

# Sustainability and Regime Type: Do Democracies Perform Better in Promoting Sustainable Development than Autocracies?

by Stefan Wurster

*In the wake of the major international environmental conferences, a multidimensional model of "sustainable development" has been developed. This framework encompasses the economic, social and ecological aspects of long-term responsibility. To meet the challenges of these aspects of sustainable development, all countries need to take action in areas such as the protection of natural resources, the preservation of social cohesion, the promotion of knowledge and innovation, and the reduction of public debt. This raises the question whether the "Churchill hypothesis" on the relative superiority of democratic regimes, in comparison to autocracies, can be confirmed in view of their sustainability performance. Based on theoretical considerations, this issue is examined by means of a quantitative analysis encompassing more than 140 countries.*

*Im Zuge der großen, internationalen Umweltkonferenzen hat sich ein mehrere Dimensionen umfassendes Leitbild „Nachhaltige Entwicklung“ etabliert, das ökonomische, soziale und ökologische Aspekte langfristiger Zukunftsverantwortung beinhaltet. Alle Gesellschaften und Staaten sind vor diesem Hintergrund aufgerufen, sich zentralen Zukunftsherausforderungen wie dem Schutz der natürlichen Lebensgrundlagen, der Bewahrung sozialer Kohäsion, der Förderung von Wissen und Innovation oder dem Problem der Haushaltskonsolidierung zu stellen. Dabei stellt sich die Frage, ob die „Churchill Hypothese“, welche von einer relativen Überlegenheit demokratischer gegenüber autokratischer Regierungsformen ausgeht, auch im Hinblick auf deren Nachhaltigkeitsperformanz aufrecht erhalten werden kann. Ausgehend von theoretischen Überlegungen, wird dieser Frage im Rahmen einer empirisch-quantitativen, mehr als 140 Staaten umfassenden Analyse nachgegangen.*

## I. Introduction

In the context of the major international environmental conferences, participants have formulated a number of general principles of sustainable development, consisting of several dimensions that embrace economic, social and ecological aspects of long-term future responsibility. All societies and countries are urged to face these key challenges, including, for example, the protection of natural resources, the preservation of social cohesion under conditions of social change,

the promotion of knowledge and innovation, and the problem of fiscal consolidation. The interests of future generations should constitute an integral part of today's policy-making via the production of "political future goods".<sup>1</sup>

According to the "Churchill hypothesis", which describes democracy as the best regime type in relation to all other available choices,<sup>2</sup> a large part of the research literature assumes that democracies can claim a higher sustainability performance in comparison to non-democratic regimes.<sup>3</sup> This assumption is based on the results of numerous studies demonstrating the strengths of democracy in its "very own core areas of expertise": input legitimation (by free and fair elections), guaranteed participation, and the consideration of preferences of today's (voting) citizens.<sup>4</sup>

However, it is debatable to what extent these conclusions are empirically valid. Looking at the policy performance of countries with non-democratic regime types and the degrees of democratisation in the areas of sustainable development mentioned above, one might gain the impression of a "future failure" in many established democracies,<sup>5</sup> while one can also observe remarkable (at least area-specific) successes of various autocratic regimes. Furthermore, it is rarely possible, even for the economically prosperous democracies of the OECD world, to meet the needs of ecologically sustainable development.<sup>6</sup> In view of social and economic challenges, some of these established democracies also show larger

- 1 *Roller, E.*: Leistungsprofile von Demokratien. Eine theoretische und empirische Analyse für westliche Demokratien. 1974-1995, in: Fuchs, D./Roller, E./Wessels, B. (eds.), *Bürger und Demokratie in Ost und West: Studien zur politischen Kultur und zum politischen Prozess*. Festschrift für Hans-Dieter Klingemann, Wiesbaden, 2002, 547-571, p. 550ff.; *Höffe, O.*: *Ist die Demokratie zukunftsfähig? Über moderne Politik*, München, 2009.
- 2 In 1947, *Winston Churchill* described democracy as follows: "No one pretends that democracy is perfect or all wise. Indeed, it has been said that democracy is the worst form of Government except all those other forms that have been tried from time to time.", cf. *Churchill, W.S.*: *Winston S. Churchill: His Complete Speeches, 1897-1963*, Vol. VII 1943-1949, New York/London, 1974, p. 7566.
- 3 *Schmidt, M.G.*: Zur Zukunftsfähigkeit der Demokratie - Befunde des internationalen Vergleichs, in: Kaiser, A./Leibold, W. (eds.), *Demokratie – Chancen und Herausforderungen im 21. Jahrhundert*, Münster, 2005, 70-90; *Halperin, M./Teorell, J./Siegle, J./Weinstein, M.*: *The Democracy Advantage. How Democracy promotes Prosperity and Peace*, London, 2008.
- 4 *Schmidt, M.G.*: *Demokratiethorien. Eine Einführung*, Opladen, 2010, p. 474f.
- 5 *Theisen, H.*: Die Zukunft als Demokratieproblem. Demokratien zwischen Kurzfristigkeit und Nachhaltigkeit, in: *Mut: Einigkeit und Recht und Freiheit*, Forum für Kultur, Politik und Geschichte, No. 390, 2000a, 6-17.
- 6 *Niessen, F.*: *Nachhaltigkeit, Kapitalismus und Demokratie. Über die politischen und ökonomischen Realisierungsbedingungen einer nachhaltigen Entwicklung*, Hamburg, 2007.

problems than one would assume.<sup>7</sup> In contrast, at least some autocracies seem to have fulfilled their commitments in regard to these challenges in similar or even better ways. However, no systematic-empirical examination of these interrelations has yet been presented.

This gap in research and knowledge is even more astonishing if we consider that doubts about the superiority of democracy have been well-documented in political theory. Thus, based on a debate on the “negligence of the future in democracies”<sup>8</sup> that reaches back at least as far as *Tocqueville*,<sup>9</sup> the question arises whether democracies are not, after all, ridden with particular difficulties integrating the interests of future generations in their political decision processes. This could be due to a democratic system’s core premise of following the preferences and interests of those citizens who are alive *today* rather than at some future date.

In the following, based on the existing empirical research gap, we shall compare not only the current “sustainability performance” of democracies and autocracies in relevant policy areas, but also the specific “sustainability effect” of the several regime types in question. Thereby, the influence of the regime type on the sustainability rating is evaluated in comparison to the effect of other explanatory variables.<sup>10</sup> This analysis of the links between the discourses on the advantages of democracy and the questions of sustainable development is guided by the following questions:

- Which results do today’s democracies and autocracies achieve in regard to their sustainability ratings? Can systematic patterns of performance be detected in regard to regime subtypes?
- Are these factors, if any, significant or are other variables more salient in explaining sustainability performance?

