INNOVATIVE FRAMEWORK FOR DYNAMIC INDICATOR ANALYSIS BEYOND GDP[1]

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Povzetek

Blaginja in razvoj sta večdimenzionalna in dolgoročna fenomena, ki presegata opazovanje bruto družbenega proizvoda (BDP), še posebej medijsko osredotočenost na stopnje rasti BDP. Razvojni program OZN, OECD in Evropska komisija že vrsto let pripravljajo konference ter razvijajo nove indikatorje in politike onstran BDP (»Beyond GDP Initiatives«). V tem članku je drugi vodilni element uporaba dinamične metodologije časovne distance, ki podaja rezultate v časovni dimenziji, s čimer dopolnjuje obstoječe rezultate in metodologije. To lahko pomaga tistim, ki se odločajo (vladi in podjetjem), pa tudi civilni družbi – ocenjujem, da bi morala prav ta, pa tudi mediji, pogosteje uporabljati tovrstne nove opisne statistične mere, ki so lahko tudi orodje za realnejše ocene.

Točka 3 pomaga razumeti razširjeni koncept merjenja in ocenjevanja velikosti neenakosti v dveh dimenzijah. Točka 4 podaja dodatno možnost vizualizacije podatkov časovnih serij z matriko NIVO-ČAS, ki pomaga ponazoriti, kako je enostransko opazovanje BDP podcenilo škodo, ki jo je svetovna finančna kriza povzročila v državah EU na drugih področjih. Točka 5 poudarja orodje časovne distance kot metode za spremljanje uresničevanja ciljev, ki se kot transparentna in lahko razumljiva mera lahko uporablja vzporedno z drugimi metodami. V članku je uporabljena za analizo uresničevanja doseganja ciljev iniciative EU 2020, katere rezultati so kar za okoli 150 primerov (pet izbranih indikatorjev in 28 držav EU) povzemajoče prikazani v eni sami tabeli, kot je tabela 2. Podana je tudi povezava s študijo za oceno doseganja razvojnih milenijskih ciljev OZN (MDG), ki sem jo opravil za 10 izbranih indikatorjev za svetovne regije, Kitajsko in Indijo ter za pet izbranih indikatorjev za 125-154 držav. Metoda je primerna tudi za podobno uporabo za tekoče spremljanje uresničevanja Agende OZN 2030 za trajnostni razvoj. Ta transparentna metoda za spremljanja uresničevanja ciljev na vseh nivojih je na razpolago, a ni široko uporabljena. Na razpolago je tudi računalniški program na www.gaptimer.eu.

V empiričnem delu članka so prikazani rezultati, ki poudarjajo, da osredotočenost na BDP podcenjuje velikost škode, ki jo je svetovna finančna kriza povzročila na poslabševanju mnogih drugih indikatorjev: 1. Stopnja zaposlenosti je padla v 20 EU državah (71 % držav); 2. Stopnja tveganja revščine kot delež v celotnem prebivalstvu se je povečal v 23 državah EU (82 %); 3. Distribucija dohodka se je poslabšala, saj sta se Ginijev koeficient in delež dohodkov kvartilov poslabšala v okoli 25 EU državah (okoli 89 %); 4. Najbolj presenetljiv zaključek se nanaša na dejstvo, da se je delež fiksnih investicij v BDP zmanjšal v vseh 28 državah EU (100 %). To je seveda negativno vplivalo na srednjeročno in dolgoročno stopnjo rasti BDP. Slovenija pri vseh petih izbranih indikatorjih beleži (kot je razvidno iz tabele 1) negativne rezultate, kar zahteva dodatno obravnavo. Razmere se sicer delno izboljšujejo, vendar so neodgovorne poteze finančnega sektorja nedvomno negativno delovale na blaginjo večine prebivalstva in razvoj v EU.

Empirični rezultati v tabeli 2 obravnavajo drugo situacijo v EU, in sicer z metodologijo spremljanja uresničevanja ciljev strategije EU 2020 za celotno EU in nacionalnih ciljev v 28 državah EU za pet indikatorjev za izbrana področja. Med njimi sta dve področji, kjer EU za dosego ciljev zaostaja več kot dve in manj kot tri leta; to sta stopnja zaposlenosti in delež investicij v raziskave in razvoj v BDP. Pri prvem področju 17 držav časovno zaostaja v času za predvideno linijo do cilja v letu 2020, 10 držav pa prehiteva. V letu 2015 ima kar 10 držav nižje vrednosti od tistih iz leta 2010, med njimi tudi Slovenija. Za drugi omenjeni indikator je položaj še slabši: 20 držav zaostaja za ciljem, le 10 držav ga preseže. Tovrstna dodatna metoda za spremljanje uresničevanja ciljev bi bila lahko del običajnega postopka pri mnogih drugih aktivnostih Evropske komisije, v stotinah slučajev pa tudi na nacionalnih in lokalnih nivojih (kot tudi v podjetjih), kot so spremljanje in ocenjevanje uresničevanja proračunov, planov, projektov, strukturnih fondov, okoljskih zavez itd.

Ključne besede: *S-časovna distanca, onstran BDP, ekonomski in socialni indikatorji, svetovna finančna kriza, spremljanje EU 2020 ciljev, spletno orodje za spremljanje uresničevanja ciljev*

Abstract

Well-being and development embody multidimensional and long-term experience, going much beyond the GDP. The focus in the media is especially in GDP growth rates. Over time, UNDP, OECD, and European Commission have participated in the conferences, indicator developments, and policy discussions of 'Beyond GDP Initiatives'. In the article, the analyses of beyond the GDP indicators are enriched by the application of the dynamic time distance methodology to complement the results of the usual mostly static tools.

With time distance methodology, a new perspective related to time does not replace but rather adds a new dimension to existing analysis across many variables, fields of concern, and units of comparison. Section 3 deals with the broadened concept of measuring and evaluating the magnitude of inequalities in two dimensions. LEVEL-TIME matrix in section 4 is an additional option of visualisation of time series data which helped to establish that GDP underestimated the scale of damage of the financial crisis in the EU for selected indicators. Section 5 emphasises the function of the time distance tool for monitoring implementation of targets parallel to other methods, with application to about 150 cases of EU2020 targets; as well as to measuring implementation of the UN Millennium Developments Goals that can be used also for the UN initiative of the 2030 Agenda for Sustainable Development. This transparent and innovative method for monitoring implementation of targets at all levels is available but not yet utilised. It can bring a new easily understandable perception of the magnitude of the gap between the actual implementation and proclaimed targets at many levels: it can help governments, the civil society, and businesses in a broader understanding of continuous policy debate and necessary adjustments. A software tool is available.

