection of interests of shareholders and other parties, the constitution and maintenance of public limited-liability companies’ capital, branches disclosure, mergers and divisions, minimum rules for single-member private limited-liability companies and shareholders’ rights as well as legal forms of undertakings such as the European Company (SE), the European Economic Interest Grouping (EEIG) and the European Cooperative Society (SCE) (EU 2012: 3, note 17). It should be noted here that while EU company law in principle may concern all EU public companies with limited liability, EU corporate governance rules apply exclusively to companies listed on a stock exchange.

European businesses and national legislators operate within the framework of primary EU law, i.e. the Treaty provisions on the right of establishment (Article 49 TFEU) and the free movement of capital (Article 63 TFEU), secondary EU law measures regulating companies as well as relevant soft law initiatives. Pursuant to Article 50(2)(g), the Union has competence to act in the area of corporate governance, notably by way of coordination measures with regard to the protection of interests of companies’ members and other stakeholders (e.g. creditors), so as to ensure that such protection is equivalent throughout the EU.

3. The elaboration of the EU corporate governance framework - a diachronic perspective

The EU framework pertaining to company law and corporate governance has been steadily elaborated over years (for a comprehensive account, see e.g. Edwards 1999; Vossestein 2010: 29ff). As early as in 1968, the First Company Law Directive (CEC 1968) regulating disclosure, the power of representation of company organs and the nullity of companies with limited liability was adopted, the adoption of the Twelfth Company Law Directive on single-member private companies (CEC 1989b: 40-42) took place in 1989. In the period between the above specified years, nine other important Directives and one Regulation on European Economic Interests Grouping (EEIGs) (CEU 1985: 1-9) were enacted which laid down inter alia rules of formation of companies with limited liability, maintenance and alteration of capital,
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annual accounts and statutory audits, mergers and divisions. The Draft Fifth Company Law Directive concerning the management structure of companies, and thus one of the most important directives for corporate governance, was never adopted by the Council since some Member States opposed it to come into law. It intended to grant employees the right to vote for a supervisory board in the obligatory two-tiered boards of directors. Even though this draft Directive had undergone three major revisions, including the abandonment of the two-tier board system (see further e.g. Murphy 1985), the compromise on the text was not achieved.

As regards specifically banking law, first Community legislative measure was the Directive 73/183/EEC (CEC 1973: 1-10), the objective of which was to enable free establishment of credit institutions within the Union. The harmonisation in the field of substantive banking law was effected by Directive 77/780 of 1977 (First Banking Directive) (CEU 1977: 30-37), thus creating the foundations for a single market for banking. In 1993 Directive 89/646/EEC (Second Banking Directive) (CEC 1989a: 1-13) was adopted whereby a credit institution authorised in one Member State is entitled to provide services within the whole EU, unimpeded of additional requirements of authorisation in other Member States (see Söderström 2015: 115). A major codification activity was carried out in 2000, whereby seven Banking Directives and their amending Directives were replaced by one single Banking Directive 2000/12/EC (EU 2000: 1-59).

The decade following the enactment of the Twelfth Company Law Directive was marked by a notable loss of dynamism in the EU (at that time Community) law harmonisation process (Wouters 2000: 257). Indeed the enactment of the Thirteenth Company Law Directive (EU 2004: 12-23) aimed at achieving greater legal certainty with regard to takeover bids was delayed until 2004 (since in the proceedings for the adoption of this directive the European Parliament for the first time rejected in plenary a compromise that was proposed by the conciliation committee), with the EU regulatory activity in the field subsequently regaining momentum in the context of the Union’s crisis management (see Section 4 infra). This pertains in particular to regulatory activity in areas of financial stability, risk management as well as consumer and investor protection, aimed at preventing all
types of financial turbulence in future (Söderström 2015: 115). Alongside the increase in the volume, strictness (i.e. possibility to impose sanctions for non-compliance) and pace of regulatory measures, there is also a notable shift in the instrument that is applied to this end, namely: numerous directives are being replaced or complemented by directly applicable EU regulations, with banking sector being particularly targeted through this regulatory agenda\(^1\) (Söderström 2015: 115).

3.1. Relevant case law

The Court of Justice of the EU (the ECJ) has brought a major contribution to the elaboration of the Community, and subsequently Union rules pertaining to the freedom of establishment and operation of European businesses by way of its interpretation of the treaty provisions, with the Court’s jurisprudence being clearly supportive of unrestricted exercise of economic freedoms by the EU nationals. To give just a few examples, in Case 270/83 Commission v France\(^2\) the ECJ ruled that the right of establishment (Article 49 TFEU, ex Article 52 EEC Treaty) embraces the right for business undertakings formed in accordance with the law of a Member State to take up and pursue their business activities in another Member State through an agency, branch or subsidiary and under the conditions laid down by the law of the state where they have their registered office and principal location of business activity (see further Edwards 1999: 344-347 and 349-350). Furthermore, in Case C-212/97 Centros Ltd v Erhvervs the ECJ ruled that it is in breach of Articles 52 and 58 of the EEC Treaty refusing to register a branch of a company formed in accordance with the law of another Member State in which it has its registered office (in this particular case in the UK) but in which it conducts no business activity, where the branch was intended to enable the company in question to carry on its entire business in the State in which that branch was to be created (here Denmark), while avoiding the need to form a company there, thereby evading application of the

\(^1\) E.g. the so called “CRD III” package on capital requirements and remuneration policies (two directives) has been overhauled by a Capital Requirements Directive (CRD IV) and a Regulation on prudential requirements for credit institutions and investment firms (CRR), with the latter instrument having the advantage of taking immediate effect in all Member States in the same way as a national instrument. For further account, see Section 4 below.

rules governing the formation of companies which, in that State, are more restrictive as regards the minimum share capital. At the same time the Court held that such interpretation does not prevent the authorities of the Member State concerned from adopting any appropriate measure aimed to prevent or penalise fraud or evasion on the part of the company members regarding their obligations towards private or public creditors established in the territory of the Member State concerned. The ECJ recalled in this context its earlier case-law according to which national measures which hinder or make less attractive the exercise of fundamental freedoms safeguarded under the Treaties must meet four conditions, namely: i) be applied in a non-discriminatory manner; ii) be justified by imperative requirements in the general interest; iii) be suitable for securing the attainment of the objective which they pursue; and finally, iv) not go beyond what is necessary in order to attain it (Case C-19/92 Kraus v Land Baden-Württemberg [1993] ECR I-1663, paragraph 32, and Case C-55/94 Gebhard v Consiglio dell’Ordine degli Avvocati e Procuratori di Milano [1995] ECR I-4165, paragraph 37). In the view of the Court, the said conditions are not fulfilled in the Centros case and the creditors not only are on notice that company is governed by laws different from those in Denmark, but may also seek protection under certain rules of Community law, e.g. Fourth Council Directive 78/660/EEC of 25 July 1978 based on Article 54(3)(g) of the Treaty on the annual accounts of certain types of companies (CEC 1978: 11-31), and the Eleventh Council Directive 89/666/EEC of 21 December 1989 concerning disclosure requirements in respect of branches opened in a Member State by certain types of company governed by the law of another State (CEU 1989: 36-39).³

The ECJ also opposed any limitation of the exercise of fundamental economic freedoms in Case 208/00 Überseering BV v Nordic Construction Company Baumanagement GmbH (NCC) where it held that Articles 43 and 48 EC Treaty (current Articles 49 and 54 TFEU respectively) preclude the non-recognition by the host Member State of the company's legal capacity and its capacity to be a party to legal proceedings on grounds that the company has not been reincorporated in the host state to which it actually transferred its centre of administration. The Court holds that establishing a difference in treatment between companies is forbidden

³ For the ECJ’s judgment, see in particular ECJ (1999), points 34-36 and 38-39.
unless “it pursues a legitimate objective compatible with the Treaty and is justified by imperative reasons in the public interest. It is further necessary, in such a case, that its application must be appropriate to ensuring the attainment of the objective thus pursued and must not go beyond what is necessary to attain it.”

Noteworthy is also Case C-411/03 SEVIC Systems AG concerning cross-border merger operations where the ECJ construed them as particular methods of exercise of the freedom of establishment important for the proper functioning of the internal market, and therefore amongst those economic activities in respect of which Member States are required to comply with the freedom of establishment laid down in Article 43 EC Treaty. As a matter of principle, providing for by law for a difference in treatment between companies according to the internal or cross-border nature of the merger is in the view of the Court contrary to the right of establishment, and thus may be permitted only if a legitimate objective compatible with the Treaty is pursued, which is justified by imperative reasons in the public interest. These could be e.g. protection of the interests of creditors, minority shareholders and employees, as well as preservation of the effectiveness of fiscal supervision and the fairness of commercial transactions. On those grounds the ECJ held that it is an unjustified restriction of the freedom of establishment when the law of a Member State allows, as long as certain conditions are met, for registration in the national commercial register of a merger by dissolution without liquidation of a company and transfer of its entire assets to another company, provided that the two companies effecting the merger are both established in its territory, but refuses such registration in general in the case when one of the two companies is established in another Member State. On the other hand, in Case C-210/06 Cartesio the ECJ stated that it is not contrary to Articles 43 EC and 48 EC when the law of a Member State under which a company is incorporated prohibits the transfer of that company seat to another Member State where its status as a company governed by the law of the Member State of incorporation is to be retained.

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6 Case C-210/06 [2008] ECR I-09641.
3.2. Harmonisation activity of EU company law shortly prior to the crisis

A most comprehensive pre-crisis review in this policy area was launched by the European Commission through the 2003 Action Plan on Modernising Company Law and Enhancing Corporate Governance in the European Union (henceforth the 2003 Action Plan) (EU 2003). The need for the European regulatory framework for company law and corporate governance to be modernised was recognised inter alia for the following reasons:

- the growing trend of European companies to operate cross-border in the Internal Market, which inevitably creates the need for common European company law mechanisms so as to facilitate freedom of establishment (Article 49 TFEU) and cross-border restructuring;
- the continuing integration of European capital markets, in which context both issuers and investors should have an opportunity to intensify their activity on other EU capital markets and to have confidence that the companies they invest in have equivalent corporate governance frameworks;
- the rapid development of new information and communication technologies, the benefits of which development should be properly exploited;
- the (then) forthcoming enlargement of the EU to 10 new Member States which called for revisiting the EU corporate governance acquis (the 2003 Action Plan, point 1.2).