Before the effect of the degree of “democratisation” or “autocratisation” on the sustainability performance ratings can be determined by regression analyses, the target dimensions of sustainable development need to be discussed and opera-

7 In particular, cf. the literature on the problems of democracy in *Brodcz, A./Llanque, M./Schaal, G.S.* (eds.): *Bedrohungen der Demokratie*, Wiesbaden, 2008; *Schmidt, M.G.*, *Demokratietheorien*, op. cit.

8 *Theisen, H.*: *Zukunftspolitik. Langfristiges Handeln in der Demokratie*, München, 2000b; *Kielmannsegg, P.*: Können Demokratien zukunftsverantwortlich handeln?, in: *Merkur – Deutsche Zeitschrift für europäisches Denken* 57/7 (2003), 583-594.

9 *Tocqueville, A. de.*: *De la démocratie en Amérique*, Paris, 1951.

10 In total, 140 countries were included in the analysis. Their sustainability performance was measured for the year 2006. Beside the micro-states (under 2 million inhabitants), all countries were included. For validating the collected data, results of a cross-section analysis of the year 2006 were also compared to the results of the year 1996 in order to strengthen the analysis.

tionalised (II). This is followed by several hypotheses on the expected regime effects and the introduction of several control variables (III), leading to a presentation of the empirical findings (IV). These results are then subject to a systematic evaluation (V), leading to a short conclusion (VI).

## II. Theoretical foundations

### 1. Sustainable development

Within the normatively charged debate on aspects of responsibility towards future generations,<sup>11</sup> of inter-generational justice, and of preparations for future contingencies,<sup>12</sup> a vast body of literature has been produced.<sup>13</sup>

As early as 1987, the *Brundtland* Commission defined sustainable development as follows: “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”<sup>14</sup> Since the Rio Summit of 1992, sustainable development no longer merely refers to the long-term protection of the environment and its natural resources, but also, in the sense of a “magic sustainability triangle”, to the realisation of social and economic goals. Concerning both intra- and intergenerational justice, it constitutes a call for an expansion of political responsibility beyond those who are currently alive to also include future generations.<sup>15</sup>

The debate on the theoretical concept of sustainable development is extremely controversial.<sup>16</sup> Provided that sustainable development can be guaranteed by an optimal adaptation to the most important challenges, it appears logical that the identification of these challenges is central to a more detailed operationalisation

11 Jonas, H.: *Das Prinzip Verantwortung. Versuch einer Ethik für die technologische Zivilisation*, Frankfurt/Main, 1979; Birnbacher, D.: *Läßt sich die Diskontierung der Zukunft rechtfertigen?*, in: Birnbacher, D./Brudermüller, G. (eds.), *Zukunftsverantwortung und Generationensolidarität*, Würzburg, 2001, 117-136.

12 Wurster, S.: *Zukunftsvorsorge in Deutschland. Eine vergleichende Untersuchung der Bildungs-, Forschungs-, Umwelt- und Energiepolitik*, Baden-Baden, 2010.

13 von Hauff, M./Kleine, A.: *Nachhaltige Entwicklung Grundlagen und Umsetzung*, München, 2009.

14 Hauff, V. (ed.): *Unsere gemeinsame Zukunft. Der Brundtland-Bericht der OCED*, Greven, 1987.

15 Grunwald, A./Kopfmüller, J.: *Nachhaltigkeit*, Frankfurt/Main, 2006, p. 27.

16 On the controversy about strong and weak, substantial and procedural sustainability as well as the one- and more-column concepts, cf. Grunwald, A./Kopfmüller, J., op. cit., p. 37ff.

of any concrete objectives. The evaluation of several Delphi surveys<sup>17</sup> permits us to conclude that the following key trends can be seen as “global challenges”:

- Increasing globalization and intensified international competition,
- processes of transformation from industrial to information societies,
- excessive burdens on public budgets due to the enlargement of state responsibilities,
- threats to natural resources by increased environmental pollution, and
- growing scarcity of natural resources by an increasing consumption.

In the early 21<sup>st</sup> century, sustainable policies are characterised by the fact that states attempt to react to these future challenges. The importance attached to solving these challenges can be illustrated by pointing at a number of international agreements over the past few decades. In the context of the follow-up to the Rio Summit, not only were the general principles of a sustainable development established, but also there was an attempt to react to several ecological challenges by means of climate, biodiversity and forest conventions.<sup>18</sup> Highest priority was given to securing elementary levels of education as well as to the diminution of starvation and malnutrition, improved healthcare and increased life expectancies by means of the UN Millennium Goals.<sup>19</sup> Finally, apart from these objectives, numerous national sustainability strategies<sup>20</sup> refer to the importance of long-term budget consolidation and the promotion of scientific innovation and competitiveness as a reaction to globalisation and the transformation from the industrial to the information age.

If one were to compile a list of pivotal sustainability goals, it is justified, with regard to the economic dimension, to consider not only budget consolidation, but also a continuous stream of investment in public infrastructure and in innovative and competitive capacities (research and development promotion) as key objectives. In the context of social sustainability, the degree of equality of opportunity and participation for future generations plays a role, measured by the human

17 *Kreibich, R.*: Generationengerechtigkeit im Zeitalter globaler Umweltkrisen, in: Stiftung für die Rechte zukünftiger Generationen, Handbuch Generationengerechtigkeit, München, 2003, 221-240; *Henry-Huthmacher, C./Wilamowitz-Moellendorf, U.v.*: Deutschland im Umbruch. Delphi-Studie 2004/2005. Befragung ausgewählter Expertinnen und Experten über die Zukunft Deutschlands, St. Augustin, 2005.

18 *Von Hauff, M./Kleine, A.*, op. cit., p. 8.

19 *Grunwald, A./Kopfmüller, J.*, op. cit., p. 25.

20 *Bundesregierung*: Perspektiven für Deutschland, Unsere Strategie für eine nachhaltige Entwicklung, 2002.

capital levels within a society in the context of the education systems provided. Furthermore, the life expectancy of children born today should be increased by appropriate measures of health protection. Finally, based on the ecological dimension of sustainability, climate and environmental protection and a reduction of resource consumption should be promoted.

