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TITLE: Revisiting the Invisible Hand Hypothesis: A Comparative Study between Bulgaria and Germany

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Revisiting the Invisible Hand Hypothesis: A Comparative Study between Bulgaria and Germany

Abstract This paper examines Adam Smith's concept of an *Invisible Hand* of the market in light of the underlying assumptions for the theory to hold. Furthermore, the study focuses on Total Factor Productivity as a measure of efficiency of resource allocation, employs growth accounting in Bulgaria relative to a frontier country (Germany), and tries to explain the Total Factor Productivity gap with the difference in the quality of institutions and economic freedom performance (where the latter is based on the *Freedom Index Indicators*). Satisfactory results have been obtained, favoring the hypothesis that freer markets perform better and a "catching up" effect of Bulgaria's Total Factor Productivity levels towards those of Germany has been observed. Finally, the study provides policy recommendations facilitating the *Invisible Hand* Process in Bulgaria for a more rapid convergence towards Germany's productivity levels.

Keywords: Invisible Hand of the Market, Free Market Economy, Total Factor Productivity, Convergence.

1. Introduction

"An Inquiry into the Nature and Causes of the Wealth of Nations" is Adam Smith's most influential work that has had an impact on the world of economics since its publishing in 1776. It became "the gospel of free trade and economic liberalism" (Copley and Sutherland, 1995). One of the most essential propositions in modern economics had been made in this classic book – competitive markets are able to allocate scarce resources efficiently when governments do not play a dominant role. Smith defined the term "wealth" of a society by the annual production of its labor and not by the amount of gold that a society owns. A good way of expanding this wealth, he suggested, is by the division of labor - when people specialize in the field that they are most productive at, and trade these produced goods and services for the one they need, this leads to an economic growth. According to Smith, a certain "natural liberty" is encoded in human nature – a condition in which individuals tend to pursue their own goals. Nevertheless, the pursuit of an individual's own

interest results in the increase in common wealth, although this is achieved unintentionally. Smith used the metaphor of an *Invisible Hand* to illustrate the natural instincts that motivate and model the behavior of the participants in a market so that a greater variety of goods and services are being offered and received (Walton and Wykoff, 1998). The process is called invisible simply because it is not intentional. Adam Smith argues that the "system of liberty" – interaction between these self-serving individuals not hampered by any excessive regulations – would lead to an optimization point (i.e., Pareto optimization).

A burning issue is whether the *Invisible Hand* of the market still relevant? In theory, three types of economic systems exist – free market economy, command economy and mixed market economy. The former is characterized by the limited role of the government, while in the latter the government is in full control of all political, economic and social matters. In practice, the third option - mixed market economy - is the most widespread in the 21st century. Almost every economy is a blend of the free market and the command economy types. Today, almost 250 years after Adam Smith's revolutionary idea was first shaped, the modern citizen of the global village enjoys a profoundly different economic situation. Thus, there is a need to transform Adam Smith's theory into modern day language. One could interchange "is the *Invisible Hand* still relevant" with "are societies that rely on economic freedom, healthier and more productive". Nowadays, the burning issue is what proportion of mix from free market and command economy will produce the most successful and productive economy? Taking into consideration the above discussed theory of Adam Smith, the consequently provided arguments and the conducted analysis of the main drivers of economic prosperity, this study advocates in favor of the relevance of the *Invisible Hand* of the market.

2. Literature Review

Although the mechanism of the *Invisible Hand* of the market (IHM), derived as an economic theory in the middle of the 18th century, has no direct reference to the field of Mathematics, it is important to acknowledge that both have common ground. Similarly to a mathematical statement, the IHM theory consists of two parts: the hypothesis or

assumptions made, and the conclusion drawn. One should emphasize the fact that the *Invisible Hand* of the Market is working if and only if specific conditions are fulfilled, and fails when they are not present. The validity of Smith's theory is highly dependent on a set of factors ranging from the economic, political and social spheres. To begin with, the essence of the *Invisible Hand* hypothesis lies in the low degree of government intervention in the economy (*i.e. laissez-faire* policy), including no price controls and stable inflation leading to prices serving as an efficient market clearing mechanism. In addition to this, a society needs to be free of informational asymmetries and confusion in order for the market to clear at the existing prices and to achieve dynamical equilibrium levels.

What is more, the market place must have low barriers to entry and exit, reasonable transaction costs as well as numerous market participants of equal size. These assumptions comprise the major requirements for a free market system to operate properly, implying that they are not specific hard-to-attain requirements for the validity of the IHM but a necessity for every free market economy. The political and social conditions represent a vital background for implementing the *Invisible Hand* Mechanism: the efficiency with which the Rule of Law is enforced, the low crime rate and the protection of human rights are a necessary prerequisite for the validity of the theory.

On balance, the above mentioned assumptions serve as a hypothesis for the *Invisible Hand* statement. *If* all the conditions are present, *then* Smith's *Invisible Hand* allocates limited resources (scarce goods and labor force) in the most efficient way (*i.e.,* in a *Pareto* efficient way), thus promoting economic prosperity (please, refer to Table 1).

Table 1. Describes the necessary conditions for the IHM to work.

	Assumptions/Hypothesis		Conclusion
If	*Laissez-faire* economy	**are present, then**	*the Invisible Hand of the Market allocates limited resources efficiently. Thus, promoting economic prosperity.*
	No informational asymmetries or confusion		
	Low entry and exit in the market		
	Uniformity of market participants		
	Low transaction costs		
	Rule of Law		
	Protection of Human Rights		

Source: Own representation

The structure of the study is along the following lines. After transforming Smith's theory into modern day language and clarifying that the *Invisible Hand* works only if a set of assumptions are present, part 3 examines instances of market failure. Those market failures imply the non-existence of the IH when one of the assumptions is not met – the lack of adequate information. The discussion relies on economic findings of George Akerlof and Joseph Stiglitz. The section also covers Schumpeter's Creative Destruction process acknowledged by this paper as a process that has much in common with the IHM. Part 5 illustrates a quantitative method (Growth Accounting) used for measuring the influence of IH on economic prosperity by introducing the concept of Total Factor Productivity (TFP) and associating it with *Freedom Index* Indicators. A thorough analysis of the drivers of economic success in Bulgaria and Germany is presented further backed by an empirical data analysis using dynamic correlation estimations in section 6. The following section provides evidence in favor of Bulgaria's TFP convergence towards Germany's TFP levels. In addition, the 8th section highlights the major impediments standing between Bulgaria and the frontier country, and proposes suggestions for improvements in the lagging components.

Appendix A further clarifies the Growth Accounting Methods used in Section 5 and provides detailed quantitative methods for generating the TFP series for Bulgaria and Germany, while Appendix B further illustrates the analysis conducted in section 6 with the use of thorough correlation tables and convergence graphs. Section 7 provides some policy recommendations, and Section 8 concludes.

Although many economists have studied the extent to which Smith's theory is viable, the analysis provided in this paper does not seem to have been formally derived in the previous literature. Both - the Invisible Hand's quantitative measure and the concentrated study of Bulgaria's convergence towards Germany in terms of *Freedom Indexes* as a manifestation of the *Invisible Hand*'s process - are an intriguing supplement to the current economic literature.

3. Instances of market failure – factors that hinder the *invisible hand* of the market

Information economics is a broad microeconomic theory that examines how information systems affect economic decisions, and thus hinder the work of the *Invisible Hand* of the market. Extensive research on this issue was originally motivated in 1945 by Friedrich Hayek with the publication of his "The Use of Knowledge in Society" but the following section focuses on information disorder research made by the *Nobel Memorial Prize in Economic Sciences* winners in 2001– George Akerlof and Joseph Stiglitz. This study discusses instances, suggested by the above mentioned economists, where the price mechanism fails to coordinate efficiently economic activity and the division of labor. Possible ways of resolving information asymmetries are also examined.

George Akerlof – Raise of Transaction Costs due to informational asymmetries

Information asymmetries inevitably arise in a market economy, causing adverse selection. The famous economist George Akerlof sheds some light upon this issue with his work "The Market for "Lemons": Quality Uncertainty and the Market Mechanism". The paper asserts that there are significant economic costs to dishonesty between a buyer and a seller, and this thesis is best explained with the market for second hand cars. According to Akerlof, there are two types of used cars – good ones and bad ones (also known as lemons). On the one hand, in a second hand market prospective buyers purchase a car with lack of information about the quality of the product. On the other hand, the owner, after managing a certain car, has observed whether the machine has malfunctioned in some areas or have shown outstanding results. His own estimate is far more

accurate than the judgment of the potential buyer. Hence, asymmetrical information has arisen; consequently, price does not serve as a signal for market clearing level any more. The existence of informational disorder violates one of the main assumptions of the *Invisible Hand* process; hence, prices no longer measure desirability and scarcity, and are unable to allocate resources efficiently. What is more, good cars and lemons must sell at the same price, since the buyer is unable to differentiate between the products. In order to inform themselves better, buyers of a certain product either use market statistics to judge the quality of the desired good, or use specialized assistance of a car mechanic. Both of these options give rise to *transaction costs*.

To conclude, dishonesty between market participants creates information asymmetries with a negative economic impact. The cost of dishonesty consists not only in the amount by which the purchaser is cheated but also in the "thinning of the market", nearly driving it out of existence. In a market with information asymmetries self-interest of market participants does not meet society's best needs, contrary to Smith's argument.