The 2003 Action Plan put forth a set of legislative and non-legislative proposals relating inter alia to corporate governance, corporate restructuring and mobility, capital maintenance and alteration and transparency. The proposals for action were organised according to the short-term (2003-2005), medium-term (2006-2008) and long-term (2009 onwards) timescales and were allocated an appropriate type of regulatory instrument to be applied so as to achieve the desired outcomes. The main objectives of the Action Plan were to strengthen shareholders’ rights and protection for employees, creditors and the other parties which companies deal with, while adapting company law and corporate governance rules appropriately for different categories of company. Amongst successful legislative initiatives count inter alia

7 On the adaptation of company law to different categories of company in the national context, see e.g. De Jong (2016).
the amendment of the Accounting Directive (CEC 1978),\(^8\) or more precisely a consolidation of existing Directives on annual accounts of companies with limited liability with the aim of coordinating Member States' provisions concerning the presentation and content of annual accounts and annual reports, the valuation methods used and their publication regarding all companies with limited liability (EU 2006a: 87-107, 2006b: 1-7, 2009: 42-44). Strict rules were also operated in respect of publication of documents and system of auditing, with only SMEs being subject to less restrictive rules. Apart from Accounting Directive, rules on an annual corporate governance statement have also been introduced by a Directive 2007/36/EC on the exercise of shareholders’ rights (EU 2007: 17-24) and the Tenth Company Law Directive (2005/56/EC) on Cross-border mergers (EU 2005: 1-9). The latter Directive constituted a relevant step forward in respect of cross-border mobility\(^9\) in the EU. Still, the current EU framework admits the co-existence of different national company law which legally excludes that companies transfer their seat across borders (the rules contained in the Statutes for the European Company (SE), for the European Cooperative Society (SCE) and for the European Economic Interest Grouping (EEIG) are exception in that regard) while at the same time preserving the company’s legal personality. That is, unless a registered office transfer is allowed under applicable national law, companies are forced to first wind up and subsequently re-incorporate. In the same vein, while Directive 82/891/EEC (CEu 1982: 47-54) has harmonised company divisions at national level, the EU legislation allowing for cross-border divisions is missing. Interestingly, a public consultation conducted amongst stakeholders by the European Commission in 2012 revealed considerable support for establishing EU rules both regarding cross-border transfer of seat (373 out of a total of 496 replies) and cross-border divisions (318 out of a total of 496 replies)\(^10\), albeit any legislation in that respect implies concrete risks and possibly moral hazard, e.g. in terms of tax avoidance or insolvency fraud, respectively.

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\(^8\) For an exhaustive list of amending acts, see http://eur-lex.europa.eu/legal-content/PL/TXT/?uri=URISERV%3Al26009 [17.02.2018].

\(^9\) It would merit further investigation to clarify whether in this case the prevailing aspect is the mobility of companies or the mobility of capital.

It is noteworthy that the EU corporate governance framework takes stock of international and national soft law codes without having elaborated its own “European” corporate governance code. In the view of the European Commission, such an EU-specific code would not offer a significant added value but constitute an additional layer between international principles and national codes (EC 2003). Therefore, the role of the EU is limited to safeguarding adequate coordination of the latter while providing for the most essential rules within a common approach.

Throughout the Union national corporate governance codes are applied on a “comply or explain” basis, i.e. companies are allowed to depart from selected rules or recommendations of the code applicable in their domestic jurisdictions or, alternatively, the code which the company may have voluntarily decided to apply, albeit they must explain the grounds for such a decision. The comply or explain principle was for the first time explicitly introduced in the EU law in 2006 through Directive 2006/46/EC amending Directive 78/660/EEC (EU 2006a: 1-7)\(^1\), namely by way of inserting Article 46a which stipulates that a corporate governance statement in a company’s annual report shall contain, “to the extent to which a company, in accordance with national law, departs from a corporate governance code (...), an explanation by the company as to which parts of the corporate governance code it departs from and the reasons for doing so.” On the one hand, this non-mandatory system leaves businesses the necessary flexibility to adapt to changing legal, economic, and market realities depending on their individual situation and needs. On the other hand, the quality of corporate governance reports in terms of explanations provided by numerous listed companies for deviations from corporate governance codes is insufficient. This was confirmed by the Study on Monitoring and Enforcement Practices in Corporate Governance (EC 2009) conducted by the Risk Metrics Group for a sample of 270 listed companies from 18 Member States. According to the study, even though a large majority of market actors and regulators consider the comply-or-explain approach as an appropriate and efficient regulatory tool, there is a wide consensus that the mechanism does not function properly. The problem of low disclosure quality of company statements is raised in particular by investors who need dependable information to take their

\(^1\) See in this regard amendments to Directive 78/660/EEC, namely the inserted Article 46a.
investment decisions and assess the value of a company (EU 2012: 6, note 6). Shortcomings in that regard limit the system’s usefulness and viability. In the light of the fact that shortcomings in corporate governance practices have been highlighted as one of the causes of the recent financial crisis\textsuperscript{12}, new EU-level regulatory-corrective action has been undertaken with a view to improving the EU corporate governance framework.

4. EU regulatory activity in response to the crises: Towards more sustainable corporate environment?

Since its endorsement in the Treaty of Amsterdam, sustainable development has constituted an overarching objective of EU policies, in view of which economic, social and environmental dimensions should be concomitantly handled. Article 3(3) TEU stipulates that the Union ”shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment.” Thus, reconciling economic efficiency, social inclusion and environmental responsibility is the essence of sustainable development (see EC 2016), which requires notably that a pursuit of economic growth does not compromise the societal and environmental components. However, since the interplay of the said elements is marked by inherent conflict of interest, the implementation of sustainability principle has continued to pose a real challenge.

At the same time sustainable development is very much dependent on the stability and reliability of banks which continue to play a major role in financing economic activity and growth. Therefore the recent financial and sovereign debt crises have provided EU decision-makers a new impulse to reconsider the conditions required for a more “sustainable” financial sector. Most relevant regulatory amendments that were introduced so as to prevent future turbulence of that kind concerned the following areas:

\textsuperscript{12} See e.g. the International Corporate Governance Network’s Second statement on the Global Financial Crisis of 23 March 2009, as cited in EU (2009: 13, note 3).
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- risk management
- shareholders’ engagement.

Board practices remain subject to comply or explain mechanism, where enhanced transparency is the only means to compensate the absence of enforceable rules. By way of example, the European Commission advocates amongst others increased transparency with regard to companies’ board diversity policy (EU 2012: 5), whereby the Board’s capacity to effectively and constructively challenge the management’s decisions may arguably be increased.

As has already been emphasized, the EU legislator focused in particular on inappropriate risk management and excessive short-termism in financial institutions, given the direct impact the said institutions may have on systemic risk and the economy as a whole. In order to create sound remuneration policies that do not encourage or reward excessive risk-taking, the so called CRD III package (EU 2010: 3-35) was adopted in 2010. It was subsequently amended by the Capital Requirements Directive (CRD IV) (EU 2013a: 338) and Regulation on prudential requirements for credit institutions and investment firms (CRR) (EU 2013b: 1-337) which operated more restrictive requirements for:

- capital, liquidity and leverage standards, as agreed in the Basel Committee on Banking Supervision ("Basel III");
- the relationship between the variable (or bonus) component of remuneration and the fixed component (or salary), with the new rules being applicable to credit institutions and investment firms, both listed and non-listed.

The intended added value of CRR as a legislative instrument (directly applicable regulation) is that it establishes a single set of harmonised prudential rules (referred to as a “single rule book”) which banks throughout the EU must respect.

Remarkably, whilst corporate governance in institutions outside the financial sector gave not so much concern as that of the financial sector, also these institutions have been affected by a lack of shareholder interest in holding management accountable for their decisions and actions, which appears to be linked to limited shareholders’ commitment demonstrated in particular by the fact that many shareholders hold their shares for only a short period of time. In response to that development, in April 2014, the European Commission published a Proposal for a
Directive as regards the encouragement of long-term shareholder engagement (EU 2014d). While remaining without prejudice to the core principle of “comply or explain” approach in the EU corporate governance framework allowing Member States and companies to fine-tune to their specific corporate culture, traditions and needs, in view of the ever more intense cross-border activity, the proposal embraced a number of elements of corporate governance (e.g. shareholder identification, the transparency and engagement of institutional investors and board remuneration) so as to ensure a harmonised approach across the Union. In concrete terms, the by now adopted Directive (EU) 2017/828 (EU 2017: 1-25) is aimed at safeguarding that shareholders have a vote on the remuneration policy and report, as well as related party transactions. The said amendment of the Directive 2007/36/EC is binding as from June 2017, with Member States being obliged to transpose this Directive into national law by 10 June 2019.

In the table below selected measures undertaken by the EU institutions with a view to safeguarding sustainable operation of institutions are briefly outlined. It should be emphasized here that for the purposes of this paper the term sustainability should not be construed as commonly applied in the context of “sustainable” or “ethical” banking, but more broadly, conveying concepts such as “durable” or “lasting”.
Table 1. Contents and enhanced sustainability potential of selected EU regulatory measures relating to company law and corporate governance

<table>
<thead>
<tr>
<th>Legal act(s) or soft law measure</th>
<th>Most relevant amendment(s)</th>
<th>Enhanced Sustainability (Yes/ No – and why)</th>
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<tbody>
<tr>
<td>“CRD-IV Package”:</td>
<td>New prudential requirements for financial institutions: stricter rules on the amount and quality of capital; stricter rules on the amount of short- and long-term liquidity leverage backstop (a mechanism limiting the growth of the total balance sheet as compared to available funds)(^\text{13})</td>
<td>Yes, in terms of improved liquidity capacity of financial institutions aimed at strengthening the EU banking sector’s resilience and its capacity to absorb economic shocks; apart from capital as prudential reference bank supervision will also look into liquidity and leverage standards, thus covering the whole balance sheet of banks.</td>
</tr>
<tr>
<td>- Capital Requirements Directive (Directive 2013/36/EU) (EU 2013a) and Capital Requirements Regulation (Regulation (EU) No 575/2013) (EU 2013b)</td>
<td>II. More restrictive requirements for the relationship between the variable (or bonus) component of remuneration and the fixed component (or salary), i.e., the variable component of the total remuneration shall not exceed 100% of the fixed component of the total remuneration takers (only exceptionally and subject to shareholder agreement the ratio may amount to 200%).</td>
<td>Yes, due to limiting financial incentive stirring risk appetite and risk-taking activity.</td>
</tr>
<tr>
<td></td>
<td>III. Obligation for institutions that are significant in terms of their size, internal organisation and the nature, scope and complexity of their activities to establish a risk committee composed of members of the management body who do not perform any executive function in the institution concerned (Art. 76 para 3 of the Directive).</td>
<td>Potentially yes, due to separation of executive function and supervisory function in institutions, thus allowing for a better risk oversight.</td>
</tr>
<tr>
<td></td>
<td>Pursuant to Art. 74 para 1, institutions shall also have “robust governance arrangements” consisting inter alia in well-defined, transparent and consistent lines of responsibility, effective processes to identify, manage, monitor and report the risks they are or might be exposed to, adequate internal control mechanisms, and remuneration policies and practices that are consistent with and promote sound and effective risk management.</td>
<td>Potentially yes, albeit the general character of the provision may in practice mean its implementation may considerably vary depending on the institutions’ readiness to comply.</td>
</tr>
</tbody>
</table>

Source: Author’s own elaboration.