The empirical study exposes that GDP underestimated the scale of damage of the financial crisis as selected time matrices showed deterioration in many indicators:
- *Employment rate fell in 20 EU countries (71% of countries);*
- *Risk of poverty as percent of total population increased in 23 EU countries (82%);*
- *Income distribution worsened as Gini coefficient and income quartile share ratio increased in about 25 EU countries (approximately 89% of countries);*
- ***The most shocking conclusion is that the value of the share of growth fixed capital formation in GDP decreased in all 28 EU countries (100%!).** This negatively affected the medium/long-term rate of growth of GDP.*

Table 2 shows possible scheme and numerical values for analysing time distance deviations for implementation of five selected headline indicators towards the EU2020 for the entire EU and national targets. It is a clear example of simplicity with an overview of about 150 cases of EU2020 targets, showing the results of 5 selected EU2020 indicators, 28 countries, and the EU aggregate in one single table. Such time distance monitoring supervision could become a standard procedure in numerous other activities of the Commission on the national and local levels, e.g. monitoring and evaluation implementation of budgets, plans, projects, structural funds, etc.

Key words: *S-time-distance, beyond GDP, economic and social indicators, world financial crisis, monitoring EU 2020 targets, Web monitoring tool*

1 Introduction

Progress and well-being are by their nature multi-dimensional and long-term phenomena. Time is of the essence in all domains, both as an operational and comparative metric. Perceptions of well-being and progress are inherently subjective: one needs measures to build the perceptions of the degree of disparity regarding the indicators in a dynamic context.

Measuring well-being and societal progress entities is a complex undertaking. In its essence, it involves the search how to answer in an agreeable way manner two questions transcending fields of concern and technicalities: perception about what elements (connected to well-being and societal progress) and which measures to use to build perception of them (measures to present and to communicate the topics

for policy making). I shall deal with the second issue and explore possibilities how the time distance concept and two novel generic statistical measures (S-time-distance and S-time-step) can enhance knowledge broadening and policy implications in the context of Beyond GDP initiatives.

Well-being and development embody multidimensional and long-term experience, going much beyond the GDP. Over time, UNDP, OECD and European Commission have become engaged in conferences, indicator developments and policy discussions of 'Beyond GDP Initiatives'. European Commission (2007, 2014) was dealing with the Beyond GDP Initiative in several events, to mention two of them. In 2007, the conference 'Beyond GDP' was organised in Brussels. In October 2014, the high-level expert EU conference "Moving 'beyond GDP' in European economic governance" was organised to discuss recent

technical advances in measuring well-being, their current policy implications and how to translate this into EU-level and national policy-making in the future.

It is very important how data and indicators are understood. New data and indicators are needed, together with innovative concepts of looking at data and new generic statistical measures to perceive and exploit the information available in existing data better. These issues are discussed in four topical sections:
– Time distance methodology – A new perspective related to time;
– Broadened theoretical concept of measuring inequalities and evaluating the magnitude of inequality;
– Time matrix presentation format indicates that GDP underestimated the scale of damage of the financial crisis;
– Time distance measurement for monitoring the target implementation and for goodness-of-fit.

2 Time distance methodology – A new perspective related to time

The theoretical starting point of my contribution is the fact that in empirical research and in decision-making the art of handling and understanding different views of data is crucial for the discovering of relevant patterns and broader understanding of reality from several perspectives. The present state-of-the-art methodology fails to realise that in principle, there exists a theoretically equally universal measure of difference (distance) in time when a given level of the variable is attained by the two compared time series, in addition to the static comparison of time series. The fact that Nobel Prize Winner Clive Granger found the concept of time distance for a given level of the variable a useful addition to the present state-of-the-art methodology is proof of the generic capability of the methodology[2] beyond the benchmarking and monitoring examples used in this article.

In graphical terms, the usual practice is to compare the time series in the vertical dimension, i.e. for a given point in time. The time distance approach uses an additional perspective: it compares the respective time series in the horizontal dimension, i.e. for a given level of the variable (Sicherl 1973, 2004a, 2004b, 2007, 2015). For a simple description of the methodology on OECD web page see Sicherl (2011), for extensive elaboration consult the book Sicherl (2012).

[2] The usual metrics for comparing two lines involve differences along the vertical axis. This can be an insufficient manner of measuring how these trends vary in terms of time, which is on the horizontal axis. When one compares trends lines based upon horizontal differences, the time distance is measured: that is, the difference between the two lines is expressed in a measure of time (such as years or months). As Sicherl (1973, 1993) proposes '[…] observed time distance is a dynamic measure of temporal disparity between the two series intuitively clear, readily measurable, and in transparent units […] It is suggested that one should complement conventional vertical measures with horizontal measures.' (Granger and Jeon 1997).

In brief, the statistical measure S-time-distance is a special category of time distance measures. It measures the distance (proximity) in time between the points in time when the two compared series reach a specified level of the indicator X. The S-time-distance for a given level of X_L is defined as:

$$S_{ij}(X_L) = \Delta t(X_L) = t_i(X_L) - t_j(X_L) \qquad (1)$$

The S-time-step measures the time elapsed between two levels of a time series, providing an alternative description of its growth rate, measuring the growth of a series by using the inverse relation to the conventional $\Delta X/\Delta t$ growth rate metrics. The S-time-step is expressed in units of time and is defined as:

$$S_i(\Delta X_L) = [t_i(X_L + \Delta X) - t_i(X_L)]/\Delta X \qquad (2)$$

The range of applications regarding the time distance methodology can be examined in two categories. The first is the application in statistics in a more narrow interpretation, i.e. adding two generic statistical measures S-time-distance and S-time-step to the literature; with the primary application in descriptive statistics but also in goodness-of–fit issues. The strength of the time distance concept lies in the fact that it enables additional exploitation of data and visualisation for time-related databases and indicator systems.

The second category is the application of time distance methodology for a better understanding of the information provided in statistical data; for building knowledge and for discussing policy and business issues in a new perspective. The two generic statistical measures S-time-distance and S-time-step have in addition to their use as descriptive statistical measures the potential to provide new understanding of a variety of situations in economics, management, research, statistics, asking new questions, formulating new hypotheses, establishing new semantics, and reaching new conclusions. The concept of time distance applies across variables, fields of concern, and units of comparison, making it an excellent analytical, presentation, and communication tool.