Joseph Stiglitz – Inefficient allocation of the labor market

In the prize lecture "Information and the Change in the Paradigm in Economics" in 2001, Stiglitz opposes the Classical Economics View and that of Adam Smith – that if free markets were left on their own, unemployment could be eliminated and an optimal division of labor could be achieved, since markets would be much more price flexible. Stiglitz asserts that significant wage and price flexibility, in times of recessions, would actually drive the economy into a bigger recession due to even higher drops in prices and wages. Furthermore, he rejects the hypothesis that unemployment is a direct consequence of interference either by government in setting minimum wage laws, or by the trade unions, using their monopoly power to set too high wages. Stiglitz regards the *Invisible Hand* of the Market as a nonexistent phenomenon and argues that government guidance is the key to a healthy economy.

Joseph Stiglitz also discusses the issues deriving from the fact that distinct people have access to diverse information. Information has an impact on decision making in both firms and households. According to the American economist, symptoms of a market failure due to information asymmetries are events such as recessions and depressions, accompanied

by massive unemployment. Joseph Stiglitz supports his thesis on the inefficient allocation of the labor force by giving an example for market participants who might intentionally create informational disorder in order to profit. For instance, managers (as a matter of precaution) would like to increase their bargaining power over a certain employee. Stiglitz regards that even an insignificant amount of information imperfection affects equilibrium levels and keeps the *Invisible Hand* from optimizing the market. Nevertheless, the economist suggests a way to combat asymmetry in information. Namely, the incentive of the worker to establish his own ability and skills diminishes informational asymmetries in the labor market. Assume several workers, he argues, are grouped under the assumption of similar skills and wages. Hence, the most able would have an incentive to reveal his/her full potential and to receive more, while the rest of the group will be left with the mean marginal product of the group. Then, the most able among the new group would also gain incentive to reveal his ability. By continuing this process, there will be a stage of full revelation and the least able will be the last person. The driving force behind this mechanism is competition among employees and the desire to perform better than one's rivals.

To conclude, the prize lecture "Information and the Change in the Paradigm in Economics", presents an indication of the asymmetries that diverse information causes in the market place, in particular the labor force allocation. However, there are means to counteract information asymmetries, and reach optimization point through competition and pursuit of one's own interest, which implies the existence of an *invisible market mechanism* if certain factors are present.

Creative Destruction vs *Invisible Hand* – complements or substitutes?

According to the classical and neoclassical theory, free markets are able to allocate scarce resources efficiently, meaning that no transaction costs must be associated with the process. Yet, Akerlof, Stiglitz and Spence provide sufficient ground to question the validity of this statement. Furthermore, even Smith emphasizes the fact that the division of labor and the expansion of the markets necessitate costs, also known as *transactions costs*. The British economist Ronald Coase (1937) was the first to state that the emergence of the firm, as an economic organization, would not have happened, unless there were transaction costs in free markets.

The reason for certain transactions to be made by firms, and not by the market participants is that they avoid costs related to information, negotiations and monitoring (Sedlarski, 2009). Transaction costs are a useful tool to explain the existence of institutions, markets failures, etc. Furthermore, the primary function of institutions and firms is to decrease the level of uncertainty that market participants have against one another by diminishing the complexity of interpersonal interactions. Taking into account game theory, institutions contribute to the rise of cooperation and the well-being of all participants.

It is essential to discuss the interactions of firms in the market place since they are a driver of economic dynamism. In 1942, the Austrian economist Joseph Schumpeter devoted a chapter from his paper "Capitalism, Socialism, and Democracy" to discuss the "Creative Destruction". There he illustrates economic evolving as a process for a certain society (Cox, 2015). Schumpeter calls "Creative Destruction" the continuous organizational development of institutions, the rise of competition among market members, and the entry of new and exit of old firms in the market. He envisions the industrial change that takes place as ongoing process of revolutionizing the economic structure by destroying the old and creating a new one. The Austrian emphasizes that this is an essential feature of *capitalism*, or free market economy.

To start with, capitalism encourages the implementation of new ideas, the production of new products and the offering of new services. This dynamic environment creates competition and entrepreneurship – main driver in the *Creative Destruction* process. Each firm has an incentive to introduce new products and services, and to use the latest technology to gain bigger market share and to maximize their profits. New entrants compete with established firms, by offering lower prices, new features, faster service, better locations and aggressive marketing strategies. Such a market behavior is similar to the one that Adam Smith has described where the pursuit of self-interest leads to progress.

Schumpeter further argues that the survival of a company is dependent on the innovation and new technologies it uses in its production. If a firm fails to offer competitive prices and innovative products, (hence losing customers), it defaults and resources are transferred from lagging sectors to allocations where their usage will bring highest returns. By doing this, *creative destruction* process (or the *Invisible Hand* of the market) makes scarce resources meet their best use; consequently, societies as a whole become wealthier.

An intriguing feature of this process is that benefits are not immediate while costs are. Western nations, such as Germany, have adopted capitalism and gave freedom to the Creative Destruction, thus achieving significant economic success. However, the constant change of lagging firms with new, better-equipped ones creates unemployment and noise in the system. Therefore, there will always be the uncertainty factor that drives emerging markets such as Bulgaria to choose the status quo instead of change. This results in resistance towards economic change; it binds up the *Invisible Hand* of the market and impedes *creative destruction*.

4. A possible approach to measure the effect of the invisible hand: A comparative analysis between Bulgaria and Germany

For the analysis that follows, this paper presumes that the assumptions made in the IHM theory, thoroughly described in Table 1 are predominantly present.

This section of the paper examines what are the underlying reasons behind the differences in prosperity between the leader of the European Union, Germany, and a transition country like Bulgaria, also a member of the European Union since 2007. While Germany is a founding member, Bulgaria has joined the EU ten years ago but cooperation between Germany and Bulgaria started one hundred years ago. During World War I and World War II they were allies and were politically and economically dependent on one another. The commercial relations were mainly Bulgarian exports to Germany. Although the initial relations between the two nations had a military basis, as time passed their relations shifted to the economic and scientific sphere. Today, around 5 000 German companies operate in Bulgaria, and a similar number of Bulgarian students attend German universities in addition to the tens of thousands of Bulgarian citizens who live and work in Germany (Ministry of Bulgarian Foreign Affairs). Furthermore, various conferences such as the "Bulgarian-German Scientific Cooperation – Past, Present and Future" outline the benefits of collaboration between scientists from both countries in diverse areas of science (Humboldt Union in Bulgaria). In 2013, Germany became Bulgaria’s main trading partner and the largest buyer of goods produced in Bulgaria worldwide (Federal Foreign Office). Thus, Bulgaria follows closely the steps of the leader of the European Union towards its way to prosperity.

But how does one measure economic prosperity? Gross domestic product is a good starting point and yet sometimes countries owe their high GDP to the increase in the inputs of the production function, namely the number of people employed and the level of capital in the economy. Interestingly, there are instances where a country has experienced an economic boom while the levels of labor and capital have been decreasing (Ganev, 2005). This fact raises the question of whether there is another factor, namely an essential feature of capitalism that drives the economy into expansion. Robert Solow gives answer to this issue in 1957 when he published a paper called "Technical Change and the Aggregate Production Function". There he argues that the growth of the gross domestic product is directly dependent not only on the relative change in capital and labor, but on the relative change in a third factor as well (please, refer to equation 1). *Technological progress* is the missing variable in the equation of economic growth. Apart from the impacts that labor and capital have on real GDP, there is an emphasis on the substantial contribution that *Total Factor Productivity* (TFP) has. It might be considered also as the *Solow residual* – the contribution of the human capital and machinery efficiency combined with the introduction of new technologies and policies. In this study, total factor productivity, technological progress and Solow residual are used interchangeably. Equation (1) illustrates the Cobb-Douglass aggregate production function:

$$Y_t = A_t . F(K_t, L_t), \quad (1)$$

or equivalently,

$$Y_t = A_t . K_t^{\alpha} . L_t^{1-\alpha}, \quad (2).$$

The growth equation comprises of labor input, capital input and technology/productivity level. L_t is measured by the total number of hours worked in the current year; K_t – the real value of machinery, equipment and buildings in the current year; and A_t – as a residual of the technological advancements and level of development for the current year. Furthermore, alpha and beta are the output elasticities of capital and labor, respectively. Assuming perfect competition, alpha and beta should sum up to 1.

This paper relies on Growth Accounting Approach[1] as a method to compute the rate of technological progress measured as a residual from

[1] Instead of employing the Growth Accounting Method in Section 6, some economic scholars use econometric approach to assess of the significance of the given factors as a driver of total factor productivity. In the current comparative study of Bulgaria and Germany, the

equation 1. Data on Y_t and L_t is available, while data on K_t could be easily generated with the capital formation series. Then, A_t could be calculated as a residual value from the equation in growth rates:

$$LnY_t = LnA_t + \alpha . LnK_t + (1 - \alpha) . LnL_t, \quad (3)$$

For further details on the computation of the residual, please refer to Appendix A.

Drivers of economic prosperity – The Freedom Index Indicators

The main debunkers of the IHM, such as George Akerlof and Joseph Stiglitz, do not take into account at all the "self-correcting" tendencies of the economy in a longer period of time. In particular, Stiglitz overstates the need of government intervention in the economy. The government should help improve an economic downturn not by a direct intervention that would create insecurity in the system, but indirectly by adopting policies that encourage research and development, saving and investing, free trade and secure property rights. Most importantly, it must provide a legal and political framework that supports private sector activities and enables them to attain optimal level of production. This legal and political framework is called the *Economic Freedom Index*. Economic freedom is a term used to measure the ability of every human to regulate his or her own labor and property. In an economic free society, government refrains from active interaction in the market sector and its main role is to provide liberty and protection of the individual. In such societies, citizens are free to consume, produce, invest and save as they will (About the Index).

Economic freedom is formed on ten qualitative and quantitative elements, divided into four extensive types: *Rule of Law*, *Limited Government*, *Regulatory Efficiency*, and *Open Markets*.