In order to be able to measure the performance in these nine areas for all countries, one indicator was chosen for each objective and evaluated based on data from the year 2006 (Table 1).<sup>21</sup>

Within the economic, social and ecological dimensions, the three performance indicators corresponding to one dimension were summarised in an aggregated index in order to be able to offer an overview for each sustainability dimension. To achieve this, the different base values of the single indicators were first z-transformed and thus standardised, and then aggregated in the respective index after corrections for direction and equal weighting.

Table 1: Goal indicators of sustainable development

Sustainable development objective	Performance indicator (2006)
Financial consolidation	National debt as percentage of the GDP
Quality of infrastructure	Safe internet servers per one million people
Research performance	Scientific articles per head
Elementary education	Graduations from primary school as a percentage of the relevant age group
Further education	Quota of tertiary education
Life expectancy	Life expectancy of newborn
Climate protection	CO <sub>2</sub> -emissions in metric tons per head
Environment protection	Share of renewable energies in energy consumption
Preservation of resources	GDP per energy unit consumed

Source: *The World Bank: The World at a Glance*, 2011, <http://data.worldbank.org/>.

## 2. Regime type

Before considering the connection between sustainability and regime type, the independent variable (regime type) needs to be defined. One can think of a continuum of possible characteristics, with an ideal (stable) democracy at one end

21 In context of the aforementioned variables, cf. the very similar sustainability indicators of *Grundwald, A./Kopfmüller, J.*, op. cit., p. 65 ff. It shall be measured to what extent the countries are able to provide important future goods for a sustainable development of their societies. While foregoing data based on uncertain forecasts, a reliable basis of evaluation shall be established by a measurement of actual performance.

and a perfect autocratic (totalitarian) regime at the other.<sup>22</sup> However, which are constituent characteristics permitting any clear distinction between the two regime types? On the basis of which central aspects can democracies be distinguished from autocracies?

In contrast to a very broad definition of democracy as expressed by the “Gettysburg formula” (“Government of the people, by the people, and for the people”) or in the concept of “embedded democracy”, considering political and civil freedom as well as equality and control as constitutive characteristics of a democracy,<sup>23</sup> a very lean concept shall be used to distinguish between regimes. Based on *Dahl’s* definition of democracy (public contestation and the right to participate), the existence of “contested elections” will be used as the central criterion for the distinction between democracy and autocracy. In order to classify a regime as democratic, both the executive and legislative branches have to be legitimised by means of relatively fair elections (meaning that the opposition must have a real chance to win). Three conditions thus need to be fulfilled:

- “1.) *Ex ante* uncertainty: the outcome of the election is not known before it takes place.
- 2.) *Ex post* irreversibility: the winner of the electoral contest actually takes office.
- 3.) Repeatability: elections that meet the first two criteria occur at regular and known intervals.”<sup>24</sup>

Only if these conditions are fulfilled, one can speak of a democracy, whereas in all other cases, we assume to be dealing with autocracies. The advantage of this narrow definition, ignoring aspects such as the separation of powers or civil rights, is based on the fact that it examines central institutional and procedural regime characteristics, but does not include the policy dimension.<sup>25</sup> Based on this definition, it is possible to design a “lean indicator” appropriate for the analysis carried out in the following.

Meanwhile, there exists a multitude of surveys that can be referred to in order to obtain precise measurements of regime types. The current “Democracy and Dic-

22 *Merkel, W.*: Systemtransformation. Eine Einführung in die Theorie und Empirie der Transformationsforschung, Wiesbaden, 2010, p. 25.

23 *Croissant, A.*: Analyse defekter Demokratien, in: Schrenk, K.H./Soldner, M. (eds.), Analyse demokratischer Regierungssysteme, Festschrift für Wolfgang Ismayr zum 65. Geburtstag, Wiesbaden, 2010, 93-114, p. 95.

24 *Cheibub, J.A./Gandhi, J./Vreeland, J.R.*: Democracy and dictatorship revisited, in: *Public Choice* 143, 2009a, 67-101, p. 69.

25 Beyond this advantage, a precise distinction between the regime type (democracy/autocracy) and the question whether a country is a constitutional state (grant of civil rights) is possible.

tatorship” dataset by *Cheibub, Gandhi and Vreeland*<sup>26</sup> has been chosen for this analysis because it is not only based on the aforementioned criteria differentiating between the regime types<sup>27</sup> and offers a comprehensive data set in a longitudinal and cross-sectional comparison, but is also characterised by a high degree of construct and content validity and allows a further distinction by regime subtypes. Below the dichotomous distinction between democracy and autocracy, parliamentary, semi-presidential, and presidential subtypes can be distinguished within the democratic spectrum.<sup>28</sup> Furthermore, the autocracies can also be further subdivided into civil dictatorships, military dictatorships and monarchies.<sup>29</sup>

### III. Hypotheses

Before proceeding to the empirical analysis, it is necessary, on a theoretical level, to reflect on the relationship between sustainability and regime type. To this end, basic approaches of system, institutional and actor theories are employed.

With the help of political system theory,<sup>30</sup> several aspects relevant to the policy effect of the regime type can be stressed. It can be argued that an autocracy, which must usually enforce its policy decisions by some form of repression, is handicapped in two ways in comparison to a democracy, which has a far higher degree of input legitimacy (expanded participation rights): on the one hand, an autocracy can accelerate the realisation of policy goals regarded as central by means of repressive measures (high capacity to act). On the other hand, such a performance optimisation strategy, which is usually, if ever, only possible for a

26 *Cheibub, J.A./Gandhi, J./Vreeland, J.R.*: Democracy and dictatorship revisited Codebook, 2009b.

27 According to this, a regime can be seen as a democracy if all of the following conditions are fulfilled: “1. The chief executive must be chosen by popular election or by a body that was itself popularly elected. 2. The legislature must be popularly elected. 3. There must be more than one party competing in the elections. 4. An alternation in power under electoral rules identical to the ones that brought the incumbent to office must have taken place.”, cf. *Cheibub, J.A./Gandhi, J./Vreeland, J.R.*, Democracy and dictatorship, op. cit., p. 69.

28 A distinction is possible by answering the two successive questions: “1. Is the government responsible to the assembly? 2. Is there a head of state popularly elected for a fixed term in office?”, cf. *Cheibub, J.A./Gandhi, J./Vreeland, J.R.*, Democracy and dictatorship, op. cit., p. 81.