3 Broadened theoretical concept of measuring inequalities and evaluating the magnitude of inequality

Apart from money, time is one of the most important reference frameworks in a modern society. People have memories of the past and expectations for the future; they compare over many dimensions and over time. This explicitly or implicitly introduces the concept of inter-temporal aspect of well-being. It is also elaborated in Sicherl (2014a) in the Springer 'Encyclopedia of Quality of Life and Well-Being Research', edited by Alex Michalos.

The inter-temporal aspects of well-being relate both to individuals regarding their time preference and in our case even to a greater extent to comparing situation between countries, regions, gender, socioeconomic

groups, individuals, etc., over time. Inter-temporal considerations might be of importance even over a very long term as e.g. parents might be considering the success of their children an important part of their well-being. Expectations and hope might be additional elements in subjective considerations over time.

As the perception of well-being is subjective, the concept of well-being and progress has to deal not only with the categories, measurement, and data availability but also with interpersonal and inter-temporal comparisons of the chosen constituent elements. The time perspective which no doubt exists in human perception when comparing different situations has been with the S-time-distance method systematically introduced in a specific way both as a concept and as a quantifiable measure in a statistical and comparative analysis.

The observed distance in time (the number of years, quarters, months, etc.) for given levels of the indicator is used as a temporal measure of disparity between the two series, in the same way that the observed difference (absolute or relative) at a given point in time is used as a static measure of disparity. This innovation opens the possibility for simultaneous two-dimensional comparisons of time series data in two specified dimensions: vertically (standard measures of static difference) as well as horizontally (Sicherl time distance).

There are two aspects. One is descriptive, i.e. two additional statistical measure with clear interpretability. The second one is the evaluation of the degree of inequality in the broader two-dimensional framework. For instance, the perception whether the gender difference for the EU average in life expectancy is large or small depends on the measure used: large (time distance amounts to 27 years, i.e. to about a quarter of century) or small (static percentage difference being less than 8%), see Sicherl (2014c). Both dimensions - static and time distance measures - are required.

In the dynamic world of today, it is not satisfactory to rely only on static measures of disparity. The arguments for extension in several directions to a broader framework in theory and especially in empirical and policy work are well established; it has to happen sooner or later. If we have a number of various measures of inequality such as static absolute or relative difference and time distance, this raises the question of weight that people attach to each of them when reaching their perception of the combined magnitude regarding the degree of inequality.[3]

However, without going into complications of the weighting process to arrive at a composite measure of inequality, it should be emphasised that analysing disparities in economic, social, environmental, technological, and business indicators will show that the degree of disparities may be very different in static terms and in time.[4] This means that new insights can be provided from existing data. Different indicators may have very different growth rates. The greater the differences in the growth rates of the indicators, the greater is the probability that the degree of the disparity measured by time distance or static measures will show different conclusions, especially in comparisons among indicators (Sicherl 1978, 1980).

The broad concept and measurement of dimensions of inequality leads to important policy consequences. The understanding of the situation using time distance measure may be very different when based on static measures of inequality alone. The schematic presentation in Figure 1 presents a simple, but not simplistic case of comparing two countries, regions or social groups for a given indicator, assuming two scenarios. Scenario A assumes a growth rate of 4%, and scenario B growth rate of 1%, for simplicity reasons both units exhibit growth at the same rate. Furthermore, the assumption that the future trends continue to grow at the same rate as before are used only for the purpose to make the scheme as simple as possible. In the two compared units, the value of the indicator for region 1 is in static comparisons kept 50% higher than that of region 2 in both scenarios.

The value judgement that people attach to the time dimension of disparities and to the static dimension of disparity is an open question for interdisciplinary research. However, it may be safe to assume that a situation with 50 percent static difference and time distance of 10 years is preferable to the situation with the same static difference and time distance of 40 years, indicated in Figure 1. The conventional analysis based only on static ratios or indexes, percentage differences, Gini coefficients or Theil indexes alone does not distinguish such situations (scenarios A and B) as different degrees of disparity.

It is highly unlikely that one would perceive such situations as equal degrees of disparity. Conventional welfare theory would need to explain why it would

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[3] OECD has with the 'Better life index' initiative provided a tool to add the first and the most important subjective opinions among fields of concern and the respective indicators. Yet within each of these indicators, there is again an open question of the weight one assigns to the discussed two dimensions of disparity, at an instance of time and over time, static measure and time distance, to arrive at a subjective overall evaluation of their position in the society and in the world. Notionally, one could look for the role of subjective weights in two rounds; first among indicators of the better life index followed by those among two dimensions of disparity.

[4] With the International Telecommunication Union we analysed in the time distances between over 200 countries and the benchmark Sweden for mobile cellular penetration rate in 2008 (ITU, 2010). Because of the indicator's very high growth rate, the time lag for the lowest Myanmar behind Sweden was not larger than 24 years. Though the static difference was very large, the level was a few times lower. In contrast, the static difference in life expectancy is 20 percent lower, the time distance is 76 years, and i.e. the level in Myanmar in 2014 was at the level of Sweden in 1938. Both types of measures are required. Additionally, other studies of digital divide have shown smaller time distances (Vehovar, Sicherl, Hüsing, Dolničar 2006; Dolničar 2008).

Figure 1: **Concept of Overall Degree of Disparity: Simultaneously Perceiving and Measuring Differences in Two Dimensions (in Indicator Value and in Time)**
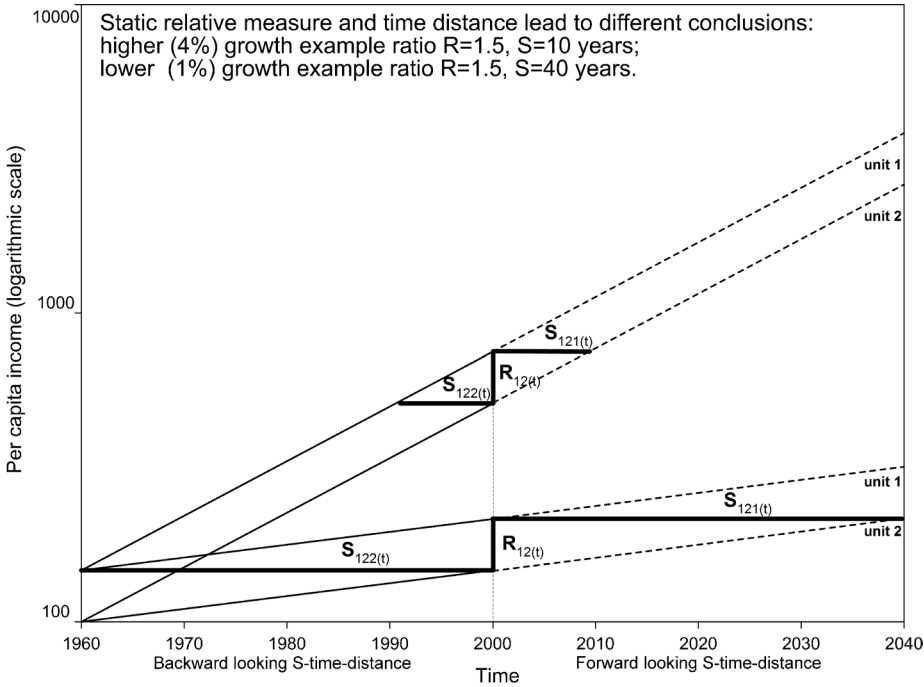
Source: Sicherl (2007).