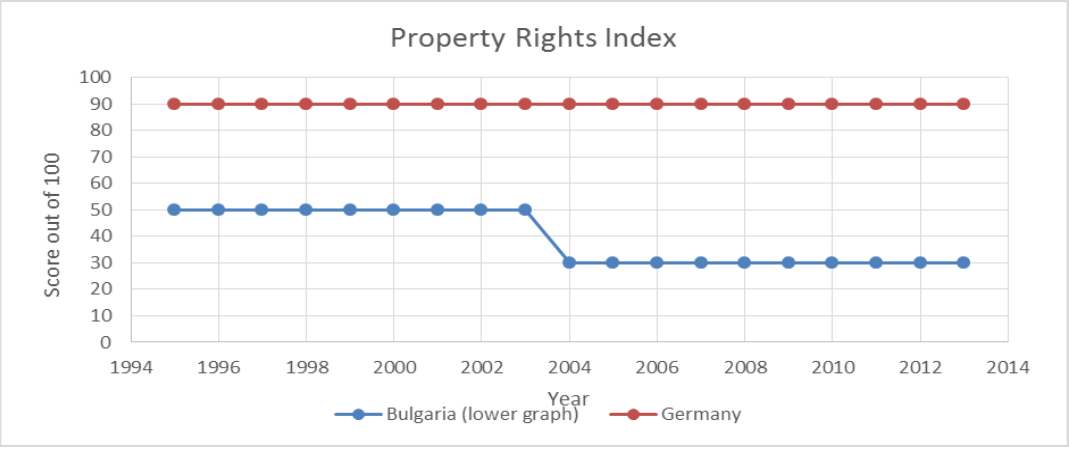
The first one includes two indexes – *Property Rights* and *Freedom from Corruption*. To begin with, *Property Rights* index is a valuation of the ability of citizens of a country to own private property that is secured

econometrics approach is not preferred due to the limitation of the available time series data for Bulgaria and Germany (annual data for the time span 1995-2013) that would generate inconsistent results.

What is more, forecasts on what will be the trend in the TFP gap two years from now could also be conducted with the use of econometric models. Analysis with current data shows that TFP gap is an AR (1), meaning an autoregressive process of order one with high persistence. These provide a basis for future research.

by laws; furthermore, the index assesses their ability to enforce contracts. Additionally, it is a measurement of the strictness with which these laws are enforces by the government as well as it is a proxy for the independence of the judiciary and the existence of corruption within it. A higher score on this index is interpreted as a good legal protection of the property, while a lower score means corruption and possible expropriation. On the one hand, data on Bulgaria suggests that during 1995-2013 the country's property rights actually deteriorated from 50(out of 100) basis points in the first half of the period to 30 in the second half of the time span. On the other hand, Germany's score remains constant at 90 through the observed period, suggesting an efficient court system and secured private property (please, refer to Figure 1.).

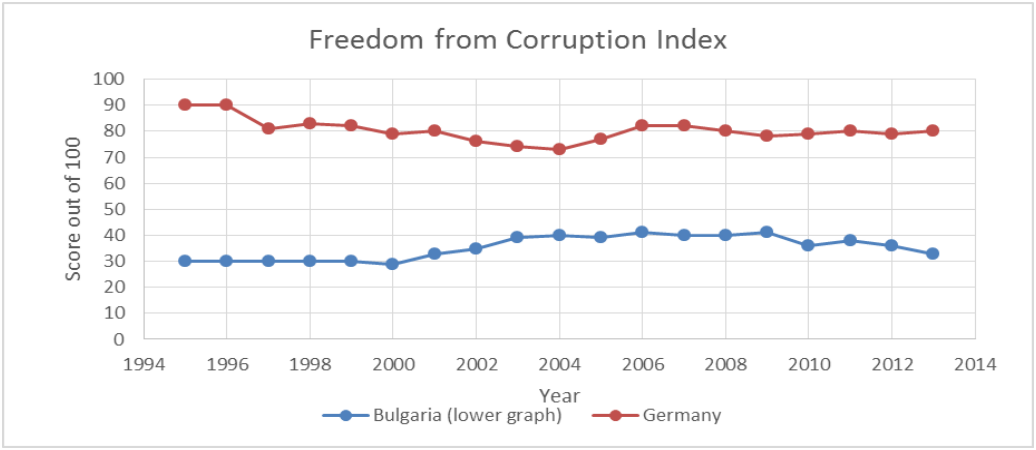
Figure 1.: Property Rights Index for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

The second component in Rule of Law is *Freedom from Corruption*. The data for it is obtained from *Transparency International's Corruption Perception Index*. Again, a high score on this component means very little corruption, while a low score indicates a corrupt government and an erosion of economic freedom. Data analysis shows an average of 35.5 for Bulgaria and an average of 80.3 for Germany for the specified time period (please, refer to Figure 2.).

Figure 2.: Freedom from Corruption Index for Bulgaria and Germany (1995-2013)

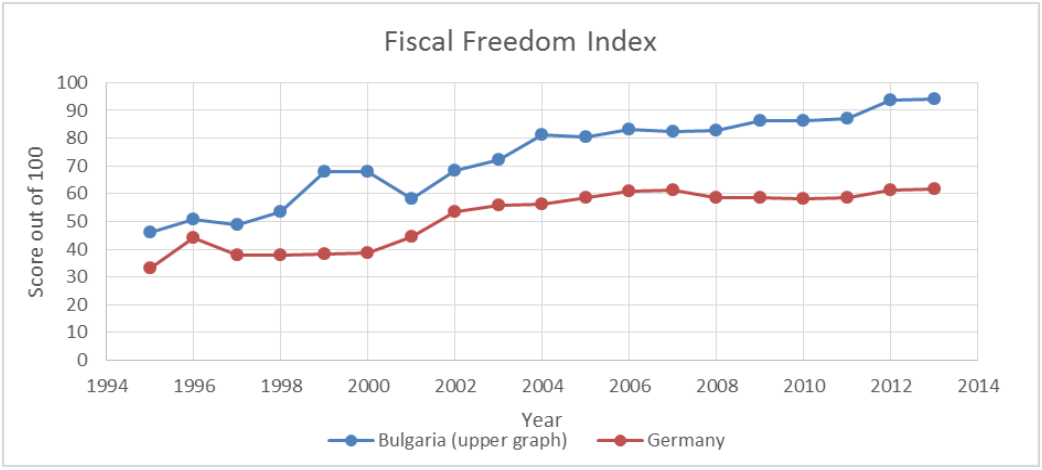


Source: Heritage Foundation

What is more, *Limited Government* is based on indexes such as *Fiscal Freedom* and *Government Spending*. The first factor is an indicator of the tax burden set by the government. It is an average measure of three types of tax in a certain country – top marginal rate on corporate income, top marginal tax rate on individual income and total tax burden as a percentage of the gross domestic product. When the three factors are averaged together, they make up to 100 basis points.

It is essential to emphasize that with the introduction of the flat tax rate in Bulgaria in 2008, the average economic growth rate became higher (Vasilev, 2015b), whereas the size of the grey economy in Bulgaria diminished (Vasilev, 2015c). These effects can be observed in Figure 3 as Bulgaria has made a tremendous jump from a score of 46 in 1995 to 94 in 2013, however the low level of taxes comes at the expense of adequate public services. Germany has also improved but not as much – from 33.2 in 1995 to 61.8 in 2013

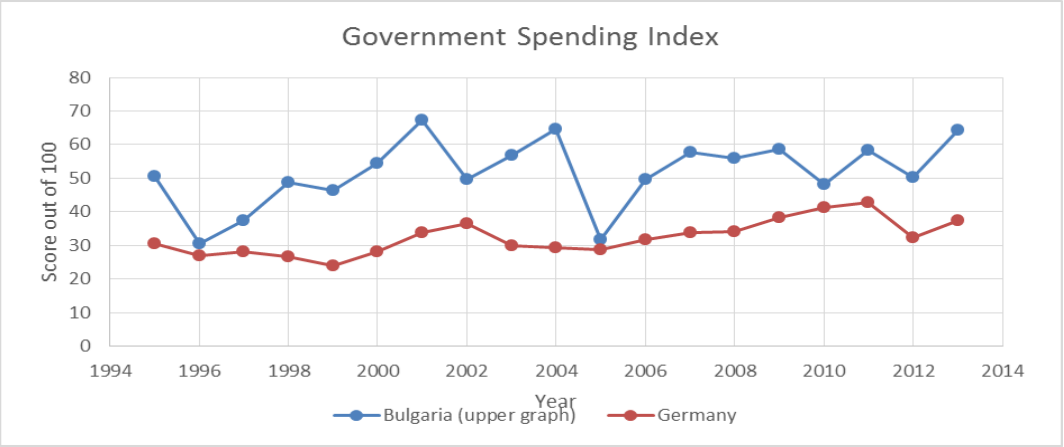
Figure 3.: Fiscal Freedom for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

Government Spending is the second element in the *Limited Government* category. State expenditure (including consumption and transfers) as a percentage of GDP is accounted for there. According to the index, there is no ideal score on this criterion, since it varies across countries. Nonetheless, research (Riedl, 2008; Stratmann and Okolski, 2010) has shown that economic dynamism is negatively affected by a high government expenditure that causes budget deficit and results as a sovereign debt. Therefore, a high score on the *Government Spending* component indicates a moderate or even low amount of government interference in the economy. Bulgaria's average score is 51.6 with latest observation in 2013 of 64.2, suggesting that the Bulgarian government's role in the economy has decreased slightly. In contrast, Germany's average score through 1995-2013 is 32.3 and in 2013 – 37.7 (please, refer to Figure 4).