\(^{13}\) Leverage backstop is a new tool for the international framework and will therefore be introduced as a binding requirement in national jurisdictions only after enough data and experience have been gathered to determine an effective leverage ratio, see: EC (2013b).
Table 1. Cont.

<table>
<thead>
<tr>
<th>Legal act(s) or soft law measure</th>
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<th>Enhanced Sustainability (Yes/ No – and why)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission Delegated Regulation (EU) No 527/2014 (EU 2014a)</td>
<td>Specification of the classes of instruments which are intended to: - reflect the credit quality of an institution; - be appropriate for the purposes of variable remuneration.</td>
<td>Potentially yes, as variable remuneration awarded in instruments may promote sound and effective risk management, while not encouraging risk-taking which exceeds the level of tolerated risk of the institution.</td>
</tr>
<tr>
<td>- Council Regulation (EU) No 1024/2013 (prudential supervision of credit institutions) (EU 2013c)</td>
<td>Introduction of an EU-level: - banking supervision (conferred to the ECB) by means of the Single Supervisory Mechanism (SSM) - banking resolution system (Single Resolution Mechanism (SRM)) with a Single Resolution Fund (SRF) to be built up progressively (a period of 8 years) by 'ex-ante' contributions from the banking industry. BRRD made also mandatory rules on bank “bail-ins”, i.e. a mechanism for effecting the exercise of the write-down and conversion powers by resolution authorities in relation to liabilities of an institution which is failing or likely to fail. The modalities of application of the bail-in tool are laid down in Article 27 of the Regulation (EU) 806/2014 (EU 2014c: 1-90).</td>
<td>Yes, insofar as continuity of critical functions and protection of depositors, investors, client funds and assets is safeguarded. In addition, there is a potential of added value in macroeconomic terms, where the mechanism helps avoid adverse effects on financial stability (including protection of public funds), notably by preventing contagion and by maintaining market discipline (minimising reliance on extraordinary public financial support). At the same time, SRF allows for risk mitigation through risk-sharing.</td>
</tr>
</tbody>
</table>

Source: Author’s own elaboration.
Table 1. Cont.

<table>
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<tr>
<th>Directive (EU) 2017/828 (encouragement of long-term shareholder engagement) (EU 2017)</th>
<th>I. Shareholders have a vote on the remuneration policy and report, as well as related party transactions.</th>
<th>Potentially yes, since the vote of shareholders shall be binding, albeit the major effect of the new regulation needs to be achieved first, namely: long-term engagement of shareholders whose interests will rest more in sustainability of their investee company rather than short-term gain. Given that the impact of the new provisions as initially proposed by the Commission(^\text{14}) has been weakened in the legislative process (see paragraph below) as well as lacking incentives for shareholders to compromise risk appetite for the sake of sustainability, the qualitative change is only limited.</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. Increased transparency in terms of: 1. identification of shareholders; 2. transmission of information facilitating the exercise of shareholders’ rights; 3. requirement of disclosure of - investment strategy by institutional investors and asset managers; - methodology and modalities of services provided by proxy advisors or alternatively of a reasoned explanation of the grounds for non-compliance (Art. 3g).</td>
<td>Potentially yes (e.g. through better managing actual or potential conflict of interest), but its impact is considerably reduced by the possibility to publicly disclose only the explanation stating reasons for non-compliance. In the light of the experiences made to date with the functioning of the “comply or explain” principle, notably in terms of the quality of reporting, the real impact on transparency and thus also sustainability will very likely be rather modest, unless external impulses or pressure is exerted in the institutions.</td>
<td></td>
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<tr>
<td>Source: Author’s own elaboration.</td>
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5. Concluding remarks

The above analysis allows for a conclusion that whilst in the initial phase of European integration process the EU rules on corporate governance were mostly concentrated on facilitating freedom of economic activity within the Internal Market, in the course of time the objective of sustainable development has been gaining more recognition, with a “climax” being achieved in the years following the outbreak of the financial and economic crises in 2008. The Commission’s legislative agenda pursued in its 2012 Action Plan with a view to modernising the EU company law and corporate governance regulatory framework in respect of supporting companies’ growth and their competitiveness, engaging shareholders in corporate

\(^{14}\) See supra note 42.
governance, enhancing transparency, as well as rendering the framework itself simpler and thus more user-friendly (see EU 2012: 4) is still to some extent “in progress”. A question which this paper attempts to address is whether those highly ambitious objectives, if not accomplished yet, have a potential of contributing to a fairer Internal Market in general and improved business environment in terms of sustainability.

The aspect which is easiest to address pertains to simplification of the EU corporate governance framework. While not challenging good reasons for the replacement of two or more instruments by way of a single new act, the overall increase of regulatory measures, including Commission delegated and implementing acts, seems to more than outweigh the reduced complexity of the revised law. A reason for the continuing increase of the regulatory density may be that the scope of regulated areas tends also to be extended. It remains questionable, however, whether the search of regulatory perfectionism on the side of the legislator is really improving the law. On the other hand, the observable regulatory activity trend may be interpreted as aimed at counter-acting excessive deregulation which demonstrated its drawbacks in the context of the financial and sovereign debt crises. The constitutional shortcomings of the EU macroeconomic governance are widely recognized in literature (see e.g. Adamski 2013; Touri, Touri 2014). According to the conventional wisdom, liberalisation provides for entrepreneurship spirit and growth, while leaving the corrective function to the self-regulatory forces of the market. This stance is broadly criticised in more recent literature (see e.g. Picketty 2013; Krugman 2012: 96 ff) and put under stress when particularities of economic systems are given more attention to, with the outcomes of financial liberalisation being by and large dependent on the general level of development, the condition of domestic financial markets, and the quality of institutions (see Broner and Ventura 2010). This is why a reverse trend may be observed in literature construing financial liberalization as an explanatory variable of banking crisis. A more balanced view is advanced by Majerbi and Rachdi (2014) who argue that, whilst the immediate effect of liberalisation translates into an increased risk of crisis, at a certain critical point liberalisation starts to have a negative relationship with the probability of crisis occurrence, with the said turning point at which further liberalization starts reducing
the likelihood of crisis appearing to vary not only depending on the type of economy (advanced vs. emerging/developing), but also its level of financial liberalisation (Majerbi, Rachdi 2014: 325). The stance that is advanced in this paper is that while the embedded liberal bargain of the EU internal market (Ashiagbor 2013) presupposes financial liberalisation, it should nevertheless be offset by a stricter supervision and corrective regulatory activity where need there is. A trend in this direction is clearly observable in the context of EU crisis management, including in the area of corporate governance.

It is arguable that the discussed EU regulatory measures have a potential of improving sustainability of single companies, were it through stricter prudential requirements for credit institutions and investment firms, enhanced long-term involvement of shareholders with their investee companies or remuneration policies that do not encourage or reward excessive risk-taking. The improved reliability of the whole financial sector is also achieved by the “bail-in” mechanism, which evidently reduces the risk of moral hazard of failing banks counting on public money injections, thus contributing to a more stable economic and financial system as a whole. However, despite the tangible added value of these measures, their real impact on sustainability of single companies may only be assessed once they have been fully implemented or, as the case may be, where and on condition that they are effectively endorsed by the companies themselves. It is not exaggerated to say that such endorsement may only take place if the companies self-reflexively recognize the need thereof. In that regard, the theoretical and analytical methods applied in this research prove insufficient to provide an entirely satisfactory answer to the research question, with the real impact of the discussed measures on sustainability being a potentially interesting field of study on the basis of a sample of system relevant financial institutions in the years to come.
References


EU RULES ON CORPORATE GOVERNANCE AS MEANS TO PROMOTE …


Legal acts


EU RULES ON CORPORATE GOVERNANCE AS MEANS TO PROMOTE …


The balance paradox of management

Tadeusz GOSPODAREK
WSB University in Wroclaw, Poland

Abstract:

**Aim:** There exists an inequilibrium between the available quantity of goods and the level of consumption resulting in local economic polarisations and asymmetric capital concentrations. Replacements of real money with derivative instruments cause strong perturbations on capital markets. Consumer preferences change towards the maximization of the utility of the used capital. The above observations are a basis for the hypothesis that managers, in general, prefer to maximize the momentum profit regardless of the risk of losing the stability of macroeconomic systems.

**Design/Research method:** It is heuristic about the objective function of an organization based on observations, that there are two excluding tendencies in formulating goals: to maximize the profit (using all possible opportunities) and simultaneously to achieve stability in the long run (keeping the micro-macro balance).

**Conclusions/findings:** Managements cause deviations from the micro-macro balance, and at the same time trying to keep this balance. This leads to the following paradox of management (the balance dilemma of management): Managers always try to maximize opportune profits, regardless of future benefits that may be derived from keeping the equilibrium. And conversely, rational long-term stability suggests postponing most opportunities and keeping external boundaries (e.g. realizing sustainable development). However, managers’ temporary preferences lead to an increasing number of unbalanced interactions between organizations and their surroundings, up to the critical point when some catastrophic economic processes may take place.

**Originality/value of the article:** Original heuristics based on the observations of some micro-macro economic balance relations in business practice.

**Implications of the research:** One more paradox in the theory of management have been presented. It is important for base statements of the theory of organizational behavriors consistency and inferring would be more accurate.

**Key words:** General economic equilibrium, rationally bounded decisions, paradox of management, micro/macro balance, management theory.