not be possible to incorporate such broader way of thinking, additional generic statistical measure(s), and the changed semantics into the present state-of-the-art methodology.

In technical terms, the reduction of relative difference (expressed as a ratio of the values of the indicator for the two compared units) depends only on the difference between the respective growths rates $(r_2 - r_1)$, while the time distance depends on the absolute magnitude of the respective growth rates as well.

A program to reduce disparities and alleviate poverty must concern itself with the absolute magnitudes of the indicator's growth rates (r_2 and r_1), and not only with the difference in the growth rates $(r_2 - r_1)$. A higher magnitude of growth rates brings a net reduction in time distance in addition to whatever reduction in time distance has been achieved by the improvement in the relative difference. Factors that influence the magnitude of overall and sector growth rates also influence the overall degree of disparity via time distance if at the same time appropriate distributional policies are being followed in the general strategic orientation for growth and equity (Sicherl 1992).

If people take into account the time distance as one element of their subjective evaluation of the (overall) degree of disparity, a new set of hypotheses with important economic, social, and political

consequences follows. An important hypothesis about the interrelationship between efficiency, growth, and disparity can be formulated.

In the conventional theory, the trade-off between growth and inequality is sometimes emphasised. In the framework here, however, a high growth rate (with appropriate distribution policy) is not only a means for reaching higher levels of need satisfaction faster, but can also be a means of reducing disparities, at least in the time dimension. Increased efficiency leads to higher growth from the same resources, leading further to small time distances that in turn could mean greater social cohesion, enabling a more conducive environment for timely adjustment to changes supporting increased efficiency and effectiveness, resulting in a continuation of the so-called virtuous circle.

Thus, higher growth can produce both positive and negative effects on social cohesion. The 'vicious' circle would work in the other direction; inefficiency has important negative economic and political consequences as far as disparities are concerned (Sicherl 1992, 1993).

Lower growth rates should signal to politicians that an increase in the degree of disparity may be felt and that social tension may be increasing and cohesion decreasing. Unfortunately, this relationship might be a key element in understanding the broad unrest and

dissatisfaction with the consequences of the financial crisis in 2008.

On the one hand, many people see that the fall or lower growth perspective for future indicators directly affect them. On the other hand, their relative position in the society or in the world could be at the same time also worsened by two factors. One is possible increasing the static degree of inequality, the other the expected increase in the time distance lag behind others because of the lower growth rates. Thus, the time distance dimension of the overall degree of disparity provides an important component of understanding of the current economic and social circumstances beyond what is detected by static measures of inequality alone.

4 Time matrix presentation format indicates at a glance that GDP underestimated the scale of damage of the financial crisis

Time matrix is an innovative possibility of additional presentation of time series data. In the usual time series, table data of the indicator (e.g. life expectancy) are organised in relation to the descriptors, such as units (e.g. countries) and time (e.g. years). The time matrix presents the original data (or their approximations) in an alternative way: descriptors are units and levels of the indicator and the value in the field of the table are times when such levels were attained. Calculating these times by interpolations may pose a small problem regarding the degree of accuracy compared to the original data, but it offers an additional understanding of the time dimension of disparities, a good summary overview over many units and years, as well as a first-level visualisation tool.

In short, time matrix organises the same data from Eurostat databases in a manner that data are arranged by selected levels of indicators showing in which year these levels of the indicators were achieved by a given country. The result is a LEVEL-TIME MATRIX which is easily understood by everybody. This presents a first level visualisation that usefully complements the details in the original database by showing the easily understandable summary dynamic overview.[5] This allows for a quick level comparison for time matrices for all 30 indicators:
– Vertical comparison between countries shows the situation and disparities across the EU countries over time.

– Horizontal comparison for each country shows how many steps over levels of indicators were achieved (which is an additional indication of the dynamics in the country).

As an example, out of 30 indicators in the report (Sicherl, 2014b), the S-time-matrix for Gini coefficient is presented in Figure 2. The levels of the indicator on the x-axis are oriented in such a way that the lowest (most desirable low inequality) values are on the right. The year presented in **bold** show the latest available presented year of the indicator for the given country. It helps to quickly observe whether there was a noticeable decrease in the observed period. It shows that for the majority of countries (25 countries or 89% of countries) the values in bold are not at the last position to the right, which means that there was a decrease for at least one step in the Gini coefficient during the analysed period.

Comparing vertically the time matrix for Gini coefficient one can observe the range of the situation across EU countries, which is very large: from the lowest value of 0.23 in Slovenia to the highest values in the range of 0.33-0.36 from the United Kingdom, Romania, Bulgaria, Greece, Portugal, Spain, and Latvia. Comparing horizontally by rows, one can see for each country the approximation for the range of values over nearly two decades in the period 1995-2013 available in Eurostat.

The examination of 30 time matrices for 28 countries compressed a very large amount of data, expressing multidimensional nature of development and well-being, indicating both visually and in numbers that very large differences exist between EU countries with respects to levels and dynamics. The telling power of S-time-matrices provided a good summary overview at-a-glance over many domains with a clear understanding to decision-makers as well as to the general public. New findings contributed to new information and better understanding.

Comparisons of time matrices for a set of indicators lead to a major policy conclusion confirming the multidimensional nature of development and well-being in the Beyond GDP initiatives. Furthermore, the damage done by the world financial crisis of 2008 can be felt in many areas and estimated in many ways. The burst of the bubble of unregulated financial instruments can be estimated in billions of dollars spent to rescue the banking system. Here a modest attempt is made to demonstrate how in the world financial crisis the levels of five selected beyond GDP indicators decreased in 28 EU countries.