29 A precise differentiation of the cases in the dataset is possible by answering the following questions: “1. Who is the effective head of government? 2. Does the head of government bear the title of “king” and have a hereditary successor and/or predecessor? 3. Is the head of government a current or past member of the armed forces? 4. Is the head neither monarchic nor military?”, cf. *Cheibub, J.A./Gandhi, J./Vreeland, J.R.*, Democracy and dictatorship, op. cit., p. 87.

30 *Easton, D.*: A Systems Analysis of Political Life, New York, 1965.

few political objectives (mostly in the economic area), leads to a situation that functional differentiation, which is important for an overall system development, is impaired. Repression and excessive political influence can overlap with functional logics (subsystem codes) of other subsystems (economy, society, culture). This can lead to significant frictions and an inefficient policy development. Such a problem is even aggravated by the dictator's dilemma as proposed by *Wintrobe*:<sup>31</sup> many autocracies depend on the massive use of repressive measures due to their low degree of input legitimisation,<sup>32</sup> leading to a distorted perception of reality by the political leadership over time, as the government is no longer supplied with reliable information by its subjects (insufficient political feedback loop). In the phase of policy implementation (at the very latest), this fact leads to systematically suboptimal results.

In the end, however, it can be stated from a system-theoretical perspective that, apart from the characteristic of the regime type, the sustainability performance of a country is influenced by the system environment<sup>33</sup> and here especially by general economic conditions.<sup>34</sup> Therefore, considering the stage of economic development and the resource base of a country as potential explanatory variables seems useful in the subsequent analysis.

Approaching the potential relationship between regime type and sustainability from the perspective of institution theory, aspects of rule transition, control and enforcement should be considered. Essentially, one can proceed from the assumption that stable and predictable institutional arrangements tend to facilitate a sustainable policy output that relies on a long-term stable framework.<sup>35</sup> Following *I Miquel*,<sup>36</sup> autocracies are particularly prone to significantly lower institutional stability in contrast to democracies. As opposed to the latter, they often

31 *Wintrobe, R.*: Dictatorship: Analytical Approaches, in: eds. Boix, C./Stokes, S. C., The Oxford Handbook of Comparative Politics, Oxford/New York, 2009, 363-394.

32 The degree of repression, however, can vary greatly from one authoritarian regime to another. In the following, it is assumed that especially military regimes use systematically these means.

33 *Easton, D.*, op. cit., p. 32.

34 *Keefer, P.*: The Poor Performance of Poor Democracies, in: Boix, C./Stokes, S.C. (eds.), The Oxford Handbook of Comparative Politics, Oxford/New York, 2007, 886-909.

35 *Olson, M.*: Power and Prosperity. Outgrowing Communist and Capitalist Dictatorships, New York, 2000; *Gandhi, J./Przeworski, A.*: Authoritarian Institutions and the Survival of Autocracies, in: Comparative Political Studies 40, 2007, 1279-1301; *Gandhi, J.*: Political Institutions under Dictatorship, Cambridge, 2008.

36 *I Miquel, G.P.*: The Control of Politicians in Divided Societies: The Politics of Fear, in: Review of Economic Studies, 74/4 (2007), 1259-1274.

face greater difficulties in organising a regulated transition to a new ruler without fundamental upheavals. The instabilities and ruptures provoked by these radical changes can be a heavy burden for any sustainable policy.

As a further institutional aspect, one must deal with the question of rule control. In this context, it can be argued that a lack of public control (as it exists in autocracies) can impede the sustainability of public policy over time. Even if we accept *Olson's* “stationary-bandit” hypothesis,<sup>37</sup> which states that the expectation of long periods of political reign in autocracies can lead to policies directed towards long-term objectives, the danger of degeneration in authoritarian systems latently persist due to a lack of effective oversight. In contrast to this, the transparent and publicly controlled decision-making processes in democracies guarantee their capacity to learn, adapt and correct errors.<sup>38</sup> This is true because deficiencies are publicly known (early warning systems) and the ruling elite is encouraged to seek out better policy solutions as a result of their accountability towards the citizenry.

With regard to enforcing political decisions, one can criticise democratic systems (in contrast to autocratic regimes) insofar as democracies usually have particular difficulties implementing unpleasant and unpopular reforms. It is hardly possible for them to govern without resistance due to a frequently large number of limitations to institutional power and a plethora of veto players,<sup>39</sup> whose number may vary according to the regime subtype. This can lead to lengthy and tough decision-making and negotiation processes, which can result in a lowest common denominator of all participating actors.<sup>40</sup> Thus, the system can fail to deliver an optimal problem solution.

Furthermore, the institutional approaches draw attention to the fact that – aside from the regime type – other factors, such as the regime age and the presence of a system of rule of law, could be important for a country's sustainability performance. Hence, corresponding explanatory variables as well as dummy variables for monarchical autocracies (controlled transition rule) and for military

37 *Olson, M.*: Dictatorship, Democracy and Development, in: *American Political Science Review* 87, 1993, 567-576.

38 *Tocqueville, A.*, op. cit.

39 *Tsebelis, G.*: *Veto Players. How Political Institutions Work*, Princeton, 2002.

40 *Scharpf, F.W.*: *Games Real Actors Play. Actor-Centered Institutionalism in Policy Research*, Boulder, 1997.

dictatorships (high regression inclination) are included in the following regression analyses.

If we concentrate on access to power as another policy-relevant aspect, the actor-related rational choice approach by *Bueno de Mesquita et al.*<sup>41</sup> is appropriate as an explanatory model. Adherents to this concept believe that the opportunity to gain influence on political decisions in democracies is much wider than in autocracies. As the “selectorate” in democracies consists of all voting citizens, a government must satisfy the interests of broad segments of the population to a much greater extent in order to be able to form a “winning coalition” as a foundation of its rule. For autocratic rulers, who only have to consider the interests of a very small “winning coalition”, usually consisting of major military figures, senior party delegates and/or economic elites, it is rational to provide private goods (preferential treatment of specific groups of the population). Democratic governments, however, need to offer a much larger amount of public goods with a high common welfare standard.

However, it is crucial for the question of the sustainability impact to what extent the interests of future generations are neglected by the current “selectorate”. Such a consideration of interests seems feasible in democracies, especially if one can suppose that there exist distinct advantages for the majority of today’s generation. The less this is true,<sup>42</sup> the less we should be able to observe any effect. In this context, an important intervening variable is the age structure of a society.<sup>43</sup> Thus, it will be considered as an independent variable in the following regression analysis.