JEL: L2, M21, D5, F41
1. Introduction

"Greed is good" was Gordon Gekko’s favorite saying in Oliver Stone’s movie "Wall Street". Today, even Pope Benedict XVI in his encyclical “Caritas in veritate” accepts the situation in which “man is organically aimed at achieving more”. How does the manager make his decision against these assumptions? It is a purely behavioral action – catch as catch can.

This paper is addressed to researchers who try to formalize the theories included in management knowledge. It primarily focuses on the problem of inconsistency of the base statements of economic balance theories explaining the goals of management. It means that using the same base statements of the theory, one can conclude the sentence where either true or false logical value assignment is possible. It is a paradox, and the balance paradox of management (Quinn (1988) is one more discovered and explained here.

Economic theories should be judged by three criteria: congruence with reality, generality, and tractability (Stigler 1965). But what if the theory offers paradoxical conclusions? In formal sciences, it is forbidden because of scientific restrictions in methodology. But it works in social sciences, mainly due to complexity of theoretically the issues described, and it sometimes leads to serious problems in the real world. For example, managers would maximize an objective function if they knew it was wrong, but despite this knowledge, their decisions are taken against rational aspects (Simon 1957). The existing ceteris paribus in social science makes all the generalized approaches far from certain, and nobody claims that this uncertainty is easy to estimate. All managerial decisions are related to the future and taken on the basis of some present and past data under the conditions of uncertainty, which is the only possible method of predicting, but due to weakness of the economic theory and the mentioned complexity, the resulting conclusions may be far from the assumed data. The subjective aspects of decision-making generally lead to future consequences, not always achievable or predictable. Theoretically. It is also the main problem of general economic forecasting which was a faux pas in relation to the present crisis. The quantitative methods regarding those elaborated by operational research are not sufficient for exact crisis forecasting and it is probable
that nothing will change in this matter soon.

One of the most important attempts to analyze the economic equilibrium is the Arrow-Debreu-McKenzie (ADM) model (Debreu 1959; Arrow & Hahn 1971). The outcome of competitive markets in an open economy is modeled as a Walrasian equilibrium, which is an allocation together with a price system that is characterized as follows:

- Each organization maximizes profits, taking prices as given.
- Each consumer maximizes preferences as subject to their budget constraint.
- All markets are clear (both parts of the game have full information, and the entrance to the market is free from barriers).

This is the basis of rational management. But it is easy to see that the objective function derived from the above may not be the most desirable because managerial decisions may be inadequate (Steinar E. and Wilson R. 1974). Then the requirements of the ADM model are not met and, as a consequence, the general economic balance is distorted. The ADM model applies to economies with maximally complete markets, in which there exists a market for every time period and forward prices for every commodity at all the time periods and in all places. Therefore, an analysis of all deviations from the above assumptions would be a basis for determining possible economic problems. Also, it may be a basis for evaluations of management decisions. Moreover, if this is so, then a reverse statement about the existence of a micro-macro balance as an indicator of the fulfillment of the ADM requirements is a correct analytical method (at a minimum qualitative level). Analyzing local deviations from the micro-macro balance for the purposes of reasoning about the clarity of the market seems to be correct then.

Management science is continuously looking for good methods of forecasting and good models of economic behaviors, because it seems probable that each new crisis may be stronger and goes faster than the previous one. The success of behavioral economics (Camerer & Loewenstein 2003) and its methods needs to take into account some irrational mechanisms of management decisions prior to the quantification approach and precise operational research methods. For that reason, the most important approach to crisis forecasting seems to be the analysis of deviation from a stable micro-macro balance and estimations of its possible
quantified results and non-measurable consequences.

Because most business activity may be treated as a set of games against the surroundings, it is possible to define the payoff function as a micro-macro state of balance, and understood as an equation of some macroeconomic parameters. Until this moment, the ADM model in its pure form may be accepted. In general, the macro balance is stabilized by the authorities at the regional or governmental level, manifested by introducing to the game some boundaries, law regulations, tax policy, governmental support, etc., thus reducing the open form of economy to the restricted type. The micro balance depends on entrepreneurial activities and local business interactions, and most of the strategies chosen are directed towards a maximization of temporary profit. Sometimes these games are of the open type but in most cases they are closed ones, in which the payoff function describes the micro-macro balance. All possible deviations from the micro balance are related to a competitive act (eliminating competitors from the market, expansion beyond the local surroundings, catastrophic behaviors of the bankruptcy type). But due to behavioral and opportunity-related actions, some cheating strategies in the game are possible (creative bookkeeping, hidden profit, payment cheatings, etc.). This often causes unbalanced perturbations from the micro-macro balance (e.g. the classic Enron case), which may induce large-scale crisis situations. Therefore, the ADM model may not be entirely acceptable and the calculated deviations may be treated as signals of possible economic inequilibrium.

Figure 1 presents the model of micro and macro balance existing in an economical system based on the game model of interactions between an organization and its surroundings. The Nash equilibrium represents a saddle point of the game. It always exists if the game may be represented in a matrix form (matrix games). All the erroneously chosen strategies and rationally bounded decisions induce the most vicious response from the surroundings, and result in a loss of payoff (deviations from the micro balance state). The Debreu equilibrium is derived from the theory of value and may be understood as a macro state of the average micro-macro interactions. But if all deviations from the micro-macro balance observed in a given time and generated by managerial decisions do not compensate each other, then the superposed deviation signal will cancel the macro balance. And it may be one of the
theoretical explanations of a crisis arising. After some time, when precise financial data were available, it would be possible to apply the ADM model and try to find some interesting quantitative estimations of the observed deviations. But now it is only possible to present some qualitative and heuristic information.

According to Simon’s theory (Simon 1957), most management decisions are rationally bounded. It is therefore obvious that most of them will be oriented towards taking advantage of any local and temporary opportunities. It is almost a paradigm of the new management theory. For that reason, it is probable that after some time a strong deviation from the micro-macro economic balance will take place. This period of time will be proportionally shorter the more opportunities in the surroundings occur and are taken advantage of. The place of the strongest deviations from the micro-macro balance will be restricted to the most active entrepreneurship business centers and places related to big capital concentrations. This process is unstoppable, it is therefore obvious that sustainable development is only a nice theoretical model, adequate for an equilibrium economy in a finished time. The following questions may also be posed: Is the ADM model a sufficient tool for explaining the economic crisis? Can the global economy be still seen as an open economy type? May the global economic balance in Debreu’s sense be assumed when replacements of money and derivative instruments are in common use? These questions are very difficult to answer, taking into account the existing crisis situation. For further discussion, it is necessary to introduce some case studies which would clarify the presented analysis.
2. Sustainable development in the EU as an example of macro balance

In human nature, risk aversion is one of the most important aspects of decision making. It is probably one of the bases for seeking economic systems and behaviors where stabilization at the micro level is fixed and easy to forecast. The sustainable development concept is an example of such thinking on the macro scale (UCN 2006). It is an ontological model of economic behaviors in which the micro-macro balance of the system is stable in a long time period and where such phenomena as speculation bubble are not available (or strongly reduced), and the investment risk is reduced to a minimum. In practice, sustainable development is realized by macro planning and project managing in the EU. This planning is carried out at all levels of regional governance, where the smallest unit is the municipal unit. All units prepare
strategies of development where a 6-year period of investment is composed of a set of possible projects. It is the basis for the European Commission to plan the central budget and introduce global programs of development. One of the most important among them is the European Regional Development Fund (ERDF). All ERDF co-financed projects are subjected to a formal logical frame approach, the procedure of evaluation and analyzed in detail before any funds are granted. Therefore, long-term effects of such planned investments improve the economic situation of the less developed regions and, thanks to activating their potential of value added creation, it results in powerful feedback for the global impact of EU economy. The existence of a micro-macro economic balance may be observed here, and there are different mechanisms regulating the volume of the offered aid regarding the average economic situation of EU regions, as presented by Eurostat. In this way, some regions do not participate in the EFRR program (e.g. London City), whereas e.g. the Polish eastern borderland regions are beneficiaries of the EU aid to a maximally acceptable level. But after some time, this economic activation will also bring positive macroscopic effects, reducing the EU economic-aid involvement. In the economic growth of the EU countries, the maximum impact of investment is focused on infrastructure projects such as: highways, waste-water utilization, waste deactivation, pure water and air. The quantities invested are huge. In case of Poland, it is over 60 billion euro for 6 years financial perspective. If we add the self-partnership capital, then the amount of around 20 billion euro indeed accounts for considerable investment power. And it is for this reason that the internal consumption is strong, resulting in the fact that during the present economic crisis, the economic situation in Poland remains among the best in the whole EU.

This macroeconomic mechanism is one of the important factors in the reduction of adverse effects of the crisis. It is also important that Poland is not too engaged in the international financial circuit. Polish banks and big financial organizations are not involved in subprime mechanisms or other money replacement products as differential instruments. It may be assumed that due to the weak engagement in global supply chains and the global financial exchange, Poland is more resistant to

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1 http://ec.europa.eu/regional_policy/funds/feder/index_en.htm
2 http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/
the crisis. All EU statistical data received from Eurostat show that sustainable development of EU regions is the right direction of economic growth.

The conclusion is that the EU model of sustainable development, represented by the ERDF program, is an example of the support of macro balance, which allows a stable economic growth of a region. It makes regions more immune to local crisis situations. Highly formalized procedures of investment protect against subjective and rationally bounded management decisions. However, in the planning practice, it may be observed that the national development strategy was not exactly derived from district and branch strategies.

Can we observe any paradoxical management behaviors in the presented case? The answer is “yes”. All managerial decisions related to the ERDF fund distribution are related to political aspects and particular benefits, often regardless of any economic sense. One of the best examples is the Polish set of macro management decisions about the ERDF capital distribution and procedures of its use and handling, which were purely nonsensical, and in the nearest future the absorption of all the available funds will become a real problem. Managing authorities are strongly influenced by politics and therefore most decisions are rationally bounded. As a result, one can observe an additional economic polarization instead of sustainable development of all Polish regions. Also, an important part of the funds will be lost due to a lack of regional, mainly municipal, capital.