It is observed that GDP underestimated the scale of damage of the financial crisis. The damage done to countries by the world financial crisis is much greater when looking at 28 countries in terms of employment, investment share, risk of poverty, income distribution,

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[5] See report Sicherl (2014b). The level-time matrix is defined for selected levels of a given variable and shows in which year various units (countries, regions, etc.) achieved these levels. The time matrix for life expectancy in the report condenses information for the period of more than 50 years (1960-2012), which amounts to more than 1000 entries in the Eurostat extended database. The data in the time matrix is condensed to a smaller number of entries (228), i.e. nearly five times smaller.

Figure 2: **Time matrix for GINI coefficient**

												S-time-matrix: time when specified level of the indicator was achieved (sorted by last available value)							
LEVEL	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
Slovenia																**2009**	2003		
Sweden																**2008**	2004	1999	1997
Czech Republic													2005	**2012**					
Slovakia											2006	2006	2007	**2009**	2008				
Netherlands											2000	2001	2009	**2010**	1998				
Finland												2001	**2009**	2000	2000	1999	1998		
Belgium									2000	2001	2005	**2008**							
Malta									2000	2002	**2010**	2007							
Austria												**2012**	2010	2002	2001				
Hungary						2006	2006	2006	2006	2007	**2013**	2012	2011	2010	2002				
Luxembourg											2009	**2012**	2005	2000	1997				
Denmark											**2012**	2010	2009	2007	2006	2002	2001	1999	1997
Germany										2008	**2011**	2006	2006	2005	2001				
Ireland						1998	1999	1999	2007	**2011**	2009								
Croatia								**2011**	2010	2009	2009	2009							
France								**2010**	2008	2007	2007								
EU 28										2010									
EU 15								1995	**2007**	2001									
Poland				2005	2006	2006	2008	**2012**	2001										
Cyprus								**2012**	2011	2008	2004	2003							
Italy						2005	2007	**2008**	2002	2001									
Lithuania		2010	2010	2011	2011	2011	**2012**	2001											
Estonia		2004	2004	2005	2005	2007	**2011**	2008											
United Kingdom				2002	2005	**2011**	2000	1998	1997										
Romania		2007	2008	2009	**2010**	2006	2006	2005	2003	2000									
Bulgaria				2011	**2012**	2006	2006	2006	2006	2006	2005	2005	2005	2005	2003				
Greece				1998	**2012**	2010													
Portugal	2005	2007	2008	2009	**2011**														
Spain					**2012**	2010	2009	2008	2004										
Latvia	2006	2009	**2010**	2002	2000														

Source: Sicherl (2014b), p. 34.

health, etc. and not at GDP alone. Table 1 shows much greater deterioration in selected indicators: employment rate, investment share in GDP, the increasing risk of poverty and increasing income inequality across Europe (from 71% or 100% of the EU countries):

The policy conclusions are straightforward. The levels of inequality and poverty indicators in the last years have been less favourable than before the crisis in 82% to 89% of EU countries. Only about four of 28 EU countries escaped the deterioration of inequality. These results make it easy to understand that people are disappointed twice: with lower GDP growth rate or even decrease in GDP level, but also with the simultaneous increase in inequality. In other words, needed policy action to counteract the inequality effect of the deterioration of the general economic situation was not forthcoming.

The other conclusion deals with next two indicators, the deterioration of employment rate and of the share of growth fixed capital formation in GDP which seriously hindered the medium to long-term capabilities of the EU economies. Employment rate decreased in 20 EU countries and is still one of the most important indicators showing delay towards the EU2020 targets analysed in section 5. In 2014, 17 EU countries were lagging behind

Table 1: **Effects of the world financial crisis beyond GDP**

Number of countries where indicator levels worsened	Employment rate (15 to 64 years), total	Gross Fixed Capital Formation in GDP	At-risk-of-poverty (% of total population)	GINI coefficient	Income quintile share ratio S80/S20
1	Bulgaria	Austria	Austria	Austria	Austria
2	Croatia	Belgium	Belgium	Bulgaria	Bulgaria
3	Cyprus	Bulgaria	Bulgaria	Croatia	Croatia
4	Czech Republic	Croatia	Croatia	Cyprus	Cyprus
5	Denmark	Cyprus	Czech Republic	Denmark	Denmark
6	Estonia	Czech Republic	Denmark	Estonia	Estonia
7	Finland	Denmark	Estonia	Finland	Finland
8	Greece	Estonia	Finland	France	France
9	Ireland	Finland	France	Germany	Germany
10	Italy	France	Germany	Greece	Greece
11	Latvia	Germany	Greece	Hungary	Hungary
12	Lithuania	Greece	Hungary	Ireland	Ireland
13	Netherlands	Hungary	Italy	Italy	Italy
14	Portugal	Ireland	Latvia	Latvia	Latvia
15	Romania	Italy	Lithuania	Lithuania	Lithuania
16	Slovakia	Latvia	Luxembourg	Luxembourg	Luxembourg
17	Slovenia	Lithuania	Netherlands	Malta	Poland
18	Spain	Luxembourg	Poland	Netherlands	Portugal
19	Sweden	Malta	Romania	Poland	Romania
20	United Kingdom	Netherlands	Slovakia	Romania	Slovakia
21		Poland	Slovenia	Slovakia	Slovenia
22		Portugal	Spain	Slovenia	Spain
23		Romania	Sweden	Spain	Sweden
24		Slovakia		Sweden	United Kingdom
25		Slovenia		United Kingdom	
26		Spain			
27		Sweden			
28		United Kingdom			
Percentage	71%	100%	82%	89%	86%

Source: Own calculation based on Sicherl (2014b).

the respective country line to target in 2020; for 10 EU countries, the current levels were not higher than their 2010 levels.

The most shocking conclusion is that the share value of growth fixed capital formation in GDP decreased in all 28 EU countries (100%!). The share of gross fixed investment in GDP indicates the relative effort to increase the fixed capital as one of the factors of production which together with the productivity of capital determines the medium/long-term rate of growth of GDP. Together with the worsened employment situation, this fact demonstrates the disastrous effects of the world financial system in the current depression on the GDP growth rates.

5 Time distance measurement for monitoring the target implementation and for goodness-of-fit

Monitoring target implementation is an integral part of policy making at many levels and in many domains. The innovation is that target implementation is described in two dimensions: static deviation from the line to target at a given point in time and S-time-deviation at a given level of the indicator.