Taking a closer look at the level of the policy process, one might identify the core problem of democratic regimes in regard to sustainable development. This core problem is caused by democracies’ tendency to act in a near-sighted fashion. The permanent focus of a democratic government on the acute management of upcoming challenges under the pressure of a short-term electoral period, and

41 *Bueno de Mesquita, B./Smith, A./ Siverson, R./Morrow, J.D.*: The Logic of political survival, Cambridge, 2003.

42 See *Birnbacher, D.*, op. cit..

43 On the one hand, it can be argued that the interests of subsequent generations, which are hard to organize in an aging society, are systematically neglected due to the existence of powerful distributional coalitions formed by older population groups, cf. *Olson, M.*: The Rise and Decline of Nations. Economic Growth, Stagflation, and Social Rigidities, New Haven, 1982. On the other hand, a positive correlation between aged societies and their sustainability performance can be detected. In an aging society, experience and know-how are accumulated as an important resources for the production of sustainable policy output.

the impression of a permanent campaign atmosphere<sup>44</sup> impedes long-term planning and decision making processes, but also increases the risk of an excessive weighting of current interests over long-term problems.<sup>45</sup> An autocratic ruler, who is firmly established, might be able to escape from such a short time based policy-making.<sup>46</sup>

The theory of competition by *Besley* and *Kudamatsu*<sup>47</sup> is also situated on the policy level. It assumes, however, that democracies are characterized by incentives to permanent policy optimisation due to the strong political competition within the democratic regime. Such incentives are missing in a consolidated autocracy so that incentives to develop long-term solutions are negatively affected. Strong involvement in international processes could be a functional equivalent of such a competitive pressure from the inside (increased competition from abroad). Thus, the transnational interconnectedness of a country (measured by the degree of openness of its economy) was chosen as a control variable for the following analysis.

Table 2 summarises all explanatory factors (control variables) and lists short descriptions of their operationalisation.<sup>48</sup>

In view of the presented theories, the arguments for a superior sustainability performance of democratic regime prevail: high level of institutional stability, strong government control, widespread potential to consider most societal interests, increased error-correction and learning capability, strong competitive orientation. Notable counter-arguments, however, have been proposed: the possibility of political blockages, short-term political cycles, a fixation on the present.

This overall perspective is expected to remain unchanged even when other potential influencing factors (economic development, wealth of resources, demographics, etc.) are considered. Furthermore, the theoretical foundations allow for differentiated statements regarding supposed systematic performance patterns on the level of regime subtypes. Following the considerations of *Brooker*,<sup>49</sup> the

44 *Linz, J.J.*: Democracy's Time Constraints, in: *International Political Science Review* 19, 1998, 19-37.

45 *Kielmansegg P.*, op. cit.

46 While democracies generally provide a long-term stable institutional framework, political processes taking place within this framework tend to be aimed at short-term objectives.

47 *Besley, T.J./Kudamatsu, M.*: Making Autocracy Work, CEPR Discussion Paper No. DP6371, 2007.

48 All potential explanatory factors were collected for 2005. Due to the difficulty to determine the exact time delay for the effect of individual factors, the time lag was assumed to be one year.

49 *Brooker, P.*: Non-democratic Regimes, Basingstoke, 2009.

different regime subtypes might vary in their inclination towards repression/inclusion as well as in their institutional stability and their ability to reform. Whereas the potentially higher ability to reform combined with a lower density of veto players could assign advantages to the parliamentary system type over presidential regimes, the transition of power in monarchies, which tends to be regulated, should constitute a great advantage for these regimes over other subtypes of autocracy. Military dictatorships, on the other hand, which are based on repression and a relatively small “winning coalition”, should be especially prone to meagre performance in the area of sustainable policy making.

Table 2: Explanatory factors for sustainable development

Explanatory factors	Description
Regime type	Democracy Dictatorship Index in 2005. Source: <i>Cheibub, J.A./Gandhi, J./Vreeland, J.R.</i> : Codebook, op. cit.
GDP per capita	Gross domestic product per capita in 2005 (or in the most recently available year). Source: <i>The World Bank</i> , op. cit.
Energy imports	Net energy imports as a percentage of energy consumption in 2005 (or in the most recently available year). Source: <i>The World Bank</i> , op. cit.
Age of regime	Years since establishment of regime in 2005. Source: <i>Cheibub, J.A./Gandhi, J./Vreeland, J.R.</i> : Codebook, op. cit.
Rule of law	Index of rule of law in 2005. Source: <i>Esty, D.C./Levy, M./Srebotnjak, T./de Sherbinin, A.</i> : Environmental Sustainability Index: Benchmarking National Environmental Stewardship, New Haven, 2005.
Military dictatorship	Regime is a military dictatorship in 2005. Source: <i>Cheibub, J.A./Gandhi, J./Vreeland, J.R.</i> : Codebook, op. cit.
Monarchy	Regime is a monarchical dictatorship in 2005. Source: <i>Cheibub, J.A./Gandhi, J./Vreeland, J.R.</i> : Codebook, op. cit.
Population aging	Share of the population over 65 years of total population in 2005 (or in the most recently available year). Source: <i>The World Bank</i> , op. cit.
Openness of economy	Import and exports relative to GDP in 2005 (or in the most recently available year). Source: <i>The World Bank</i> , op. cit.

On the basis of these theoretical considerations, the following hypotheses are proposed:

- Hypothesis 1: In comparison to autocracies, democratic states are characterized by a better performance in all goal dimensions of sustainable development.
- Hypothesis 2: Within each regime type, further systematic performance differences can be detected:

- Hypothesis 2a: Within the spectrum of democratic states, parliamentary regimes achieve better results than semi-presidential and presidential regimes.
- Hypothesis 2b: Within the spectrum of autocratic countries, monarchies achieve the best and military dictatorships the worst results.
- Hypothesis 3: A positive regime effect in favour of the democratic countries is preserved in all goal dimensions after correcting for the influence of other explanatory variables (control variables).

#### IV. Comparison of Performance

If a mean comparison test between democracies and autocracies is conducted for the three sustainability dimensions and the nine single indicators chosen (cf. Table 3), then, in general, it seems obvious that democracies attain higher results. However, a closer examination reveals clear differences according to the field of study and the regime subsystems. A great deviation from the general pattern of the superiority of democracy is notable in the first indicator (state indebtedness). The mean comparison test (Table 3; column 2) states that democracies do not achieve better results than other states. Instead, monarchies achieve a significant better result with an average of 49.19 per cent of the GDP deficit debt than the parliamentary (55.92% of GDP), the semi-presidential (54,74% of GDP) and the presidential democracies (65.27% of GDP). Their performance is only undercut significantly by the military dictatorship (102.06% of GDP)<sup>50</sup>.