3. How to disturb the micro-macro balance from a macro point of view?

The conclusion may be supported by experiments with options in currency rates in relation to the international speculation against the Polish złoty (PLZ). Within the period of half a year (from August 2008 to March 2009), the exchange rate of PLZ/$ changed by 75%. The same situation was observed for the rates of PLZ/euro and PLZ/yen. Now we have a reverse situation. The exchange ratio is rising by up to 50% in relation to March 2009 minimum. Why? There is no economic explanation to this kind of behavior. But Poland is not an island on the ocean of economics. The surroundings found the opportunity for an easy way to earn quick money, disturbing
the existing macro balance in the process, of course. A lot of false information was coming from the surroundings, including signals which were important in taking business decisions. This information was cleverly prepared by banks, some influential people, opinion-making centers, etc. They created an impression that the zloty was getting stronger and stronger despite the rationally justified signals stemming from the real economic data. At that moment, clever bankers started selling options on the currency ratio, having the knowledge that the offered products are pure cheat. Simultaneously, some external corporations started speculating against the zloty, setting the depreciation of its rate at above 75% in a short period of time. As it was easy to predict, a lot of buyers of toxic options ended up falling into a critical economic situation. But for the surroundings, nice profits were reaped.

The conclusion is that any disturbance of the micro-macro balance due to managerial decisions induces some catastrophic reactions, which may result in a crisis situation. The enterprises which are more involved in toxic transactions may go bankrupt.

Where does the paradox of management lie? The answer is simple. Regardless of the existing risk and the necessary knowledge of derivative instruments, some managers decided to buy toxic financial instruments anyway. They broke the micro-macro balance for some dubious short-time profits. The punishment proved severe. Some enterprises went down, becoming sad evidence of catastrophic behaviors on a local scale. What is more – this situation is easily expandable into the entire surroundings.

4. Entrepreneurial decisions (micro balance perturbations)

Let us have a look at the structure of decision making presented in Figure 2. The main stream of decisions are behavioral actions of the entrepreneur. In general, they are induced by temporary opportunities. Entrepreneurial decisions are therefore affected by the surroundings in a positive and/or negative way as information feedback. The positive interactions include stimulations (e.g. governmental support, external funds, etc.) and free information exchange (e.g. knowledge diffusion from
the surroundings, support based on the web 2.0 concept, etc.). The negative aspects include all the regulations (legal restrictions, taxes, free law interpretations, etc.), boundaries (different protection rules, social demands, etc.) and pathological interactions (e.g. corruption, paid concessions, hidden taxes, etc.). The above interactions are related to the micro-macro balance and may be analyzed by the SWOT and PEST methods. But it is possible to distinguish an internal core of entrepreneurial decisions, representing the operational aspects of the micro-macro interaction. The subjective aspects are rationally bounded decisions of the entrepreneur toward any changes of the objective function. A visionary entrepreneur can take the risk of changes without precise, quantitative data, but he can take into account some rational aspects derived from the surroundings. But all entrepreneurial decisions are related to taking advantage of opportunities, thus introducing some kind of micro-macro balance perturbation. What if this perturbation is important and difficult to compensate by the surroundings? Some enterprises may go bankrupt in a catastrophic form and are not replaced with new ones. A good example may be the decline of the local linen and cotton industry, replaced by imported fabrics, which began a 20-year long crisis situation in the region of Lower Silesia in Poland.

The conclusion is that entrepreneurial decisions may change the micro-macro balance regardless of the rational aspects of stabilization in the long run. Decisions tend to be behavioral and redirected onto changes of the entrepreneur objective function toward a temporary maximization of profit.

The paradox of management is clear. Entrepreneurial decisions are related to the easiest changes of production results, eliminating the local suppliers of fabrics and replacing them with cheaper imports or any other form of outsourcing service using Global Supply Chain possibilities (Neace & all. 2013). It destabilizes the temporary local macro-economic balance and in the long run leads to some negative consequences.
5. The objective function

Let us now have a look at the descriptions of strategic schools. The fundamental assumption of all strategies is how to defeat the competitors. In other words, how to achieve a competitive advantage and how to take advantage of the chances in the surroundings. Such a determination of strategic aspects suggests the objective function, where the optimum is related to temporary success. Even the real option school of management (Dixit & Pindick 1994) shows a way to fulfill such assumptions in the shortest and the most effective way. But what if the optimized function is wrong? An improper optimization may lead to catastrophic behaviors and clearly interrupts the existing micro- or micro-macro balance. But managerial decisions are subjective and therefore rationally bounded, strongly influenced by the policy and probable incentives resulting from a fast success. Therefore, the objective function realized by a typical manager is not directed toward a long-term sustainable development, but toward immediate, quick success.

The conclusion is that strategic management introduces the objective functions which may affect the existing micro-macro balance. The behavioral aspects of strategic decisions define short time functions redirected onto quick profit. As a result, even some cheating mechanisms in management decisions are also observed (like e.g. selling toxic financial instruments fully aware of this fact).

The paradox of management is clear here. When better incentives are offered to a manager, then quicker objective functions redirected onto medial success and appropriation of payoff are preferred, regardless of all the balance aspects.

6. Hidden knowledge utilization

One of the most dangerous aspect of the destabilization of the micro-macro economic balance seems to be discovery and the use of tacit knowledge and tacit utility of resources. Sometimes a revolutionary concept rolled out into practice may induce unforeseen results. Some financial engineering experiments with derivative instruments are the best examples. Introducing replacements of real money with
substitutes makes the fundamental Arrow-Debreu-McKenzie model of general economic balance insufficient. Sometimes business receives an extraordinary product from scientific laboratories. What is the main aim of the management, then? To register a patent as soon as possible and cut off the competitors, then to sell as much as possible regardless of the potential long-term consequences both for the seller and for the surroundings. This process is analogical to any self-induced reaction in nature: it is irreversible and unstoppable. Sometimes hidden knowledge is very dangerous but nobody cares about that. There are some interesting examples of replacing technologies in a catastrophic way (e.g. the replacement of CRT monitors with LCD technology) together with the positive and negative results observed.

The conclusion is that hidden knowledge and utilization of resources are a basis for potential deviations from the micro-macro balance, and sometimes for the macro balance. Because knowledge-based entrepreneurial activity is strongly supported by world capital, possible unbalanced business processes will develop. In some cases, it may induce catastrophic behaviors in the area where industrial processes will stop due to technological elimination. The paradox of short-term preferences instead of long-term balance protection is clear. All management decisions will be redirected onto quick profit.

7. Rationality-bounded decisions and the economic balance

As pointed out in the cases presented above, most management decisions are rationally-bounded and of the behavioral type. Majority of strategic decisions are oriented towards local opportunities. This process of quick success orientation is unstoppable and therefore micro-macro balance deviations will always be observed. The second general conclusion drawn from the micro-macro balance perturbation consequences caused by management processes may be formulated as follows: because of the bounded rationality of management decisions taken in uncertain circumstances, the category of open economy in Debreu’s sense does not exist in practice and serious deviations from the model are observed. All our economic surroundings are more or less restricted by boundaries, rules and rights, and tend to
change periodically as a result of arising hidden opportunities. The hidden opportunities may derive from the hidden utilization of the available resources and information processing (including that of tacit knowledge). Thus, all the quantitative approaches based on certain data processing and ex-post-based forecasting are useless in forecasting crisis situations.

Sustainable development is a nice idea, but its practical usage seems impossible, regarding the tendencies among strategic schools. The case of the ERDF program presented above, is a positive example of the solution of one aspect (the right use of big capital during a long period of time). But full realization of sustainable development requires a co-operation of entrepreneurial acts closely related to governmental projects. And because of management decisions focused on quick success, the long-term stabilization programs only make the surroundings less turbulent. Much has been written about possible causes of the global financial crisis, but the following factors seem to be the most responsible:

- The barrier between the capital markets and banking has been affected by faulty or dishonest financial innovations, especially derivative instruments and money replacements offered worldwide without certain information.
- All incentives for the employees of financial institutions have been geared to short-term profits instead of long-term benefits, which serves as one of the best exemplifications of the management paradox described in this paper. This mechanism seems to be impossible to eliminate in the future, which will in turn generate further deviations of the micro-macro balance.
- Risk insurance has been neglected on the macro scale, and true information about possible consequences of the use of risky instruments has been hidden. Therefore, managerial decisions to invest in toxic instruments have been of the bounded rationality type.
- Financial institutions have been excessively leveraged and their activities not transparent enough or subjected to suitable control procedures. In conjunction with the incentives system for managers, temporary benefits have been preferred to long-term sustainable development.
- Inadequate macro balance stabilization activities of politicians and governments based on pumping capital into less recognized and evaluated critical points of
destabilization have been examples of bounded decisions related to temporary effects disregarding long-term consequences.

All the presented cases show that rational aspects of managerial decisions are affected by various factors and there is no way to eliminate subjective and behavioral acts. What is more, the interactions between financial corporations and business will always be a kind of game where the micro balance is not its fundamental payoff.

8. Conclusions

In conclusion, the main objective of this paper has been to propose the following statement: *One of the most important factors in all economic crisis situations is the balance paradox of management.* It means that, despite the rational sustainable development and socially accepted long-term strategies, managements make rationally-bounded decisions focused on temporary and quick appropriation of payoff regardless of the possible serious deviations from the micro-macro economic balance.

Globalization, present in the global supply chains, networking and over-national management, leads to capital concentration and macro-economic balance oscillations. Sometimes a deviation from the micro-macro balance is so strong that the global system is not able to compensate for it. It may then be possible to start self-inducing processes of chaotic capital flow without control, which may cause critical economic behaviors on a large scale.

Based on the deviations from the Nash equilibrium at the micro-macro level, and the deviations from the Arrow-Debreu theory of value and general economic balance, and also taking into account the use of derivative instruments and faulty financial engineering, it is possible to theoretically explain the economic mechanisms of a crisis.

Behavioral economics seems to be the most valuable tool in explaining managerial decisions with bounded rationality and deviations from the micro-macro economic balance. Because the psychological aspect of the micro-macro balance perturbation seems to be the most important, it is impossible to avoid crisis situations
in the future. There are no suitable tools for crisis forecasting and due to the lack of reliable semi-quantitative models of the formation of speculation bubbles along time, our knowledge of future deviations from the macro-economic balance would be uncertain. Because the balance paradox of management seems to be impossible to eliminate, our tacit knowledge about crisis forecasting will remain hidden.

References


Bankruptcy prediction models as a source of assessment of the company’s financial situation

Justyna Beata BARLIK
WSB University in Wroclaw, Poland

Abstract:

Aim: The aim of the work is to make an attempt at matching an appropriate discriminatory model to companies in the Polish energy sector in 2013-2015.