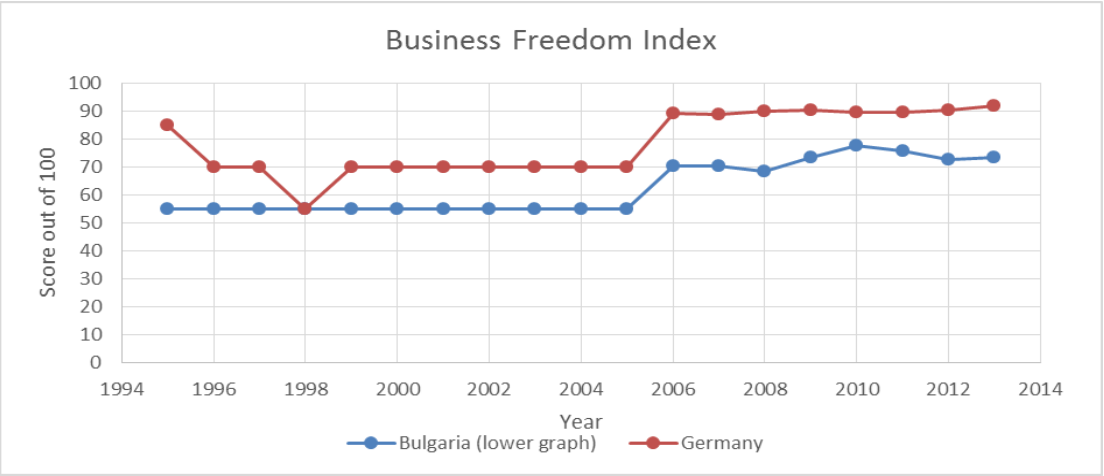
Figure 4.: Government Spending Index for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

The next element, *Regulatory Efficiency*, rests on three types of freedom – *Business*, *Labor* and *Monetary* (please refer to Figures 5, 6, 7). A proxy for the State regulation of business is the *Business Freedom Index*. It is comprised of ten equally weighted elements obtained from the Doing Business report by the World Bank. Namely, these are – starting a business (the number of procedures, cost, time and minimum capital requirements it is necessary to start a business), obtaining a license (measuring the number of procedures, the cost, time necessary to obtain a license), and closing a business (time, cost and recovery rates). Germany's score on Business Freedom is high, but in the studied time period it increases by only 7 basis points (from 85 in 1995 to 92 in 2013), while Bulgaria has marked a significant improvement of 18 basis points (from 55 in 1995 to 73 in 2013).

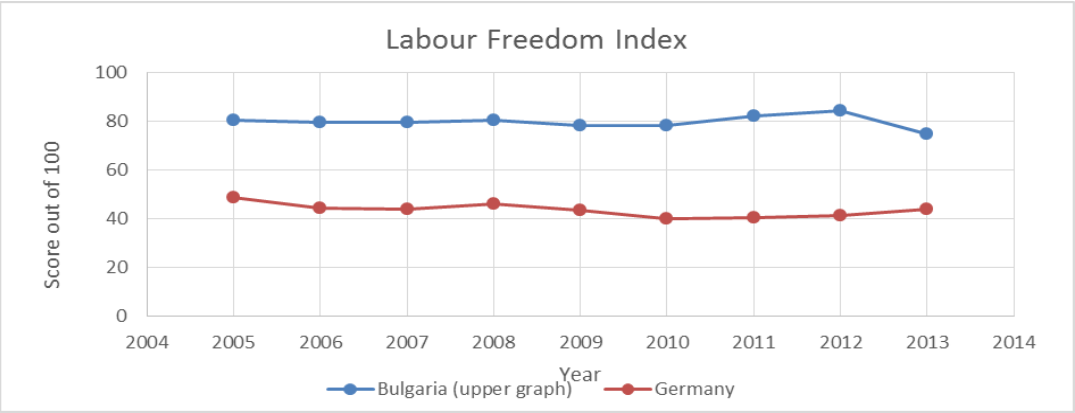
Figure 5.: Business *Freedom Index* for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

The second component of *Regulatory Efficiency*, the *Labor Freedom*, is an overall measure of the regulatory framework of the labor market that comprises of six equally weighted elements- ratio of minimum wage to the average value added per worker, rigidity of hours, hindrance to hiring an additional employee, difficulty of firing a redundant worker, legally mandated notice period, and mandatory severance pay. Data on these components is again extracted from the Doing business research of the World Bank. Data on *Labor Freedom* in 1995-2004 is unavailable. However, data from 2005 to 2013 suggests that Bulgaria has an average score of 79.7, while Germany is lagging behind with an average of only 43.6. Results indicate that the Balkan country has as twice as freer labor market than the leader of the European Union. An underlying reason behind these scores is the fact that Bulgaria has a uniform minimal wage, while Germany has a minimal salary per sector, meaning larger government intervention. Furthermore, the labor market is highly unionized in Germany with larger labor taxes (Vasilev, 2015a). Yet, one should emphasize that those come along with accredited and sometimes free of charge public services.

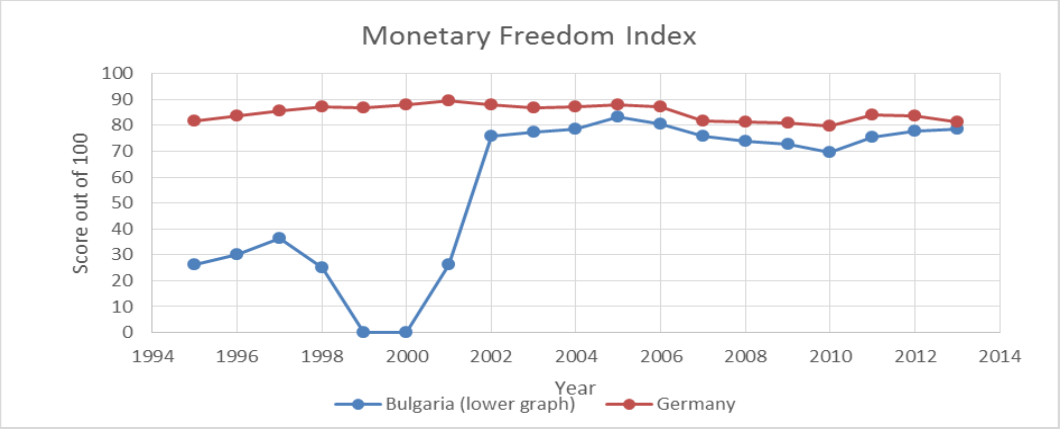
Figure 6: Labor *Freedom Index* for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

The third element of Regulatory Efficiency, Monetary Freedom, is calculated with the use of factors like price stability and price controls. Ideally a free market possesses price stability without intervention, since both price controls and high inflation creates noise in the market that disrupts economic dynamism. Germany remains constant at an average of 84.8 points throughout the observed period. Due to the hyperinflation in 1997 in Bulgaria, its average score is 20 between 1995 and 2002, but more recent observations provide evidence for a tremendous advancement in Bulgaria with an average monetary freedom of 76.6 basis points. This "catching-up" effect of Bulgaria's series to the German ones is due to the adoption of the Currency Board in Bulgaria, fixing the currency to the German mark and consequently to the euro. Furthermore, the Bulgarian monetary policy closely follows the one conducted in the European Central Bank.

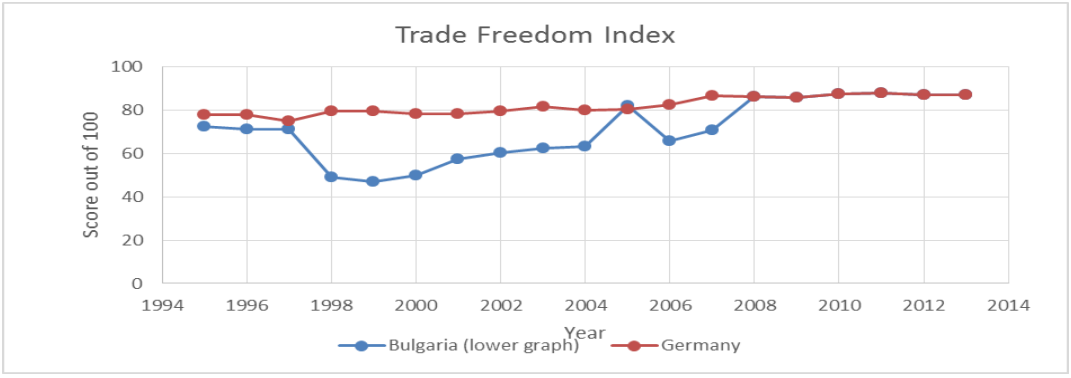
Figure 7: Monetary *Freedom Index* for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

And last, but not least, key elements in *Open Markets* are *Trade Freedom, Investment Freedom and Financial Freedom* (please, refer to Figures 8, 9, 10). The first component is an indicator for the absence of tariff and non-tariff barriers. The trade freedom relies on the trade-weighted average tariff and a penalty is accumulated in case non-tariff barriers such as price, quantity, investment or customs restrictions as well as direct government intervention (e.g., with subsidiaries) exist. The Balkan country and Germany have a *Trade Freedom* average of 70 and 81, and a standard deviation of 14 and 4, respectively. Moreover, data shows that Bulgaria is converging towards Germany's Trade Freedom levels since 2008, which is only natural because in 2007 Bulgaria entered the European Union Customs Union (EUCU), and since then both countries enjoy free mobility of goods, meaning zero tariffs on goods within the EUCU.