Describing the implementation of targets as leading or lagging in time against the line to well-known targets

is a very useful application in the policy debate that enhances knowledge, giving data a value beyond spreadsheets. Expressed in time units, S-time-distance is easily understood by policy makers, managers, media and the general public, thus being an excellent presentation tool for policy analysis, and debate. It can help to form a new perception of the magnitude of the gap between the implementation and proclaimed targets for a given indicator as well as across more indicators.

The deviations were measured in two dimensions. Firstly, one can measure the difference in variables at a given point in time. And secondly, discrepancies in time (either time lead or time lag) are measured. Monitoring and evaluating the degree of implementation of policy or business targets are very important. Deviations from the line to target both at the public administration and at the enterprise levels, i.e. comparing actual values with target values, forecasts, budgets, plans, etc. can now be measured in two dimensions: static deviation and time distance deviation (see Figure 3).

People understand and feel time. The story-telling and the interpretation of the deviation of actual development from the line to target with S-time-distance measure are straightforward and intuitively understandable.

For each unit, the method deals with lead or lag of actual development against the line to their own target for the selected indicator. It is similar to tracking the actual arrivals in comparison with the train or bus timetable,

the difference being that the concept of geographical space is in this application replaced with the indicator space.

The characteristic that time distance monitoring is expressed in time units means that the results are comparable across variables, fields of concern and units of comparison, which makes S-time-distance an excellent complementary analytical and presentation tool for policy and business debate.

Table 2 shows possible scheme and numerical values for analysing time distance deviations regarding the implementation of five selected headline indicators towards the EU2020 EU and national targets. Such results would be available continuously for each year of actual development against the respective line to the target. In this table, only the latest available year is shown. In a single Gaptimer progress chart like Table 2, the results are summarized for the EU aggregate as well as for individual countries for their national targets for 5 selected EU2020 targets. The BrainPool report discussed indicator factors as well – salience for a broader audience and from the very broad discussion we would like to mention three elements: simplicity, ability to understand and to communicate. The intersection between indicator factors from public perspective and policy perspective is described with two elements: 1. be attractive to the eye and accessible, 2. be easy to interpret. Time distance measures are clearly meeting these two objectives.

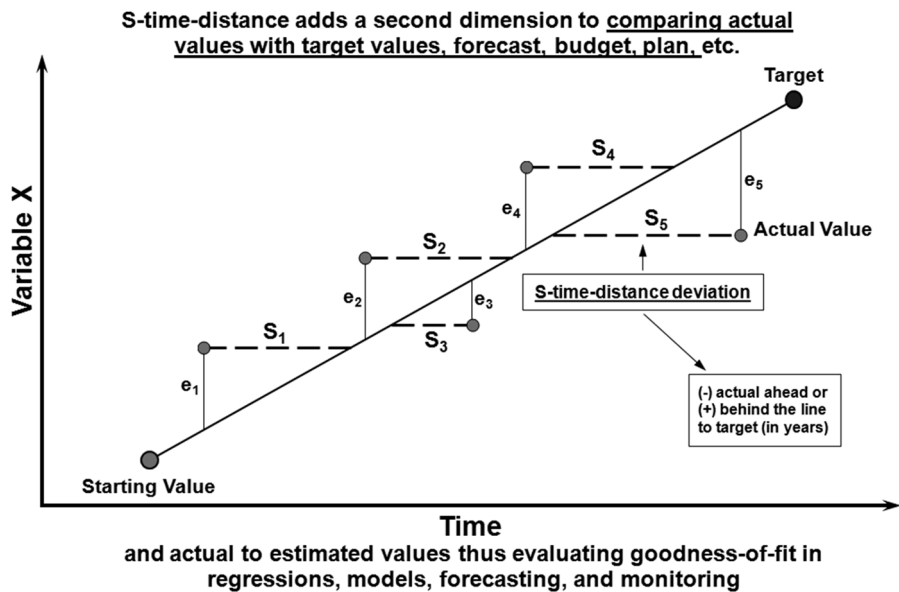*Figure 3:* **Monitoring: time distance deviations from the line to target**

Table 2: **EU28 time distance monitoring to the line to target EU2020**

	Employment rate - total (2015)	R&D in GDP (2014)	Renewable energy (2014)	Early leavers from education - total (2015)	Tertiary educational attainment - total (2015)
			(S-time-distance: (-) actual ahead or (+) behind the line to target (in years))		
EU28	2,6	2,9	-1	-2,4	-3
Belgium	> 5	-0,8	-0,4	-2,5	> 5
Bulgaria	2,7	0,5	TA	> 5	-0,4
Czech Republic	-4,6	TA	TA	> 5	-3,6
Denmark	3,3	TA	-5,1	TA	TA
Germany	TA	-1,6	-1,1	-4,4	2,6
Estonia	TA	> 4	TA	> 5	TA
Ireland	-4,6	> 4	-0,1	TA	2,6
Greece	> 5	-0,8	-3,3	TA	TA
Spain	> 5	> 4	-0,3	-1,2	> 5
France	4,6	2,9	1,9	TA	2,1
Croatia	> 5	3	TA	TA	-1,5
Italy	> 5	1,5	TA	TA	-4
Cyprus	> 5	-2,1	-1,2	TA	TA
Latvia	-4,5	2,6	-4,8	TA	TA
Lithuania	TA	1,1	TA	TA	TA
Luxembourg	4,1	> 4	0,7	TA	1,5
Hungary	-1,2	0,1	2,1	> 5	TA
Malta	-2,9	1,7	-2,6	2,1	-0,7
Netherlands	> 5	0,4	1,3	-4	TA
Austria	3,7	1,2	-3,5	TA	TA
Poland	-0,4	0,9	-0,4	3,9	-3,6
Portugal	> 5	> 4	-0,4	-3	-0,6
Romania	2,6	> 4	TA	4,8	-3,9
Slovenia	> 5	0,1	0,7	TA	TA
Slovakia	0,8	-1,5	-1,6	> 5	0,8
Finland	> 5	> 4	TA	0,2	TA
Sweden	TA	> 4	TA	TA	TA
United Kingdom	N/A	N/A	-0,5	N/A	N/A
Target achieved	4	2	9	13	12
Time lead	6	5	14	5	8
Time lag	7	12	5	4	5
Lower than 2010	10	8	0	5	2
Ahead of schedule	10	7	23	18	20
Behind schedule	17	20	5	9	7
TA = Target already achieved			Time lead		Time lag

Source: Own calculations based on data from Eurostat (2016a).