Design/Research methods: The unitary financial statements of five companies from the energy sector in Poland over the period of 2013-2015 were studied. Following the example of practical calculations, the effects and result of the methods used were presented.

Conclusions / findings: Assigning accurately a particular model to the whole energy industry is not possible, as there has not been any research so far that would allow for matching bankruptcy prediction models to specific industries and enterprises. When assessing the risk of failure, taking into account just one model is not sufficient.

Originality / value of the article: Demonstration of many methodical problems that require further research in order to find optimal methods for matching discriminatory models to specific market segments.

Key words: discriminatory models, bankruptcy of the company, financial situation.

JEL: G01,G11,G17

1. Introduction

In economy a company going bankrupt is a natural phenomenon playing the role of economic selection (Hadasik 1998).

In the past bankruptcy used to have local implications; however, owing to the globalization process, a company going bankrupt is nowadays increasingly more frequently associated with a so-called domino effect. The consequence of the domino
effect is that the failure of one company may have broader implications affecting considerably the entire economy. Even corporate giants may go bankrupt and they are usually not prepared for this situation.

One of the important elements of the theory of bankruptcy is the strand of research focusing on quantitative models for predicting bankruptcy. Given the shortcomings of the traditional indicator-based analysis, one searched for a synthetic measure allowing for assessing a company with the highest possible accuracy. Discriminatory models have become very popular. According to experts, they represent a highly effective method of a synthetic assessment of the company’s financial situation (Siemińska 2003: 124-126).

The aim of this paper is to present selected Polish discriminatory models used for assessing whether or not a company is at risk of failure, and to demonstrate their application as exemplified by selected companies over the period of 2013-2015. The research was conducted on the basis of unitary financial statements. In her research the author chose from the models available on the Polish market those which had been created by their authors also on the basis of industry.

2. The concept of financial situation

The concept of financial situation has been presented in publications concerned with finances, the company management, economic and financial analysis and within banking. The vast majority of authors involved in this issue sees the concept of financial situation as being the same as that of financial condition (Pierścionek 1996: 156).

In looking for an adequate definition, it is worth citing the theory advanced by the European Union Commission. It considers a firm to be in financial distress “when it is unable, whether through its own resources or with the funds it is able to obtain from its owners/shareholders or creditors, to stem losses which without outside intervention by the public authorities will almost certainly condemn it to going out of business in the short or medium term” (OJ EU 244 of 1 October, 2004). Moreover, Bien’s position in this respect is worth considering as he uses the term financial situation interchangeably
Bankruptcy Prediction Models as a Source of Assessment …

with the term of financial standing, with the latter being conceived of as the firm’s competitive position on the market, its credibility and economic strength (Bień 1999: 81). E. Siemińska (2002, 2003) sees this concept in the same context asserting that financial situation implies the firm’s position resulting from the decisions it makes and opportunities of further growth which are the outcome of those decisions.

The concept of financial condition refers to the company’s sustainability, security and financial credibility, as well as the ability to generate profit or increase its value. “The condition of health” of a company is described in particular by such parameters as financial liquidity, solvency, profitability of resources and profitability of the company’s operations. One can speak about a poor condition when, for example, the company lost its liquidity, fails to yield profit and it is no longer viable (www.nbportal.pl/slownik/pozycje-slownika/kondycjafinansowa). The advantage of this definition is linked to the elements it contains used for the purpose of assessing the entity’s financial situation, i.e. profitability, effective management of its wealth and assets, and liquidity.

3. A statistical discriminant analysis as an early-warning tool

The attempts to transpose the models applied in other countries onto the Polish setting failed to bring satisfactory results. Moreover, what they brought to light was that it was necessary to create models adapted to the country’s specific features. This goal became the focus of the research started in 1997 at the Institute of Economic Sciences of the Polish Academy of Sciences (PAN) (the research was headed by E. Mączyńska (Maczyńska, Zawadzki 2006) within the framework of the project Systems of early warning against business bankruptcy. Early-warning indicators funded by KBN – the State Committee for Scientific Research), with the research still going on. The global practice has confirmed that the demand for early-warning models increases drastically during a time of rapid economic and social changes, which Poland is currently experiencing. This is linked to the EU integration that is now unfolding and to the civilisational breakthrough which the world is witnessing. The competition, which has been growing as the result of those developments, is not an easy challenge
for companies. The large scale of the changes has the effect that the uncertainties and risks involved in the functioning of companies are increasing. That is why it is so critical to have tools enabling one to receive an early warning against approaching threats. Among various early-warning tools and techniques, the application of statistical discriminant analysis has so far been the most widespread practice.

Discriminant analysis is a statistical method employed in solving classification problems for sets which vary in their characteristics. Discriminant variables discriminate clearly a population of objects. As a measure discriminating between the populations of objects one considers the measure expressing the ratios of the size of differences between groups to the size of differences within a group. The value of a discriminant function is made up of the sum of products of variables and the parameters of the function statistically determined, that is, the weights of those indicators. The value of the function, which is determined on the basis of classification characteristics, provides the answer, by being compared to the limit value, to which group the object in question belongs (Walczak 2007). Today, for estimating parameters of discriminant models, methods are used whose underlying approach is that of a greater acceptance of the failure to meet the requirement of a normal distribution of variables. These methods were outlined in detail in Polish literature in D. Hadasik’s works (Hadasik 1998: 153).

As the analysis of the existing achievements within the scope of discriminatory models shows, the key issue in their construction is the choice and selection of indicators characterizing the condition of a company and the estimation of the weights of those indicators. The weights reflect specific features of the conditions in which a company and its environment operate.

The analysis of international and domestic works concerned with failure prediction models indicates their basic characteristics as follows:

a) Using usually a dozen or so variables illustrating basic traits of business financial condition, mainly, liquidity, debt and profitability. The basis here is formed predominantly by quantitative variables, with qualitative variables being used only occasionally.

b) Sporadic use of variables coming from the capital market.

c) Indicators which are characterised by normal distribution represent a vast
majority among indicators employed in discriminatory models. The measures which are typically used in a financial analysis are not employed, i.e. profitability indicator (ratio of financial result to equity). It is on account of the problem of the discontinuity of indicator values; a situation when the level of equity is equal to zero (Rogowski 1999: 57-58).

In her paper, the author presented Mączyńska’s model, the Poznan model and the model devised by Gajdka and Stos (1996). They are the most popular models developed by Polish scientists.

Mączyńska’s model was built to reflect the need of customizing Altman’s model to Polish conditions. E. Mączyńska and E. Zawadzki developed 7 early-warning models. The authors carried out an analysis on a balanced sample, that is one comprising 50% of firms at risk of failure and 50% of “healthy firms. The study included 80 companies listed on the WSE in Warsaw, using financial statements from the years 1997-2001, and financial indicators calculated on their basis. The study used 45 indicators characteristic for profitability, liquidity, debt level, operational efficiency and the companies’ growth dynamics. The final version of the model is given by the following formula (Mączyńska, Zawadzki 2006: 7):

\[ Z_M = 1.5w_1 + 0.08w_2 + 10w_3 + 5w_4 + 0.3w_5 + 0.1w_6 \]

where:

- \( w_1 = \frac{\text{gross profit + depreciation}}{\text{total liabilities}} \)
- \( w_2 = \frac{\text{total liabilities}}{\text{balance sheet total}} \)
- \( w_3 = \frac{\text{total liabilities}}{\text{gross profit}} \)
- \( w_4 = \frac{\text{sales revenues}}{\text{value of stocks}} \)
- \( w_5 = \frac{\text{sales revenues}}{\text{sales revenues}} \)
- \( w_6 = \frac{\text{balance sheet total}}{\text{sales revenues}} \)
The interpretation of the results of the discriminant function for this model is as follows:

- negative value of indicator $Z$ indicates a company at risk of bankruptcy,
- positive value, yet less than 1, indicates a weak company, but not at risk of going bankrupt,
- positive value within the range of 1-2, a rather sound company,
- value above 2, a company in a very good financial condition

Another model of early warning against company’s failure was developed by M. Hamrol, B. Czajka and M. Piechocki on the basis of financial statements of 100 Polish commercial companies between 1999 and 2002 (half of the companies was represented by healthy enterprises). The companies regarded as bankrupt where those for which bankruptcy procedure or arrangement procedure had already been completed. The selection of healthy companies was based on the comparable amount of assets (Ksielińska, Waszkowski 2010:24). The Poznań model is given by the following formula (www.analizy-prognozy.pl):

$$Z_p = 3,652w_1 + 1,588w_2 + 4,288w_3 + 6,719w_4 - 2,368$$

where:

$$w_1 = \frac{\text{net profit}}{\text{total capital}}$$
$$w_2 = \frac{\text{circulating capital} - \text{stocks}}{\text{short – term liabilities}}$$
$$w_3 = \frac{\text{constant capital}}{\text{total capital}}$$
$$w_4 = \frac{\text{net sales profit}}{\text{sales revenues}}$$

The interpretation of the model:

$Z_p<0$ a difficult financial situation

$Z_p>0$ a good financial standing of the entity.
Another model used in the paper is one developed by J. Gajdka and D. Stos. The studies were carried out on 40 companies listed on the Stock Exchange in the following industries: manufacture, construction and trade. In this model, discriminant function has the following form (Gajdka, Stos 1996: 59-63):

\[
Z_{GS} = 0,7732059 - 0,0856425w_1 + 0,000774w_2 + 0,9220985w_3 \\
+ 0,6535995w_4 - 0,594687w_5
\]

where:

\[
w_1 = \frac{sales\ revenues}{average\ value\ of\ assets\ in\ total}
\]

\[
w_2 = \frac{average\ value\ of\ short-term\ liabilities}{production\ costs\ of\ goods\ sold} \times 360
\]

\[
w_3 = \frac{average\ value\ of\ total\ assets}{net\ profit}
\]

\[
w_4 = \frac{gross\ profit}{sales\ revenues}
\]

\[
w_5 = \frac{total\ liabilities}{total\ assets}
\]

The interpretation of the model:

\[
Z_{GS} > 0,45 \text{ company is not at risk of failure}
\]

\[
Z_{GS} < 0,45 \text{ company at risk of failure}
\]

For an average user, discriminative methods are more transparent and communicative when set beside newer generation methods, such as neural networks, with their results being easier to compare and interpret.