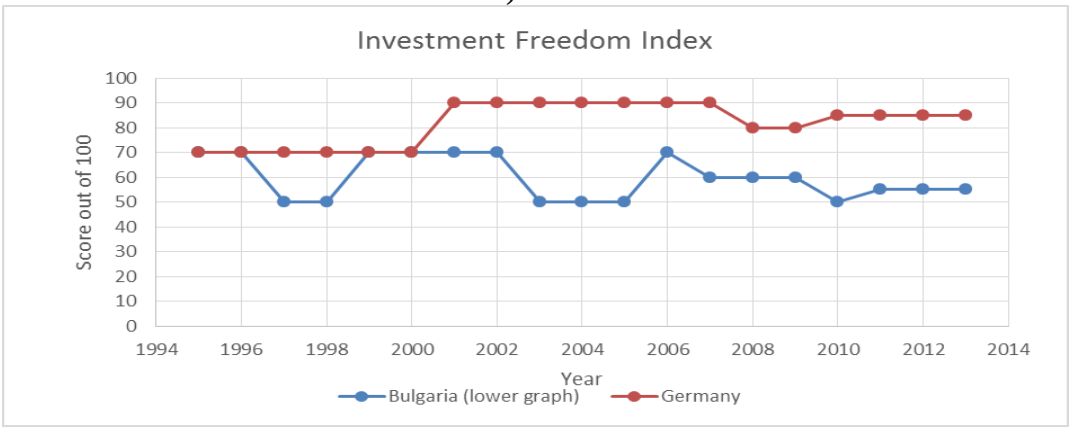
Figure 8.: Trade *Freedom Index* for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

Furthermore, a country is economic free if no constraints on the flow of investment capital exist. In such a country each individual and firm would be able to move without restrictions their resources internally as well as across borders. A score of hundred on the *Investment Freedom Index* suggests the above mentioned criteria are satisfied. In this component Bulgaria's performance has deteriorated, falling from 70 in 1995 to 55 in 2013, whereas Germany has excelled with an increase from 70 in 1995 to 85 in 2013.

Figure 9: Investment *Freedom Index* for Bulgaria and Germany (1995-2013)

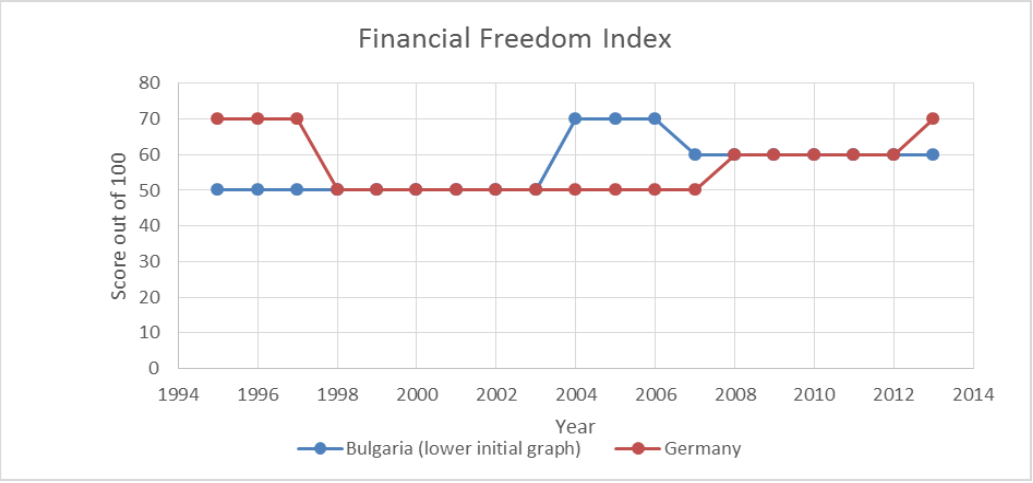


Source: Heritage Foundation

And finally, *Financial Freedom* means banking efficiency with independence from government interference. State ownership of financial institutions hurts competition and the variety of services offered and such

a country scores low on this index. In particular, Bulgaria and Germany's average scores are the same - 56.8, yet in 2013 the former scores 60, while the latter - 70. The average score indicates that in both EU countries there is a significant government interference with not fully independent central bank and both the Bulgarian and the German governments control certain share of the financial intermediaries. As illustrated by data, a financial convergence between the two countries is present and it is only natural considering integration within the Eurozone.

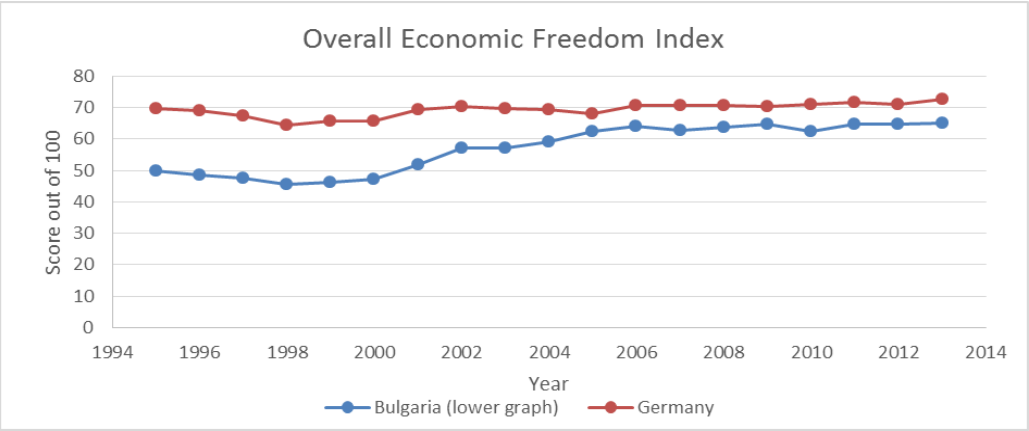
Figure 10.: Financial *Freedom Index* for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

All the categories – *Rule of Law, Limited Government, Regulatory Efficiency* and *Open Markets* - contribute with equal weight to a country's overall economic freedom measure. The above made discussion of the components of the *Freedom Index* Indicators gives significant evidence in favor of placing Bulgaria in the moderately free economies with an Overall score of 65 and 55th place worldwide. While Germany falls into the group of mostly free economies and occupies the 16th position with an Overall score of 72.8.

Figure 11: Overall *Freedom Index* for Bulgaria and Germany (1995-2013)



Source: Heritage Foundation

5. Dynamic correlation analysis

The paper continues with a discussion of whether the listed economic freedom indicators are significant drivers of productivity and prosperity in Bulgaria, as a representative of a transition economy with a lower economic freedom, as well as in Germany, as an instance of a developed and mostly free economy. Growth accounting method provides the means to measure the Solow residual, also referred to as total factor productivity (please, refer to table 1B in Appendix B).

Dynamic Correlation between Bulgaria's TFP and Germany's TFP levels with the Overall Freedom Index *Indicator*

Step one in this empirical part of the paper calculates the correlation coefficient between total factor productivity and the *Overall Economic Freedom Indicator* with 19 observations in the time span of 1995-2013. The time series has been detrended with the use of Hodrick–Prescott time-series filter applied in the statistical package Stata. This approach will put emphasis on the generated correlation in the current period as well as on the most significant correlation with the use of maximum 9 lags (half the number of all observations). The highest correlation coefficient will point out the years needed for a change in the *Freedom Index* Indicator to have its thorough effect on the level of productivity. One would expect that a change, say in *Government Spending Index*, not to have an immediate impact on the current level of

total factor productivity. Reasoning lies on the economic theory that a change in policy is followed by a slow response in economic levels, i.e. there is an adjustment process to the new implementations that could take up to several years. Additionally, if indeed freer societies are more prosperous, then one would rely on a positive and significant correlation between the *Freedom Index*es and following periods of total factor productivity.

Analysis on dynamical cross-correlations of the detrended time series suggests that Bulgaria's contemporaneous correlation between TPF and *The Overall Freedom Index* scores the moderately low value of 0.16, whereas Germany's correlation reaches the moderately high value of 0.38 (please, refer to table 2B in Appendix B). Both correlation coefficients are positive and significant. An essential observation to be made is that the most significant correlation coefficient for Bulgaria is between 4^{th} and 5^{th} lag with values on average of 0.51. While Germany scores the highest in its contemporaneous effect with a diminishing rate in the lag structure.

The output for Bulgaria suggests a unit change in the *Overall Economic Freedom Index* causes approximately 0.51 positive change in the level of productivity given enough adjustment time given (in this case in the range of 4-5 years). This founding could be a signal that the changes in policies associated with the Freedom Indices initially create noise in the Bulgarian system, while the full potential of such a change on productivity levels reveals in the medium term. Hence, there will always be the uncertainty factor that drives societies such as Bulgaria to delay the economic change. As already discussed, this binds up the *Invisible Hand* of the market and impedes Schumpeter's *Creative Destruction* in the short term.

The most significant lag correlations for Germany are between the 1^{st} and 2^{nd} lag with values on average of 0.28, however, contemporaneous correlation remains the highest (equal to 0.38), suggesting that Germany's economy feels the thorough effect of a policy change more rapidly. This result is a proof that the Western nation gives more freedom to the *Creative Destruction* process, thus achieving significant economic success in the short term.

Correlation between the TFP gap of Germany and Bulgaria with the respective gap in their Freedom Index *Indicators*

The following step is to verify whether the gap in the productivity levels of Bulgaria and Germany are again significantly correlated with the

respective gap in their *Freedom Index Indicators*. In such a case, this would be clear evidence in favor of the thesis that the difference in the level of productivity is due to the differences in the levels of freedom of the economy, i.e. that mostly free societies such as the German one owe their prosperity to fast implementation of policies in the economic sector due to guidance by an *Invisible Hand*, while a moderately free society such as the Bulgarian one is lagging behind its target due to a slower response to innovations, resistance to change and thus a deviation from the assumptions that allow the *Invisible Hand* to work.

The gap between the leader of the Euro-zone and the Balkan country is indeed correlated with the gap in their *Freedom Index*es (please, refer to Table 2).