The Gaptimer progress chart in Table 2 is a clear example of simplicity with an overview of about 150 cases of EU2020 targets, showing in one single table the results over 5 selected EU2020 indicators, 28 countries, and the EU aggregate.

For time distance monitoring of target implementation for examples of indicators for EU2020 and UN Millennium Development Goals, SICENTER developed a software tool to facilitate interested users to use the method for their own data in such circumstances. The tool can be accessed at http://www.gaptimer.eu/s-t-d_monitoring_tool.html.

Without going into further details, the summary numbers show a very large difference between headline indicators. The last three indicators in Table 2 showed that about 20 countries were ahead of schedule; for early leavers and tertiary education in 2015 in more than 10 countries even their 2020 targets were already attained. For employment rate, these results show another quantitative expression of the severe employment situation in the EU: 17 countries were behind the schedule. What is worse, in 2015, 10 countries were below their 2010 starting values; in the language of S-time-distance deviation, they were more than 5 years behind the line to the 2020 targets. In other words, for 10 countries there was no progress in the 2010-2015 period with regards to the employment rate.

When it comes to the headline indicator renewable energy, more countries are ahead of schedule than behind it, but with fewer cases that already reached the 2020 targets. R&D in GDP indicates a different picture, with 7 countries ahead and 20 countries behind the schedule. Overall, it is closer to the employment rate situation compared to the other three indicators. In political terms, the implementation analysis is much more interesting when it is discussed in relation to national targets, which may vary substantively between countries.

In the EU 2020 context, the time distance methodology can be applied especially for benchmarking and monitoring implementation by complementing rather than replacing existing statistical measures. It may appear that some politicians, organisations, and experts might not like the additional information on the implementation of targets as it portrays a clear message understandable to everybody. On the contrary, for the media, NGOs, independent experts and international organisations, the improved transparency provides an additional instrument for strengthening the democratic debate.

If EU and national institutions would care to assess the S-time-distance measure by the same eight criteria applied for the selection of structural indicators by Eurostat (Munoz 2004) such as 1. Easy to understand, 2. Policy relevant, 3. Mutually consistent, […] 6. Comparable between countries, etc., then for this application for monitoring implementation of EU and national strategies S-time-distance would pass the test with flying colours.

Eurostat periodically publishes reports on sustainable development in the European Union covering a broad set of indicators beyond GDP. In the methodological part of the 2009 monitoring report of the EU sustainable development strategy (Eurostat 2009, p. 36), it was mentioned that one particular method which has been used in the analysis of certain indicators, may need explaining. "The so-called 'S-time-distance method' (Sicherl 2006) developed by P. Sicherl measures the distance to target in terms of time lag or, in other words, how many years the indicator lags behind its target path."

Eurostat published the report with the title "Smarter, greener, more inclusive? Indicators to support the Europe 2020 Strategy" (Eurostat 2016b), providing the situation with many headline indicators and other specific groups as well as the picture of the situation at the national level in relation to the Europe 2020 headline indicators. It provides detailed analysis across relevant economic, social, and environmental phenomena. Table 2 is built on the information of the Eurostat databases and it presents a useful addition in two respects: firstly, it is expressed in years (time lead or time lag) against the line to targets, which makes it easily understandable to general public; and secondly, it presents the overview of the results of nearly 150 cases in one single table. A similar application to monitoring Lisbon targets by successive years in the previous decade was given in this Review (Sicherl, 2008).

In addition to the within EU monitoring of targets, the new UN initiative of the 2030 Agenda for Sustainable Development (UN 2015) will expand these indicator activities to the EU countries. In the past, initiative Millennium Development Goals (MDGs) concentrated on developing countries. Now the setting of targets, actions, and monitoring of the implementation of these goals will be an important part of policy decisions and implementation in all countries, which will increase the relevance of the time distance methodology in this respect. On their Global development website, the Guardian published my article on time distance method of measuring implementation of MDGs, where Gaptimer progress chart summarised the situation over 7 world regions and 10 selected MDG indicators around 2010 (Sicherl 2013). An updated study "System for Monitoring Implementation of Targets: Present MDGs and Post-2015 SDGs" Gaptimer Reports, Vol. 4, (Sicherl 2015) is now available. The study offers a system for time distance monitoring implementation of targets for many areas and levels. The detailed application to present MDGs could be immediately applied for the post-2015 SDGs.

This outline offers an improved extended monitoring system that could be used in the operational work of Commission Services, across countries as well as across indicators. The additional time distance monitoring supervision can be a standard procedure in numerous other activities of the Commission. The same applies to national and local levels in hundreds of cases such as monitoring and evaluation implementation of budgets, plans, projects, structural funds, etc. It is difficult to understand why it is so hard to persuade Commission services to test and use such innovative methodologies in their work.

The time distance method brings the second dimension of deviations or disparities that the present state-of-the-art methodology has neglected so far. This semantics is clear and understandable to everybody and it communicates the message in the narrative for a policy debate that is beyond the message of the standard statistical tables. It can help to form a new perception of the magnitude of the gap between the actual implementation and proclaimed targets for a given indicator as well as across more indicators.

The time distance information seems to be at least as helpful in providing a proper perception of the progress in implementation or the lack of it as is the percentage difference. Over the years, much effort has been put into developing indicator systems and data coverage but not enough attention has been paid to finding new innovative ways and measures to utilise indicators in the next phases: knowledge building and policy use. This is a much more transparent way of monitoring the implementation of targets for governments and the civil society that can help to bring about continuous policy debate and adjustments.

Good governance does not use a setting of targets only to specify the vision and the desired direction but it also uses the feedback from the implementation as an indispensable phase of the policy process to adjust the future actions. This transparent innovative method for monitoring implementation at all levels is available but not utilised.

6 Summary and conclusions

The benefits of the new time distance view in comparisons, inequality measurement, competitiveness issues, benchmarking, target setting, and monitoring for economic, employment, social, R&D, and environment indicators at the world, EU, country, regional, city, sector, socio-economic groups, company, project, household and individual levels could be immediately applied to many indicators from a wide variety of substantive fields using existing data and indicator systems from international, national, regional, business and local sources.

In its role as a descriptive statistical measure complementing existing approaches, time distance can be applied literally to thousands of cases of time series comparisons so that additional information content embodied in countless databases in different fields of concern for socio-economic research is not left unutilised. In the information age, this additional view of the existing data should be evaluated as an important contribution to the more efficient utilisation of the information in many fields.