4. Description of energy sector in Poland

The work that had been conducted since the beginning of the 1990s relating to the energy sector brought about the adoption of Energy Law by the Sejm of the Republic of Poland on April 10 1997 (Journal of Laws, No. 54, item 348), which has been in
force (as amended) since then. This act represents the highest level of legal regulations in force for this sector. The Energy Law governs economic activity pursued within the area of energy products, with the exception of coal, which is subject to the provisions set forth in the Act of 4 February 1994 – Geological and Mining Law (Journal of Laws No. 27, item 96). The Energy Law is followed directly by executive acts to this Law issued by the Council of Ministers, Prime Minister and the Minister of Economic Affairs. There are also individual legal regulations issued by the President for the Office of Energy Regulation (URE).

Presently Polish electricity sector consists of four large capital groups which are under the state control, a few private power plants and energy distributors. As the result of the government “Program for Electricity,” which intended to create four large undertakings capable of competing against other European undertakings on the free energy market, the following entities were founded: PGE Polska Grupa Energetyczna S.A. TAURON Polska Energia S.A. (former Energetyka Południe S.A.), ENEA S.A., ENERGA S.A.

PGE is the largest energy undertaking in Poland and one of the largest in Central and Eastern Europe. It is engaged in brown coal mining, the production of electricity and heat, electricity distribution and the production of energy in renewable sources. The PGE Group was established as the result of the merger of the companies BOT group and Zespół Elektrowni Dolna Odra, and on the basis of the assets left after carving out distribution companies such as ŁZE, Łódź Teren, ZEORK, ZE Białystok, ZE Warszawa-Teren, LUBZEL, ZKE and Rzeszowski Zakład Energetyczny from PSE S.A. The main shareholder of the PGE Group is the State which owns 57.39% of the Group’s shares.

Tauron Polska Energia was founded as a result of the merger of the following entities: PKE, EnergiaPro and Enion distributors, and Stalowa Wola Power Plant, Tychy Heat and Power Plant, and Przedsiębiorstwo Energetyki Cieplnej of Katowice. The group is made up of 90 undertakings linked by capital, including 17 subsidiaries. The parent company of the group is TAURON Polska Energia S.A. The state owns 30.06% of shares of the TAURON Group.

ENEA S.A. Group was established as a result of the merger of ENEA and Kozienice Power Plant. The Group’s major activity is the production, distribution and
The state is the group’s largest shareholder holding 51.50% of shares.

ENERGA Group was founded following the merger of ENERGA with Ostrołęka Power Plant. The Group runs its operations in the field of electricity production, trade and distribution. With 51.52% of shares, the state is its main shareholder.

The past years have seen the ever more frequent emergence of capital groups in the Polish energy sector. Considering the fact that small energy undertakings are not capable of financing their development on their own, what is necessary is continuous consolidation of the Polish energy sector. The transformations in the domestic power industry started in the early 1990s. Their objective was to adjust the sector to the conditions prevalent on the global markets. The consolidation of the Polish energy sector continues to be necessary given the fact of growing competition following Poland’s accession to the EU. It is necessary for Polish energy undertakings to increase their competitiveness, and without consolidation the achievement of synergies and economies of scale is not possible. On the other hand, despite the measures undertaken to this end, the condition of the Polish energy sector may still be too weak to face these challenges.

5. Application of discriminatory models on selected examples

The study encompassed five undertakings from the energy sector: Tauron Polska Energia S.A., PGE S.A., Enea S.A., IDEON S.A. and Heat and Power Plant Będzin S.A over the period of 2013-2015. The selection of the companies was necessitated by having to use economic and financial data in the analysis which were available for the companies discussed to the extent allowing for conducting the analyses. The companies under study were chosen purposefully so as to allow for comparing the companies owned predominantly be the state (PGE S.A., Tauron Polska Energia S.A., Enea S.A.) with those in which the state held no shares (IDEON S.A., EC Będzin S.A.). The economic entities examined are joint stock companies listed on the Stock Exchange. For the assessment of their financial situation, the following models were used: Mączyńska’s, Gajdka and Stos and the Poznań model.
Tables 1-5 present the values obtained on the basis of the models in question. The values which demonstrate a good financial condition are in green color, while red color denotes those values of indicators which imply the risk of failure.

In 2015 Spółka Tauron Polska Energia S.A was assessed as being in a poor financial condition according to Mączyńska’s model, and the model by Gajdka and Stos. The values calculated for the other years showed the company as being in a good financial condition.

Table 1. The values of indicators in the selected models for the company Tauron Polska Energia S.A. (2013-2015)

<table>
<thead>
<tr>
<th>MĄCZYŃSKA’S MODEL</th>
<th>indicators</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>0.20</td>
<td>0.12</td>
<td>-0.35</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>3.28</td>
<td>3.00</td>
<td>2.68</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.06</td>
<td>0.04</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>0.15</td>
<td>0.13</td>
<td>-0.38</td>
<td></td>
</tr>
<tr>
<td>W₅</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>W₆</td>
<td>0.39</td>
<td>0.29</td>
<td>0.35</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE POZNAŃ MODEL</th>
<th>indicators</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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</thead>
<tbody>
<tr>
<td>W₁</td>
<td>0.06</td>
<td>0.04</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>0.63</td>
<td>1.37</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.89</td>
<td>0.91</td>
<td>0.82</td>
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</tr>
<tr>
<td>W₄</td>
<td>0.03</td>
<td>0.02</td>
<td>-0.001</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GAJDKA AND STOS MODEL</th>
<th>indicators</th>
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<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>0.41</td>
<td>0.30</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>92.99</td>
<td>117.57</td>
<td>145.72</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.06</td>
<td>0.04</td>
<td>-0.12</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>0.03</td>
<td>0.13</td>
<td>-0.38</td>
<td></td>
</tr>
<tr>
<td>W₅</td>
<td>0.30</td>
<td>0.33</td>
<td>0.37</td>
<td></td>
</tr>
</tbody>
</table>

Source: self-reported data base on the unitary financial statements of Tauron Polska Energia S.A. as of 31 December 2013, 31 December 2014 and 31 December 2015.

Table 2 presents the values of the indicators of Mączyńska’s model, the Poznań model and Gajdka and Stos model for the company PGE S.A over the period of 2013-2015. Over that time, the company PGE S.A. was classified as a company in a good financial condition by all the models used.
Table 2. The values of indicators in the selected models for the company PGE S.A. (2013-2015)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mączyńska’s Model</th>
<th>Poznań Model</th>
<th>Gajdka and Stos Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>W₁</td>
<td>1.68</td>
<td>1.29</td>
<td>0.30</td>
</tr>
<tr>
<td>W₂</td>
<td>22.37</td>
<td>8.79</td>
<td>6.50</td>
</tr>
<tr>
<td>W₃</td>
<td>0.07</td>
<td>0.15</td>
<td>0.04</td>
</tr>
<tr>
<td>W₄</td>
<td>0.19</td>
<td>0.57</td>
<td>0.16</td>
</tr>
<tr>
<td>W₅</td>
<td>0.02</td>
<td>0.04</td>
<td>0.02</td>
</tr>
<tr>
<td>W₆</td>
<td>0.40</td>
<td>0.26</td>
<td>0.28</td>
</tr>
<tr>
<td>W₁</td>
<td>0.07</td>
<td>0.15</td>
<td>0.02</td>
</tr>
<tr>
<td>W₂</td>
<td>9.39</td>
<td>8.06</td>
<td>1.97</td>
</tr>
<tr>
<td>W₃</td>
<td>0.99</td>
<td>0.99</td>
<td>0.95</td>
</tr>
<tr>
<td>W₄</td>
<td>0.09</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>W₁</td>
<td>0.40</td>
<td>0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>W₂</td>
<td>21.6</td>
<td>15.09</td>
<td>11.30</td>
</tr>
<tr>
<td>W₃</td>
<td>0.07</td>
<td>0.16</td>
<td>0.04</td>
</tr>
<tr>
<td>W₄</td>
<td>0.19</td>
<td>0.57</td>
<td>0.16</td>
</tr>
<tr>
<td>W₅</td>
<td>0.04</td>
<td>0.14</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Source: self-reported data base on the unitary financial statements of PGE S.A. as of 31 December 2013, 31 December 2014 and 31 December 2015.

Mączyńska’s model classified the company Enea S.A. in 2015 as being at risk of failure. The calculations made for 2013 and 2015 indicated that the company was in a good financial condition. The Gajdka and Stos model as well as the Poznań model defined the company Enea S.A. as a company in a good financial condition over the entire period under study.

Table 4 contains the values of the indicators according to Mączyńska’s model, the Poznań model and Gajdka and Stos model for the company IDEON S.A. over the period of 2013-2015. The model by Mączyńska as well as that by Gajdka and Stos classified the company as being at risk of failure in the years 2013-2015. Only the Poznań model was of “different opinion”, as its values showed that the company was in a poor financial condition only in 2014, while in 2013 and 2015 the values demonstrated the company’s good financial condition.
Table 3. The values of indicators in the selected models for the company Enea S.A. (2013-2015)

<table>
<thead>
<tr>
<th>MĄCZYŃSKA’S MODEL</th>
<th>indicators</th>
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<th>2015</th>
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<tr>
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<td>4.56</td>
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<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.07</td>
<td>0.05</td>
<td>-0.06</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>0.17</td>
<td>0.14</td>
<td>-0.20</td>
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</tr>
<tr>
<td>W₅</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>W₆</td>
<td>0.40</td>
<td>0.35</td>
<td>0.32</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE POZNAŃ MODEL</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>0.06</td>
<td>0.05</td>
<td>-0.07</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>2.19</td>
<td>2.99</td>
<td>2.16</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.92</td>
<td>0.93</td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GAJKDA AND STOS MODEL</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>0.21</td>
<td>0.38</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>41.23</td>
<td>72.72</td>
<td>306.50</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.03</td>
<td>0.05</td>
<td>-0.07</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>0.17</td>
<td>0.14</td>
<td>-0.20</td>
<td></td>
</tr>
<tr>
<td>W₅</td>
<td>0.14</td>
<td>0.22</td>
<td>0.39</td>
<td></td>
</tr>
</tbody>
</table>

Source: self-reported data base on the unitary financial statements of Enea S.A. as of 31 December 2013, 31 December 2014 and 31 December 2015.

Table 5 presents the values of the indicators of Mączyńska’s model, the Poznań model and that by Gajdka and Stos for the company EC “BĘDZIN” S.A. over the period between 2013 and 2015.