Democracies perform somewhat better in the field of infrastructure quality when measured for the number of secure internet connections. Parliamentary democracies in particular (210.66 Internet servers per 1,000,000 people) perform well in comparison to autocratic subtypes (Table 3, column 3). A similar situation exists in relation to research performance when measured by the number of articles produced per capita (Table 3, column 4). In this case, a more detailed study of individual countries shows that the superiority of democratic regimes is largely caused by the effect of the group of OECD countries.<sup>51</sup> The overall index for

50 A detailed consideration of individual country results shows that autocracies with abundant natural resources (Kuwait, Russia or Saudi Arabia) outperform some weaker democracies (e.g. Belgium, Greece, Italy and Japan). However, some African developing countries have the highest levels of debt while most of the newly industrialising countries, led by China, achieve rather good results.

51 The impact of the stage of economic development is especially apparent in the fact that less developed democracies hardly achieve better results in regard to the two indicators than their autocratic counterparts, whereas economically developed autocracies, as, for example, Singapore, can achieve results clearly above the average.

economic performance (Table 3, column 5) essentially reflects the same phenomenon.

Monarchies achieve a better performance on average when examined for the social dimension of sustainability (Table 3, column 9).<sup>52</sup> These results are based on relatively high rates of primary education (89.01% primary graduation rates for relevant age groups, Table 3, column 6) and advanced education program completions (20.04% tertiary graduation rates for the relevant age groups, Table 3, column 7).<sup>53</sup> With an average life expectancy of 73.14 years for newborns (Table 3, column 8), monarchies approach the values attained by democratic regimes, which perform much better in almost all other social indicators.<sup>54</sup>

Results are more differentiated in the climate protection rating when measured by CO2 emissions per capita (Table 3, column 10). In second place after the monarchies (that are usually rich in natural resources), parliamentary democracies are the greatest CO2 producers with an annual average of 7.31 metric tons per capita. Military dictatorships, on the other hand, emit relative small amounts

Table 3: Mean Comparison of Regime Types

Regime type	Financial consolidation	Quality of infrastructure	Research performance	Economic performance	Elementary education	Further education	Life expectancy	Social performance	CO2-emissions	Environmental protection	Preservation of resources	Ecological performance
Parliamentary democracy	55,92	210,66	0,000453	0,70	92,11	54,49	75,78	0,70	7,31	11,92	6,97	0,00
Semi-presidential democracy	54,74	64,55	0,000185	0,02	87,92	43,64	70,16	0,30	4,72	16,84	5,85	0,15
Presidential democracy	65,27	57,51	0,000089	-0,17	89,21	29,01	68,89	0,08	2,54	15,49	7,05	0,40
Civilian dictatorship	65,53	2,30	0,000013	-0,41	76,59	18,42	60,44	-0,52	3,04	5,32	3,63	-0,17
Military dictatorship	102,06	18,60	0,000054	-0,40	65,85	13,29	61,92	-0,56	2,07	1,57	5,97	0,24
Monarchy	49,19	15,44	0,000041	-0,23	89,01	20,04	73,14	0,11	14,04	1,56	4,61	-1,22

52 Reaching a performance value of 0.11, they succeed even in slightly surpassing the average value of presidential democracies (0.08).

53 In regard to both indicators, individual autocracies (e.g. Cuba) achieve at least similarly good results as the developed Western industrial countries.

54 In particular, the military dictatorships perform badly in regard to all social sustainability indicators (65.85 % as quote of primary graduation, 13.20 % as quote of the tertiary education, 61.92 years as average life expectancy for newborns), closely followed by the civil dictatorships.

of greenhouse gases.<sup>55</sup> Democracies perform better, however, when considering environmental protection measures (percentage of renewable energy). The comparative averages (Table 3, column 11) show significantly higher share of renewable energy in all democratic subsystems while monarchies demonstrate particularly poor performance in this field (1.56%). When examining the conservation of resources (measured by the GDP produced per consumed energy unit, Table 3, column 12), results are similar.<sup>56</sup> In sum, democracies achieve significantly better overall environmental performance (Table 3, column 13), especially considered against the clearly under-average results of monarchies.

Thus, with the exception of CO2 emissions and budget discipline, democracies considerably out-perform non-democracies. While parliamentary systems achieve better results than their counterparts, at least in the economic and social dimensions, monarchies fare marginally better than other autocratic regime subtypes. In contrast, the otherwise lagging military dictatorships achieve relatively good results with respect to environmental sustainability.

At this point, it is important to consider the noticeable differences in results between individual sustainability indicators. The distribution within a regime type, depending upon the indicator, can reveal very wide spectra. This shows that comparative averages alone are not sufficient in explaining performance results. Thus, it is useful to add a greater number of explanatory variables.

## V. Regression analyses

The aggregated results of the regression analysis are presented in Table 4. More detailed results are for the nine sustainability indicators analysed are documented in Table 5 (cf. Appendix).<sup>57</sup>

55 A closer look at the micro-level shows that apart from some developed industrial nations (Australia, Canada, USA), autocracies with abundant resources (Kuwait, Oman, Saudi Arabia) or high levels of economic development (Singapore) are linked to high levels of greenhouse gas emissions.

56 A certain exception exists only concerning the military dictatorships, which achieve a performance slightly above the one of semi-presidential democracies (5.97% GDP produced per consumed energy unit).