Table 2: Dynamical Correlations between the gap in TFP levels between Germany and Bulgaria and their respective gap in the *Freedom Index Indictors*

Gap correlation (Ge - Bg levels)	**Current Correlation**	**1 Lag**	**Most Significant Lag (MSL)**	**Value of MSL**
A with Overall	**0.294**	0.112	1	0.112
A with PropR	0.050	0.172	4	**0.479**
A with FrCorr	**0.771**	0.642	1	0.642
A with FiscFr	0.066	0.072	5	**0.258**
A with GovtSp	0.242	0.375	2	**0.377**
A with BusFr	**0.374**	0.303	4	0.341
A with MonFr	**0.058**	0.017	1	0.017
A with TradeFr	-0.574	-0.567	7	**0.165**
A with InvFr	-0.368	-0.366	8	**0.626**
A with FinFr	**0.742**	0.593	1	0.593

Source: Own Estimations

The conducted analysis shows that a unit decrease in the *Freedom from Corruption* gap and *Fiscal Freedom* gap would lead to a significant decrease in the productivity gap by 0.77 and 0.74 units, respectively (i.e. a significant and positive correlation). A possible reason behind these coefficients is the fact that Germany scores high on both components and mostly remains constant while Bulgaria is at the bottom of the chart on the first criterion.

What is more, this study has found moderate correlation coefficients between the TFP gap and the gap in *Government Spending* and *Business Freedom*. They have positive moderate contemporaneous correlation with values of 0.24 and 0.37, respectively, strongly confirming the theory that less government intervention in the economy and the easiness of doing business are vital for economic prosperity.

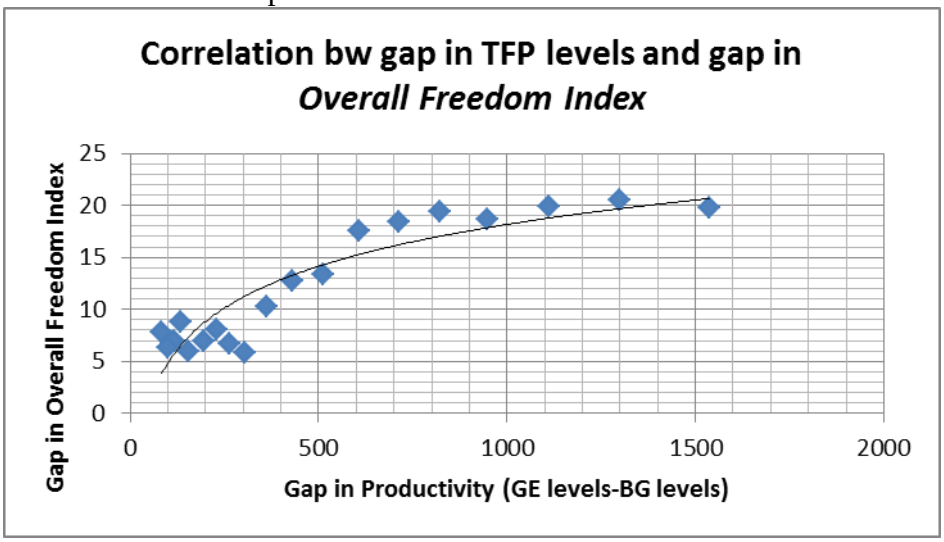
Additionally, the protection of *Property Rights* has a negligible effect on TFP in the current period; nonetheless its significance emerges in the 4^{th} lag with a high value of 0.48. A similar trend emerges with the gap in *Fiscal Freedom* – it has an insignificant contemporaneous correlation of 0.05 and a moderate 0.26 in the 5^{th} lag. These two observations provide evidence in favor of the theory that the economy is sometimes slow when incorporating policy changes. The gap in *Monetary Freedom, i.e.* price stability, seems insignificant for the TFP gap in both current and lagged periods, which is counter-intuitive. However, both countries are under the control of The European Central Bank, implying that both countries follow the same monetary policy. Thus, the conducted analysis shows that the different productivity levels are not caused by the monetary component, in particular for the case of Bulgaria and Germany.

Output indicates that a unit increase in gap of *Trade Freedom* and *Investment Freedom* would lead to a significant decrease in the productivity gap by 0.57 and 0.37 units, respectively (i.e., a significant and negative correlation). A possible reason behind these coefficients is the fact that both states score high on those components, on average for Bulgaria – 60 on *Trade Freedom* and 57 on *Investment Freedom*, while the mean for Germany is 82 on both *Trade* and *Investment Freedom*. Still, there is room for improvement on Bulgaria's score in order to catch up to Germany. There has not been much volatility throughout the observed period (1995-2013), which might be a factor affecting the consistency of the generated results. Still they are counter-intuitive and provide *basis for future research*. Due to limitations in the *Labor Freedom Index* on both

series, no correlation coefficient has been calculated (only 8 observations are present starting from 2005).

On balance, correlation between the gap in TFP and the Overall Economic *Freedom Index* Gap between Germany and Bulgaria is equal to the moderately high score of 0.29 (please, refer to Figure 12). Six out of nine calculated correlations support the thesis that differences in prosperity between countries like Germany and Bulgaria rely heavily on the independence, reliability and effectiveness in their financial and business sphere, government sector, protection of property rights, fiscal and anti-corruption policies. Hence, the pursuit of market participants' own interest guided as if guide by an *Invisible Hand* leads societies to a better performance.

Figure 12: Correlation between the TFP gap between Germany and Bulgaria and their respective gap in Overall *Freedom Index* for the period 1995-2013.



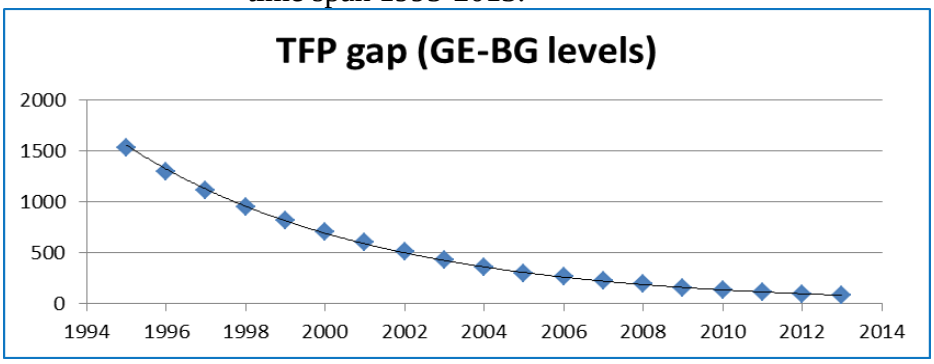
Source: Own Estimations

6. Bulgaria's convergence to Germany

In economic literature convergence is defined as the hypothesis that poor countries grow at a faster rate than rich countries, and eventually catch up with them. The theory speculates that in long term both poor and

wealthy economies converge in terms of income per capita. Nonetheless, convergence as a hypothesis could be also interpreted as adopting best practices, a strong driver behind Total Factor Productivity. Di Liberto and Usai (2013) examine the TFP convergence across the European region.Even though the report of Di Liberto and Usai shows absence of TFP convergence among the EU15 (Bulgaria is not a member) in the time span of 1985-2006, the present study identifies a convex and monotone downtrend in the difference between Germany's and Bulgaria's Total Factor Productivity from 1995 until 2013 (please, refer to Figure 13). The TFP gap was defined as the difference in levels between the Solow residuals of Germany and Bulgaria obtained from the economic equation of growth (please, refer to equation 1 and Appendix A). This founding implies that Bulgaria is slowly but consistently catching up with the TFP levels of the leader of the European Union during the period 1995-2013.

Figure 13.: Gap in Total Factor Productivity levels between Germany and Bulgaria shows a monotone and decreasing trend in the time span 1995-2013.



Source: Own Estimations

The monotone and decreasing relationship between the gap in Bulgaria's and Germany's TPF levels implies that they converge to distinct TFP levels but to the same steady state growth rates of TFP, suggesting an existence of a conditional medium-term convergence. This result is explained by taking saving and population growth as exogenous (Mankiw et al., 1992), and taking into consideration the fact that a developing country, Bulgaria, replicates the production methods, technologies, and institutions of a developed country, Germany.

Furthermore, the significant decline in the period 2004-2013 in the TFP gap depicted in Figure 13 is best motivated by fact that in the mid-

2000s, Bulgaria has started adopting the *EU Chapters that* represent the basis for accession to the European Union. They correspond to various reforms in administrative and institutional infrastructures as well as integration of Bulgaria's national legislation to the legislation of the EU. In 2007 Bulgaria was accepted as a member of the European Union, thus becoming a part of a dynamic business environment, modern and socially friendly economy that thrives for high growth and employment. Economic integration between the *Partner countries* - Bulgaria and Germany, lies at the heart of free trade agreements, cooperation and the unifying structure of sectoral policies across all EU members.

However, the observed 1995-2013 time period is short and could only serve as a signal for a potential initial long term convergence. Further research is needed following these lines once a more substantive and longer data sample is obtained to determine whether indeed a long term convergence pattern is present in the data series.

7. Discussion and policy recommendations

This paper also aims at providing policy recommendations aiming at decreasing the Germany-Bulgaria TFP gap even at a faster rate than the one already observed. Data shows that Bulgaria is lagging behind Germany in its *Property Rights*, *Freedom from Corruption* and *Investment Freedom Index*es the most out of all ten *Freedom Index Indexes*.