The company EC “BĘDZIN” S.A. was assessed as being in a poor financial condition in 2015 by Mączyńska’s model and the model by Gajdka and Stos. The values obtained for the other years showed the company as being in a good financial condition.
Table 4. The values of indicators in the selected models for the company IDEON S.A. (2013-2015)

<table>
<thead>
<tr>
<th>MĄCZYŃSKA’S MODEL</th>
<th>indicators</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>-0.26</td>
<td>-0.23</td>
<td>-0.24</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>0.62</td>
<td>0.24</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>-0.42</td>
<td>-0.97</td>
<td>-0.36</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>-0.32</td>
<td>-3.08</td>
<td>-36.93</td>
<td></td>
</tr>
<tr>
<td>W₅</td>
<td>0.006</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>W₆</td>
<td>1.33</td>
<td>0.31</td>
<td>9.72</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE POZNAŃ MODEL</th>
<th>indicators</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>-0.36</td>
<td>-1.26</td>
<td>-0.36</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>1.41</td>
<td>0.43</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>0.51</td>
<td>-0.62</td>
<td>-0.51</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>0.02</td>
<td>0.003</td>
<td>0.87</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GAJDKA AND STOS MODEL</th>
<th>indicators</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>1.15</td>
<td>0.15</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>W₂</td>
<td>252.72</td>
<td>321.62</td>
<td>290.11</td>
<td></td>
</tr>
<tr>
<td>W₃</td>
<td>-0.31</td>
<td>-0.30</td>
<td>-0.26</td>
<td></td>
</tr>
<tr>
<td>W₄</td>
<td>-0.32</td>
<td>-3.08</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>W₅</td>
<td>1.60</td>
<td>4.16</td>
<td>1.51</td>
<td></td>
</tr>
</tbody>
</table>

Source: self-reported data base on the unitary financial statements of IDEON S.A. as of 31 December 2013, 31 December 2014 and 31 December 2015.

According to Mączyńska’ model, in 2013 the company Tauron Polska Energia S.A. was considered to be a company enjoying a very good financial situation, in 2014 it continued to sustain its good condition, however, in 2015 the sales revenues fell substantially (negative value), which had the effect that the company was classified as being at risk of failure. The second of the models analyzed (the Poznań model) assessed the financial condition of the company Tauron S.A. over the years 2013-2015 as very good. The Gajdka and Stos model recognized the company as good in 2013 and 2014, however the year 2015 saw a substantial decrease in the company’s net profit, which contributed to assessing the company as at risk of failure.
Table 5. The values of indicators in the selected models for the company EC “BĘDZIN” S.A. (2013-2015)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>MĄCZYŃSKA’S MODEL</th>
<th>THE POZNAŃ MODEL</th>
<th>GAJDKA AND STOS MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>W₁</td>
<td>0.59</td>
<td>8.45</td>
<td>-0.002</td>
</tr>
<tr>
<td>W₂</td>
<td>7.84</td>
<td>60.82</td>
<td>3.13</td>
</tr>
<tr>
<td>W₃</td>
<td>-0.03</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>W₄</td>
<td>-0.03</td>
<td>0.10</td>
<td>-0.45</td>
</tr>
<tr>
<td>W₅</td>
<td>0.09</td>
<td>0.13</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Source: self-reported data based on the unitary financial statements of EC “Będzin” S.A. as of 31 December 2013, 31 December 2014 and 31 December 2015.

The assessments and values of the parameters of the selected models as well as the accuracy of the prediction are presented in Tables 6-10.

Table 6. The value and interpretation of discriminatory models for the company Tauron Polska Energia S.A.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Mączyńska’s model</th>
<th>The Poznań model</th>
<th>The Gajdka and Stos model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>interpretation</td>
<td>value</td>
</tr>
<tr>
<td>2013</td>
<td>1.98</td>
<td>Very good</td>
<td>6.06</td>
</tr>
<tr>
<td>2014</td>
<td>1.56</td>
<td>good</td>
<td>7.02</td>
</tr>
<tr>
<td>2015</td>
<td>-3.46</td>
<td>at risk of failure</td>
<td>2.20</td>
</tr>
</tbody>
</table>

Source: self-reported data
Table 7. The value and interpretation of the selected functions for the company PGE S.A.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mączyńska’s Model</th>
<th>The Poznań model</th>
<th>The Gajdka and Stos model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>interpretation</td>
<td>value</td>
</tr>
<tr>
<td>2013</td>
<td>6.06</td>
<td>very good</td>
<td>17.65</td>
</tr>
<tr>
<td>2014</td>
<td>7.02</td>
<td>very good</td>
<td>15.66</td>
</tr>
<tr>
<td>2015</td>
<td>2.20</td>
<td>very good</td>
<td>5.44</td>
</tr>
</tbody>
</table>

Source: self-reported data

Table 8. The value and interpretation of discriminatory models for the company Enea S.A.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mączyńska’s model</th>
<th>The Poznań model</th>
<th>The Gajdka and Stos model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>interpretation</td>
<td>value</td>
</tr>
<tr>
<td>2013</td>
<td>2.89</td>
<td>very good</td>
<td>5.54</td>
</tr>
<tr>
<td>2014</td>
<td>1.98</td>
<td>good</td>
<td>6.62</td>
</tr>
<tr>
<td>2015</td>
<td>-1.52</td>
<td>at risk of failure</td>
<td>4.82</td>
</tr>
</tbody>
</table>

Source: self-reported data

Table 9. The value and interpretation of discriminatory models for the company IDEON S.A.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mączyńska’s model</th>
<th>The Poznań model</th>
<th>The Gajdka and Stos model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>value</td>
<td>interpretation</td>
<td>value</td>
</tr>
<tr>
<td>2013</td>
<td>-6.00</td>
<td>risk of failure</td>
<td>0.88</td>
</tr>
<tr>
<td>2014</td>
<td>-25.39</td>
<td>risk of failure</td>
<td>-8.92</td>
</tr>
<tr>
<td>2015</td>
<td>-4.78</td>
<td>risk of failure</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Source: self-reported data
Table 10. The value and interpretation of discriminatory models for the company EC “Będzin” S.A.

<table>
<thead>
<tr>
<th>Year</th>
<th>Mączyńska’s model</th>
<th>The Poznań model</th>
<th>The Gajdka and Stos model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>year</td>
<td>value</td>
<td>interpretation</td>
</tr>
<tr>
<td>2013</td>
<td>1.19</td>
<td>good</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>18.96</td>
<td>very good</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>-2.00</td>
<td>risk of failure</td>
<td></td>
</tr>
</tbody>
</table>

Source: self-reported data

According to Mączyńska’s model, PGE S.A. was considered to be in a very good financial situation in 2013-2015. The Poznań model also classified the company as one in a very good financial situation over the period examined. The Gajdka and Stos model also classified the company as good over the entire period in question.

The analysis of the financial condition of the company Enea S.A. carried out using Mączyńska’s model indicated that in 2013 the company was in a very good financial situation, in 2014 it was in a good financial situation, while in 2015, following the losses recorded at the end of the accounting period, it was considered to be at risk of failure. However, the values of the function in the Poznań model indicated that the company was in a very good financial situation over the period in question. The value of the function in the Gajdka and Stos model indicated that over the period of 2013-2015 the company was in a good financial situation.

According to Mączyńska’s model, the company IDEON S.A. was considered to be at risk of failure over the entire period examined. This interpretation was largely affected by the negative gross profit recorded for the years 2013-2015. The Poznań model, on the other hand, assessed the company’s financial condition as good in 2013; yet in 2014 when the short-term liabilities exceeded the value of the constant capital, the value of the function was negative, which implied that the company was at risk of failure. However, in 2015 all the indicators analyzed improved with the financial situation becoming good again. Moreover, the Gajdka and Stos model considered the company to be at risk of failure over the entire period examined.

Heat and Power Plant “Będzin” S.A., according to all models was considered to be in a good financial situation over the years 2013-2014. In 2015, however, following the negative gross profit, the level of stocks at zero and no sales, the company was considered to be at risk of failure by Mączyńska’s model and the Gajdka and Stos
model. Only the Poznań model, which does not take into account these elements in its function, considered the company EC “Będzin” as being in a very good financial condition.

The analysis found that the classification of a company in terms of whether or not it is at risk of failure may differ depending on the model applied. Considering the financial situation of the companies: Tauron, PGE, Enea, IDEON and “Będzin”, one should emphasize that all the companies are still listed on the Warsaw Stock Exchange. All the models included in the study showed that the financial situation of the companies examined was good over the period of 2013-2015, with the exception of the company IDEON, which according to Mączyńska’s model and the Gajdka and Stos model was at risk of failure throughout the entire period examined. Only the Poznań model in the years 2013 and 2015 classified the company as a company in a good financial condition. The Poznań model diverges in its interpretation from the other models. One has to note that this model examines other aspects of financial statements, with gross and net profit being outside its focus, unlike in the case of the majority of indicators applied in Mączyńska’s model and the Gajdka and Stos model.

However, the studies conducted demonstrate that while attempting to assess the risk of bankruptcy one should not use only one model, for models may differ as to their interpretation of the company’s financial situation.

6. Conclusions

On the basis of the studies conducted by the author the following conclusions can be drawn:

- the companies which belong to capital groups of the Polish energy sector are in a much better financial condition that companies without the state shareholding,

- through the calculations conducted, it was possible to indicate one company which was at the greatest risk of failure and that was IDEON S.A. All models showed the lowest values for this company compared to the rest of
the sample. According to Mączyńska’s model and the Gajdka and Stos model, the company was classified as being at risk of failure over the entire period under study.

- discriminatory models of early warning are not sufficiently reliable tools. An adequate choice of a model to assess the risk of failure allows for obtaining a high quality forecast;

- one should not forecast bankruptcy prediction based on just one model. In order to make the analysis results objective, one should apply a few discriminant functions and to observe how their values change over time;

- only estimation samples selected adequately so as to match the characteristics of the object under study allow for obtaining, a long time in advance, high quality forecasts of insolvency;

- the application of discriminatory models in company management makes it possible to extend the period over which a company functions on the market while limiting the risk of making wrong management decision.

The author believes, drawing on the discussion and calculations, that it is not possible to assign a specific model to the entire energy sector, for there have so far been no studies which would match bankruptcy prediction models to particular industries and businesses. The author, however, has observed that Mączyńska’s model examines the energy sector in a most detailed way owing to its components. Still, in investigating the risk of failure one should not rely on calculations obtained on the basis of just one model.

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