57 In the tables, a regression model containing all the explanatory factors from Table 2 is included for each sustainability dimension and each performance indicator. As the number of countries included alternates slightly due to data restrictions depending on the respective regression model, all models were also employed for a core sample of countries for which all data points were available across all indicators in order to validate the results (adjustment of sample results). Although this caused certain shift concerning the size of the individual regime groups (the percentage of democracies increases and the percentage of autocracies decreases), the results presented are preserved in nearly all aspects. This is also the case for

Table 4: Regressions of the goal dimension of economic, social and environmental sustainability

Goal dimension	Economic sustainability		Social sustainability		Environmental sustainability	
Constant	-0,39*** (0,18)		-1,16*** (0,25)		-0,09 (0,26)	
Regime type	0,03 (0,11)	0,02	0,24* (0,16)	0,13	0,60*** (0,16)	0,43
GDP per capita	0,01*** (0,01)	0,58	-0,01* (0,01)	-0,24	0,01 (0,01)	0,02
Energy imports	0,01 (0,01)	0,05	-0,01** (0,01)	-0,15	0,01* (0,01)	0,18
Age of regime	0,01 (0,01)	0,10	0,01 (0,01)	0,09	0,01 (0,01)	0,08
Rule of law	0,17** (0,08)	0,23	0,29*** (0,11)	0,32	-0,14 (0,11)	-0,20
Military dictatorship	-0,04 (0,13)	-0,02	-0,04 (0,18)	-0,02	0,44 (0,39)	0,21
Monarchy	-0,36 (0,19)	-0,11	0,43* (0,27)	0,11	-0,72** (0,28)	-0,24
Population aging	0,01 (0,01)	0,04	0,11*** (0,01)	0,67	-0,02 (0,02)	-0,16
Openness of economy	-0,01 (0,01)	-0,02	0,01** (0,01)	0,13	-0,01 (0,01)	-0,11
R <sup>2</sup>	0,75***		0,66***		0,38***	
Corrected R <sup>2</sup>	0,73		0,63		0,33	

Note: One asterisk (\*) represents a significance of 90%, two asterisks (\*\*) of 95% and three asterisks (\*\*\*) of 99%. In the left field for each variable stand the partial regression coefficient together with (in parentheses) the relative standard error. The right field contains the standardized partial regression coefficient. N in all models = 126.

If we first consider economic sustainability (Table 4; column 2), it is evident that the regime type does not contribute significantly to an explanation.<sup>58</sup> However, a high level of economic development and a strong enforcement of the rule of law are key to a good performance result. This also proves true when looking at the individual indicators of infrastructure quality (Table 5; column 3) and research performance (Table 5; column 4). According to the results of the regression calculations, apart from a high level of economic development, legal certainty and long-run reliability (regime age) play an important role in the provision of

the regression models calculated for the year of 1996. Therefore, more detailed presentations of these control exercises proved unnecessary.

58 In an overall model producing a convincing explanation (corrected R<sup>2</sup>= 0.73), the standardised partial regression coefficient of the regime type variable reaches a value of 0,02 and thus an only very small and in significant result in favor of democratic countries.

future goods.<sup>59</sup> On the other hand, the expected effect of democratic government is less salient.<sup>60</sup>

The opportunities to participate in public decision-making seem to have no significant influence on the containment of public debt.<sup>61</sup> In a weak overall explanation model (Table 5; column 2), the only significant link can be found between a high level of economic development and high levels of public debt.<sup>62</sup> On the other hand, public debt decreases if a country has a huge number of energy resources at its disposal and thus is less dependent on energy imports.

Whereas the aforementioned institution and actor theories might have difficulties explaining the missing democracy effect on the economic level, considerations of system theory could be pivotal. The economic sustainability performance (outcome legitimisation) seems to be eminently important for the regime stability, especially in autocracies with weak input legitimisation. This fact might explain why, in contrast to numerous democracies, autocracies with particularly strong economic development drives (China, Russia or Singapore) show above-average results.

However, the situation is different in regard to the dimension of social sustainability. A significantly positive “democracy effect” on the overall index can be detected (Table 4; column 2),<sup>63</sup> even if its explanatory power is, once more, weaker than that of the rule of law. A stable constitutional foundation seems to be very important for the provision of basic needs. This can be shown by the factors of primary school graduation quotas (Table 5; column 5) and the life expectancies of newborns (Table 5; column 7). In contrast to this, its importance in explaining the successes in the tertiary education sector (Table 5; column 6) decreases considerably. On the other hand, the demographic component does not

59 On the other hand, great wealth of fossil resources, which is characteristic for many countries classified as monarchies, seems to decelerate improvement in these fields.

60 This is surprising especially in the context of the provision of safe internet servers, supposing that the possibility to communicate and to exchange information is vitally important for democratic communities.

61 Cf. *Lafferty, W.M.* (ed.): *Governance for Sustainable Development: The Challenge of Adapting From to Function*, Cheltenham, 2006.

62 While initially surprising, this can be explained by *Wagner's* law that states that public spending increases with increasing levels of development, cf. *Schmidt, M.G./Ostheim, T.*: Die sozioökonomische Schule, in: Schmidt, M.G./Ostheim, T./Siegel, N.A./Zohnhöfer, R. (eds.), *Der Wohlfahrtsstaat. Eine Einführung in den historischen und internationalen Vergleich*, Wiesbaden, 2007, 29-39, p. 32.

63 In an overall model producing a solid explanation (corrected  $R^2 = 0.63$ ), the standardised partial regression coefficient of the regime type variable reaches a value of 0.13 at a significance level of 90%.

only influence the overall index, but also all other included indicators of social sustainability. In this regard, aging societies seem to place particular emphasis on the socio-political development of their countries. While there exists a negative correlation between the economic stage of development and the social sustainability performance – when controlled for other factors –, the opposite seems to be the case regarding the presence of abundant natural resources.

In an attempt to explain the positive correlation between the degree of democratisation and the observed high levels of social sustainability, system-, institution- and actor-related arguments can be used.<sup>64</sup> Apart from the broad competence of considering interests across numerous social groups (larger “winning coalition”), a lower inclination to repression and a higher level of institutional stability might be the decisive arguments in favour of democratic systems.

An even clearer regime effect in the expected direction (cf. hypothesis 3) can be stated for the dimension of ecological sustainability. Its robustness cannot only be seen in a highly significant result in regard to the overall index (Table 4, column 3),<sup>65</sup> but it is also indicated by each individual indicator. Thus, in the context of renewable energies (Table 5; column 9) and the efficient use of resources (Table 5; column 10), none of the other variables can contribute significantly to the explanation, illustrating the importance of democratisation in this regard. In the context of the first indicator (the level of CO2 emissions, Table 5; column 8), only the stage of economic development can be identified as a being of additional significance. While this factor is positively correlated with the expansion of renewable energies and to resource efficiency in a country (without reaching a significant level), it seems that economic performance and climate pollution are still correlated.

Considering the theoretical foundations, it seems reasonable that the clearly positive correlation between the degree of democratisation and ecological sustainability is linked, first, to factors covered by system theory (facilitation of functional differentiation in the young field of environmental policy, sensitive feed-back loop in regard to new environmental problems) and, second, to institutional and actor specific factors. The existing power control mechanisms and the

64 A significantly positive connection exists between the degree of democratisation and the life expectancy of newborns; for similar results cf. Zweifel, T.D./Navia, P.: Democracy, Dictatorship, and Infant Mortality, in: Journal of Democracy 11, No. 2, 2000, 99-111.