Measurement is costly and this novel generic statistical view should be evaluated as an important contribution of how additional insights could be more efficiently derived from existing data in many fields without affecting the current mostly static measures. There is no need to collect new data: one can start using the existing data and indicator systems from international, national, regional, business, and local sources.

Time distance is an innovative approach for looking at time series data. Expressed in time units, the approach is easy to understand and provides a useful complement to existing methods. The strength of the time distance concept is that it enables additional exploitation of data and clear visualization of time series. It is a generic concept, in the same way as static difference and growth rates; it provides an additional view to many problems and applications. Empirically, the degree of disparity may be very different in static terms and in time distance, which leads to new conclusions and semantics important for policy considerations.

The time distance measure can present one of the measures that produce knowledge and policy messages in a very understandable way to build both objective and subjective perceptions of the situation. It can influence one's perception and decisions when assessing one's relative position in the surroundings, in the society and across countries over time, which is very important. As said; understandable measures enhance transparency and encourage participation in dialogue and democratic debate (Giovannini 2008).

By providing an additional dimension of temporal disparity, the time distance approach has two advantages: Firstly, as it is expressed in time units, it is intuitively understood by policy-makers, professionals, managers, media, and the general public; secondly, time distance measure can be compared across variables, fields of concern, and units of comparison.

Especially in dealing with a wider set of fields of concern and a greater number of indicators (immanent in the Beyond GDP analysis), the additional view of the problem provided might be important for a more realistic evaluation of the situation, for the improved semantics of discussing the policy issues, and for

progress monitoring. By analogy, this methodology could be applied to numerous similar problems in business at the micro and corporate levels, for long-term, medium-term or short-term analysis.

The time perspective which no doubt exists in human perception when comparing different situations, adds an element of intertemporal aspect of well-being and progress. It leaves the static measures of disparity unchanged but the notion of the overall degree of disparity might change the understanding of the situation and the overall conclusion. In this context, three conclusions are underlined:

1. In addition to the use of S-time-distance as a descriptive statistical measure, the broad conceptual framework poses new interesting questions for growth and welfare theory and the related policy issues. Inequality within and between countries is a major challenge in the world and needs to be perceived and measured in both dimensions. Higher growth rates lead to smaller time distances, and influence the overall degree of disparity that is based on both static disparity and time distance. Static measures alone are inadequate. The relations between growth, efficiency, convergence, and perceptions are different in a dynamic concept of overall degree of disparity.

S-time-distance relates performance and efficiency with inequality in a novel way. It was argued that increased efficiency by leading to higher growth from the same resources, may at the same time lead to smaller time distances that in turn could mean greater social cohesion, enabling a more conducive environment for timely adjustment to changes supporting increased efficiency and effectiveness, and the 'virtuous' circle can continue. For instance, in this framework, the improvements through 'circular economy' initiative could have besides saving resources and fostering growth an additional indirect effect by decreasing the time distance of inequality.

Unfortunately, the 'vicious' circle works in the other direction. Inefficiency has important negative economic and political consequences as far as disparities are concerned. The consequences of the financial crisis of 2008 analysed in Section 4 across many domains put many EU countries in a situation of the double difficulty of diminished levels of indicators and slower growth rates or expectations resulting in the perception of higher time distances between groups, regions, and countries. The broad framework makes it easier to understand the wide unrest and dissatisfaction with the situation. Since immediate turnaround and sizeable substantial growth rates are not in sight the strategy at country and EU levels decision makers should in the medium term put policy emphasis also on direct improvements in the inequality domain to compensate for the detrimental effects of past inefficiencies that

resulted in the deterioration of social cohesion. In the short run, the efficiency improvements alone will not repair the damage done.

If one does not use the broader framework explicitly outlined here, there is a possibility that in political debate and policy formulation, various interest groups would intentionally look only at the specific statistical measure (like static absolute and relative disparities or time distance) that will suit their particular interest. For a better understanding of the reality, one should take into account all these aspects simultaneously.

2. The innovative time matrix presentation format enables compressed summary visual presentation over many countries and over time. This offers an additional understanding of the time dimension of disparities and a good summary overview over many units and years and also a first-level visualisation tool. SICENTER and the Faculty of Social Sciences at the University of Ljubljana prepared time matrix calculator tool www.timedistance. net that enables users to convert conventional timetables into time matrices.

The study 'European Union at a glance' presents an easily understandable overview of 30 selected indicators over 28 EU countries in the time leading to a major policy conclusion. The time matrix presentation format indicates at a glance that GDP underestimated the scale of damage of the financial crisis, showing much greater effect in the deterioration of employment rates, investment share in the GDP, in the increasing risk of poverty and increasing income inequality (from 71% or 100% of the EU countries).

3. A transparent innovative method for monitoring target implementation at all levels is available but not utilised. Monitoring target implementation is an integral part of policy making at many levels and in many domains. The two-dimensional measurement of deviations brings a new perception of the magnitude of the gap between the actual implementation and proclaimed targets in a more transparent way, it can help governments and the civil society in a broader understanding of continuous policy debate and necessary adjustments.

It resembles tracking the arrivals in comparison with the train or bus timetable, the difference being that the concept of geographical space is in our application replaced with the indicator space. The characteristics that time distance monitoring is expressed in time units means that the results are comparable across variables, fields of concern, and units of comparison, which makes S-time-distance an excellent complementary analytical, and presentation tool for policy, and business debate. The presented progress chart is a clear example of combining simplicity with the summary story of overview across about 150 cases of EU2020 targets (5 indicators x 28 countries, and the EU 28 aggregate). It is

a joy or nightmare of the possible transparency for the Commission, member countries, media, and interested public of citizens and entrepreneurs for the policy debate in the Beyond GDP framework. The monitoring framework can be used both for internal operations and/or for publication.

Since S-time-distance is expressed in time units it is easily understandable by managers, policymakers, professionals, media, and the general public. The time distance dimension of the overall degree of disparity provides an important component of understanding of the current economic and social circumstances at the world, national, local, and business levels, beyond what is detected by static measures of inequality alone. Potential users of the methodology and results are very many at various levels: international and national organizations, NGOs, experts, businesses, managers, educators, students, interest groups, media, and the general public. The time distance concept can influence the perception and decisions of people when they are assessing their relative position in their surroundings, in the society, and across countries over time.

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