Guidelines for the Rule of Law component

Two of the above mentioned Indexes are included in the Rule of Law, implying that Bulgaria is predominantly lagging behind its target country in this component. No degree of substantive law improvement would bring the Rule of Law to Bulgaria without an agile enforcement, and a sound judiciary is the core to enforcement (Dam, 2006). Each society needs institutions to resolve disputes and state structures to enforce property rights and contracts. If such mechanisms are not implemented then transactions are limited to simple trades, bearing high risk, while productive investments are constrained.

Data provided in this paper implies that during 1995-2013 the greatest *Freedom Index* gap between Bulgaria and Germany is *Property Rights*. On this *Freedom Index* Germany has been steady at a high grade of 90 out 100, whereas it has been deteriorating in Bulgaria, increasing

the gap even further in recent years. The Balkan country must consider placing this component in its list of top priorities that should undergo improvement. Roumeen Islam, a scholar at the World Bank (WB), discusses in her 2003-paper "Institutional Reform and the Judiciary: Which Way Forward" that when judicial systems are strong, countries tend to have larger companies operating. Another observation made in the WB paper is that some states in Brazil with better judicial system tend to have more developed credit markets. Naturally, creditors avoid taking credit when unable to enforce repayment for their services. In Bulgaria the court system is ill-functioning, and hence companies are forced to be involved in a "relationship business", meaning that they are obliged to contract with those they have already established firm business relations. As already discussed, prosperous economies allow Schumpeter's *Creative Destruction* process to take place, *i.e.* innovation, entrepreneurship and competition guide the market place. However, the political and economic environment in Bulgaria is constraining companies from undertaking potentially profitable opportunities. Furthermore, these limitations restrain the extent to which businesses are able to protect themselves from no longer profitable business relations. To conclude, the independence of the judiciary and the ability of individuals and business to enforce contacts is vital for achieving business integrity and hence an economic dynamism.

It is essential to emphasize that public and private institutions influence the incentives and performance of agents in the judicial system (Islam, 2003). On the one hand, private institutions, as a part of an accountability mechanism, affect the reputation of judges and lawyers; hence their performance as well. On the other hand, the State has the authority to sets rules for judges' promotion for efficient performance and penalties for underperformance. When applied swiftly, these can determine how court cases are conducted - access to them, their duration, meaning how long they stay in court and fairness associated with them.

Additionally, external agencies, domestic or international non-governmental organizations, media journalists, or policy institutes overseeing the judiciary also affect its performance in two broad directions. Firstly, they monitor and gather information on court processes and their outcomes, and secondly they circulate the information, making it publicly available. The poor performance of the judiciary and the disregard of property rights suggest that such a feedback mechanism is ill-functioning in Bulgaria in the recent years. And public awareness needs to

be addressed along these lines. Hence, a priority for Bulgaria's prosperity is to implement changes in the current judicial system. Designing a judicial reform, however, is complicated due to the small amount of information and research made on developing economies. Interestingly, the "best practices" for a specific country are not always to follow the international laws (*i.e.*, for Bulgaria to follow Germany's Anti-Corruption policies), but rather to follow similar practices regarding institutions in neighboring countries (Islam, 2003). And since the gap in the *Freedom from Corruption Index* is the next issue to be analyzed, Bulgaria's Northern neighbor – Romania, emerges as a bright example for Anti-Corruption policies and enforcement.

To begin with, Romania's GDP growth is 3.8 (%, year-on-year), being the economy with 5th largest growth rate in Europe as of October 2015. Furthermore, the European Commission 2016 Forecast Report on GDP growth for Romania is 3.3 (%, year-on-year), whereas Bulgaria's is 1.3 (%, year-on-year). These estimations comprise a significant 2 (%, year-on-year) difference between the two neighboring countries which have entered the European Union concurrently in 2007. These data imply that Bulgaria is lagging behind a similar to its recent history post-communist country, and an underlying reason is the strength of the judiciary and the Anti-Corruption policies in place. For the last four years, Romania's Supreme Court has: sentenced the former Prime Minister, Adrian Nastase, to two years of prison for involvement of a corruption scandal; arrested the Bucharest's mayor for allegations of taking bribes; and, charged the former Prime Minister Victor Ponta with accusations for fraud. These anti-corruption practices have a strong and positive effect on Romania's economy, furthermore, they earn praise from Romania's Economic Partners for its efforts to combat corruption. From an economics point of view, unless Bulgaria follows similar to Romania's solid Anti-Corruption practices, it would be exposed to insecure economic transactions that would continue to hamper economic dynamism.

Guidelines for the Investment Freedom component

The large gap in *Investment Freedom* between Germany and Bulgaria is the third and last component that the study will analyze. Moreover, it will provide Bulgaria with recommendations for improvement on this issue. As already defined, *Investment Freedom* measures the constraints associated with the flow of investment capital

internally and across borders. Bulgaria has performed poorly on this criterion, with a decrease in its score from 70 in 1995, reaching 50 in 2011 and finally stabilizing to 65 in 2015 (please, refer to figure 9 in Section 3).

What might be the reasons behind these fluctuations in the Bulgarian Index? The precise method of computing this particular Index is by subtracting points from the ideal score, meaning 100. A negative influence is measured by several factors such as the existence of national treatment of foreign investments, burdensome bureaucracy, restrictions on land ownership or sector investment, capital and foreign exchange controls.

Bulgaria is a party to 63 bilateral agreements for mutual protection and stimulation of foreign investment. In addition to them, Bulgaria has signed the Encouragement of Investment Act (EIA) which provides for equal treatment of local and foreign investors in the Balkan country (KPMG, 2015). This Act regulates the encouragement of initial investments in both tangible and intangible long term assets, as well as the creation of new job opportunities, in compliance with regulations by the European Union. The EIA gives various stimulus privileges for both local and international investors who undertake large investment projects within the territory of Bulgaria. These measures are financed by the government and their goal is to improve the business environment.

One would bring up the question why is then Bulgaria lagging behind in *Investment Freedom* if the country is involved in Acts and bilateral agreements whose function is to safeguard the free flow of investment capital. The due diligence with which these contracts are implemented might be the underlying reason for the bad performance of Bulgaria in *Investment Freedom*. Recent government decisions caused damage, either indirectly or directly, on the Index.

Firstly, Bulgaria's poor performance might be due to the burdensome bureaucracy that both foreign and local investors are confronted to. According to the *Doing Business* Report by the World Bank (2016), in order to start a business in Bulgaria, you need to go through at least 4 procedures and 18 working days, whereas for obtaining a construction permit the number of procedures increases to 16 and the number of days jumps to 110. This delay increases immensely investment costs, causing return on investment to drop and hence Total Factor Productivity rises with lingering rates.

Secondly, in 2014 the Bulgarian National Assembly approved a five-year residency requirement for the purchase of agricultural land by non-EU foreign investors, which certainly had a negative effect on the *Investment Freedom* score. A Parliament amendment of the law in 2012 (stating that a strategic infrastructure project could receive a preferential expropriation regime) damaged private property laws, and decreased even further the investment incentives of foreigners. In 2013 after a Constitutional Court decision on a land owner plaintiff, the State limited the prior preferential treatment strategy for key infrastructure projects. Currently, three major motorways are under construction with forecasts to be completed in 2020 – Struma (part of Pan-European Corridor IV), Hemus (connecting the capital city with Varna), and Black Sea (connecting numerous coastal cities). Such infrastructure projects will certainly improve the efficiency with which goods, services and people are transported. Nevertheless, in order to improve investment incentives in Bulgaria, the expropriation of these lands needs to be done in a prudent manner with fair compensation of the private property owners.

Last but not least, as already largely discussed in the beginning of this section, corruption is a vicious disease that infects various sectors of the economy. Due to weak judiciary performing poor enforcement of the law and the lack of concrete Anti-Corruption practices, corruption might be present in staring up a business, obtaining a license, negotiating private property owners' compensation or simply in the execution of EU funded projects. From an economics perspective, corruption could be regarded as an additional tax burden on capital and investment as a whole. Consequently, investment incentives are decreased leading to a sluggish economy.

We also admit to some limitations of current research: for example, the analysis is only based on a correlation analysis, which does not necessary prove the impact of labour market mechanisms on productivity. In addition, growth models are also including other factors as well, like human capital; the capacity of the HF Freedom Index to revel the market freedom might also have some shortcomings.

8. Summary and Conclusions.

This paper transforms Adam Smith's theory about an invisible force that drives free societies to prosperity into an updated modern understanding of the drivers of economic success. If vital conditions are

present such as low degree of government intervention, lack of informational asymmetries, uniformity of market participants and efficient Rule of Law, then the *Invisible Hand* of the market makes limited resources meet their best ends, hence promoting economic excellence. Nevertheless, free markets and mixed market economies often suffer from the listed above economic features which hamper economic dynamism. Two of the main debunkers of the *Invisible Hand* theory, Joseph Stiglitz and George Akerlof, suggest that information asymmetries, in particular, cause *inefficient allocation* of the labor force and give rise to *transaction costs*. Yet societies that are exposed to both of these factors have learnt how to mitigate their adverse impact on the markets. Namely, they let Schumpeter's *Creative Destruction* process take over the market (it accounts for the industrial change of revolutionizing the economic structure by destroying the old and creating a new one). Or equivalently, the government should help improve an economic downturn not by a direct intervention that creates insecurity and confusion, but indirectly by providing a legal and political framework that supports private sector activities and competition. A useful way to assess the state provided legal and political framework is the *Economic Freedom Index*, which is divided into four extensive types: *Rule of Law* (Property Rights and Freedom from Corruption), *Limited Government* (Fiscal Freedom and Government Spending), *Regulatory Efficiency* (Business, Monetary, Labor Freedom), and *Open Markets* (Trade, Investment, Financial Freedom).