65 In an overall model producing acceptable explanation (corrected  $R^2 = 0.38$ ) the standardized partial regression coefficient of the regime type variable reaches a value of 0.43 at a significance level of 99%.

transparency of public processes in democracies might increase the ability to correct errors and thus make it easier to react appropriately to ecological problems. Furthermore, the inclusion of different interests and the political rights of freedom and participation open up vast opportunities to environmental pressure groups. Autocracies, in contrast, face a structural deficit in this regard.

## VI. Conclusion

In summary, democracies generally achieve higher degrees of sustainability performance than autocratic regimes. A detailed comparison, however, shows that they are not always superior; democracies underperform particularly in the field of financial consolidation. In addition, the superiority of democracies in infrastructure, research and education is caused only by a relatively small group of advanced OECD countries. Beyond this, the assumption of a general superiority of democracies as formulated in hypothesis 1 cannot be confirmed due to sporadic deficits in the ecological sustainability rating.

Similarly, the assumed performance differences between regime subtypes (hypothesis 2) are, in part, greater than the dichotomies between democracy and autocracy. As predicted by theory and explained by varying veto structures, small advantages of parliamentary democracies over presidential democracies can be found within the spectrum of democratic countries. The expected wide performance variation between “successful” monarchies on the one hand and poorly performing military dictatorships on the other hand is particularly visible in the realms of economic and social sustainability.

Hypothesis 3 proposes the expectation that democratic regimes should enjoy higher sustainability levels even when controlled for other explanatory factors. However, this expectation can only be confirmed in the dimension of environmental sustainability (climate protection, environmental protection and conservation of resources) and, to a lesser degree, in the dimension of social sustainability (increase in life expectancy). While we can observe a “democracy effect” in the “softer” fields (such as social sustainability, environmental protection, etc.), this effect plays no role in the field of economic performance. The results suggest that autocratic regimes use their significant political capacity to optimise the performance in those areas of economic and social development that are key to their regime stability (outcome legitimisation). Reflecting on the environmental dimension, it seems that the capacity of democracies to satisfy many different

interest groups (large winning coalitions) and to achieve a high error correction as a result to higher levels of transparency leads to a performance advantage.

The analyses show that we cannot observe a secular “regime effect” across all fields. In part, economic factors (such as the degree of economic development and the wealth of natural resources) play a role. Another important determinant is the stage of development of a regime’s constitutional institutions. It seems that an established system based on the rule of law is much more successful in laying the foundations for the satisfaction of basic economic and social needs than “authentic democratic participation”. Along with regime age, the societal age structure also plays an important role, especially regarding social development.

In conclusion, the analysis of several aspects of sustainability presents a rather differentiated picture that this contribution could not map in all its facets. This suggests a necessity of further research to explore not only the theoretical connection between regime type and sustainability in greater detail, but also to analyse the differences between regimes and regime subtypes. In addition to the analysis of further significant explanatory factors of sustainable development (cultural factors, geographic settings, specific actor constellations), research focused on dynamic processes could prove fruitful in this relatively new field of study.

VII. Appendix

Goal indicators	Financial consolidation	Quality of infrastructure	Research performance	Elementary education	Further education	Life expectancy	CO2-Emissions	Environment protection	Preservation of resources
Constant	99,4*** (25,51)	-1,56 (34,19)	0,01 (0,01)	62,02*** (7,54)	-3,95 (6,79)	54,89*** (3,05)	1,65 (150)	-1,50 (7,74)	4,70*** (1,05)
Regime Type	-1,89 (15,07)	8,14 (20,20)	-0,01 (0,01)	2,61 (4,46)	3,17 (4,05)	3,51** (1,79)	0,16 (0,88)	10,24** (4,37)	2,08*** (0,62)
GDP per capita	0,01* (0,01)	0,51 (0,01)	0,01*** (0,01)	-0,01*** (0,01)	-0,01 (0,01)	-0,01 (0,01)	0,01*** (0,01)	0,47 (0,01)	0,10 (0,01)
Energy imports	0,09* (0,05)	0,25 (0,06)	0,09** (0,01)	0,01** (0,01)	0,09 (0,01)	-0,02* (0,01)	-0,11 (0,01)	-0,21 (0,01)	0,01 (0,01)
Age of regime	-0,25 (0,30)	-0,21 (0,42)	2,37*** (0,09)	0,09 (0,01)	0,18 (0,08)	0,11 (0,08)	0,14 (0,04)	0,06 (0,02)	0,06 (0,02)
Rule of Law	-3,63 (10,76)	-0,10 (15,90)	17,53 (15,90)	0,10 (0,01)	0,01* (0,01)	6,42* (3,56)	0,29 (3,19)	4,05 (3,19)	0,15 (0,01)
Military dictatorship	-24,30 (27,01)	-0,12 (27,89)	-18,84 (27,89)	-0,03 (0,01)	0,01 (0,01)	-11,69** (5,79)	-0,18 (0,01)	1,09 (5,21)	0,01 (0,01)
Monarchy	-8,99 (25,35)	-0,05 (36,4)	-99,*** (36,4)	-0,14 (0,01)	0,01*** (0,01)	4,08 (8,05)	0,05 (0,01)	0,44 (7,21)	0,01 (0,01)
Population aging	-2,82* (1,51)	-0,39 (2,03)	-2,45 (2,03)	-0,08 (0,01)	0,01 (0,01)	2,19*** (0,47)	0,55 (0,08)	3,77*** (0,41)	0,76 (0,07)
Openness of economy	-0,51** (0,25)	-0,25 (0,40)	-0,81** (0,40)	-0,10 (0,01)	0,01 (0,01)	0,22** (0,09)	0,20 (0,08)	0,10 (0,08)	0,07 (0,07)
R <sup>2</sup>	0,16*	0,81***	0,87***	0,44***	0,72***	0,60***	0,66***	0,14*	0,32***
Corrected R <sup>2</sup>	0,04	0,79	0,86	0,40	0,70	0,57	0,63	0,06	0,25
N	103	120	126	116	119	126	125	103	108

Note: One asterisk (\*) represents a significance of 90%, two asterisks (\*\*) of 95% and three asterisks (\*\*\*) of 99%. In the left field, the partial regression coefficient is recorded together with (in parentheses) the relative standard error. The right field contains the standardized partial regression coefficient.