Correlation analysis between Total Factor Productivity (as a measure of economic well-being) and the *Freedom Index Indicators* of Germany and Bulgaria is conducted for the period 1995-2013. With small exceptions, all correlations seem to be moderate and positive. For instance, Bulgaria's contemporaneous correlation between TFP and the *Overall Economic Freedom Index* is a moderate value of 0.16, with highest significance of 0.52 in the 4^{th} lag. In contrast, Germany's correlation between the same factors has a more significant value of 0.38, followed by a diminishing correlation in the lag structure. Hence, one might conclude that a transition economy such as the Bulgarian one responds fully to policy changes within the following 4 years, whereas a mostly free economy, such as the German, incorporates policies rapidly. Moreover, the gap in the productivity levels of both countries is also moderately correlated with the gap in their *Overall Freedom Indices* with a satisfactory value of 0.29. Thus, the output provides evidence in favor

of the thesis that the difference in the level of productivity is due to the differences in the levels of freedom of the economy, *i.e.* Germany owes its prosperity to rapid implementation of policies reliant on the principles of economic freedom, while Bulgaria is lagging behind its target country due to a slower response to innovations and a lower reliance on freedom in the economy.

Another essential founding of this paper is the monotone and diminishing relationship between Germany and Bulgaria's TFP levels in the time span 1995-2013, suggesting the existence of a "catching up effect". To extend Bulgaria's medium-term convergence towards Germany's TFP levels to long term, The Balkan country needs to implement essential policy improvements in its investment incentives and Rule of Law.

To conclude, the comparative study between Germany and Bulgaria is a vivid proof that the *Invisible Hand* of the Market is relevant even today. Almost 240 years after Adam Smith first considered that societies, not hampered by excessive regulation, tend to perform better, the *Invisible Hand* of the Market still guides them to prosperity.

Appendix A

Growth Accounting Approach (as derived in "Measuring Total Factor Productivity: Growth Accounting for Bulgaria" by Ganev in 2005)

To measure Y_t we use the gross domestic product in constant prices, and for L_t – labor force 16-65 years, obtained from World Development Indicators (WDI) Database for both Bulgaria and Germany. However, data on the variable K_t is not published and it can be obtained by the Permanent Inventory Method. There is a recursive relation between the individual components of the capital time series.

$$K_t = I_t + (1 - \delta).K_{t-1}\,, \quad (1)$$

In the above equation, I_t represents total investment and δ is the depreciation rate. The total investment variable in PPP USD is extracted from International Monetary Fund (IMF) Database. Furthermore, the calculation of equation (1) is a bit challenging due to the unknown level of the initial capital.

The method used for calculation of the initial capital is dependent on the depreciation rate of capital. In this case, the δ equals 0.05 for Bulgaria (Ganev 2005) and 0.082 for Germany (Vasilev 2015a). The first

coefficient can be interpreted as the fact that full depreciation of capital occurs in 20 years in Bulgaria, whereas in Germany it takes only 12 years.

Initial capital is calculated by the formula (2) by setting the initial capital equal to the ratio of initial investment and the depreciation rate:

$$K_0 = \frac{I_0}{\delta}, \qquad (2)$$

The conducted analysis is heavily dependent on the delta that we are using for the generation of initial capital. Nevertheless, this effect decreases significantly in time. The further back in time the initial capital is, the smaller the influence that its levels has on the obtained results. The already mentioned Permanent Inventory Method represents a recursive substitution back in time. For instance, the formula for the period (t-1) is:

$$K_{t-1} = I_{t-1} + (1-\delta).K_{t-2}, \qquad (3)$$

Equation (3) can be substituted back into equation (1) and the result looks like:

$$K_t = \sum_{i=0}^{n-1}(1-\delta)^i.I_{t-i} + (1-\delta)^n.K_{t-n}, \qquad (4)$$

This relation could be continually applied to an arbitrary moment in time. This is the so-called method of geometric decline in capital. However, this method does not best meet our assumptions about the nature of capital. We need capital to have finite life and to amortize for a finite amount of time. Yet, calculation based on formula (4) with $n \to \infty$ would never converge to zero, assuming capital has infinite life. On those grounds, a modified version of formula (4) to calculate the capital series is used:

$$K_t = \sum_{i=0}^{n-1}(1-i.\delta).I_{t-i} + (1-n.\delta).K_{t-n}, \qquad (5)$$

In this paper, the preferred model for capital generation is the linear method. It assumes a uniform decline of the initial capital. Moreover, the advantage of this model is that a unit of capital is fully amortized for $1/\delta$ number of periods. The generated results for Bulgaria and Germany in the period 1995-2013 are as follows:

	Bulgaria's capital	**Germany's capital**
1995	124 128 525 081	12 903 321 577 517
1996	233 973 187 489	23 575 508 596 145
1997	443 807 139 456	43 020 309 248 486
1998	842 627 989 823	78 397 963 631 779
1999	1 596 546 134 740	142 713 467 095 092
2000	3 024 826 246 510	259 659 016 317 899
2001	5 730 531 843 410	472 191 773 790 463
2002	10 854 805 713 447	858 504 353 064 718

2003	20 561 198 267 706	1 560 788 845 488 420
2004	38 946 045 326 271	2 837 373 441 641 450
2005	73 769 377 427 557	5 157 882 837 242 330
2006	139 727 783 773 461	9 376 008 146 181 050
2007	264 657 454 305 092	17 043 428 339 475 400
2008	501 284 615 611 210	30 980 669 315 124 100
2009	949 469 463 121 593	56 314 609 454 191 600
2010	1 798 367 010 318 220	102 364 870 955 834 000
2011	3 406 245 472 025 810	186 071 465 937 432 000
2012	6 451 690 619 530 030	338 226 697 939 466 000
2013	12 219 996 036 381 000	614 802 609 946 305 000

Appendix B

Table 1B

Year	Bulgaria's total factor productivity (in levels)	Germany's total factor productivity (in levels)
1995	66.7425	1603.2074
1996	52.1928	1351.4600
1997	39.6224	1150.6945
1998	31.4715	980.8526
1999	22.8329	843.0880
2000	18.6347	730.4991
2001	14.5188	622.5835
2002	11.6891	523.6953
2003	9.4624	438.7196
2004	7.6019	370.2106
2005	6.1861	310.7001
2006	4.9052	269.3596
2007	3.9652	232.8945
2008	3.1533	197.6323
2009	2.3050	156.7001

2010	1.7901	137.1397
2011	1.4045	118.4588
2012	1.0717	101.2197
2013	0.8253	84.8819

Source: Authors' computation

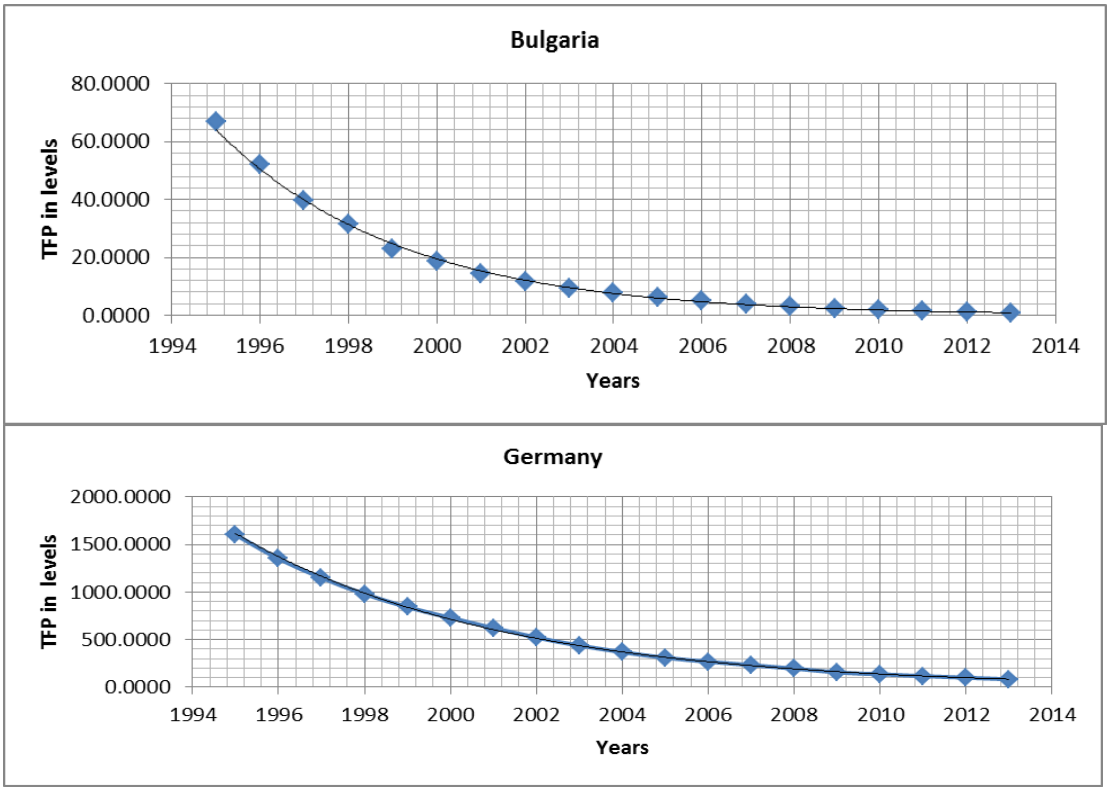


Table 2B

Correlation between Overall *Freedom Index* and TFP levels		
Time period	**Bulgaria**	**Germany**
Current	0.160	**0.378**
First Lag	0.288	0.286
Second Lag	0.388	0.281
Third Lag	0.421	0.203

Fourth Lag	**0.518**	0.190
Fifth Lag	0.502	0.199
Sixth Lag	0.467	0.143
Seventh Lag	0.436	0.026
Eight Lag	0.276	-0.128

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