

Empirical Analysis of Time in Relation to Economic Development. A System of Time Accounts

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A*bstract.* The paper proposes a new approach to the relation between socio-economic development and time. Measuring the economic development of a country by GDP it is obvious that the indicator is an insufficient measure in order to illustrate the progress of the society. National Time Accounting is a set of methods for measuring, comparing and analyzing how people spend and experience their time. The approach is based on evaluated time use or the flow of emotional experience during daily activities. In order to determine the level of development an international system of new statistical indicators was elaborated to express development through the quality of life growing. The indicators are related to the economic level of the country, living and environmental conditions, employment and the quality of human capital in labour market, but also they reflect the household activities, the balance between professional and private life of people, health condition. The U-index helps to overcome some of the limitations of interpersonal comparisons of subjective well-being.

Key words: time use, working time, economic development, time accounts

JEL classification: J22 - Time Allocation and Labour Supply

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Introduction

In the economic literature on economic growth and development there are plenty of theoretical and empirical arguments reflecting the economic growth factors as well as the labour, the capital, high technologies, research and developing (R&D). The aim of this paper is to identify the role of time use in the equation of economic growth and socio-economic development impact.

Economic development and the social progress of a country could be expressed using the GDP, but the indicator is considered at present an insufficient measure. In order to determine the level of development an international system of new statistical indicators was elaborated to express development through the quality of life growing. Time accounts consist of a set of methods in order to measure, compare and analyze the patterns of available time use.

If initially the economic development was an objective to grow the GDP, at present, the main objective is to view development over the GDP. The economic development couldn't be any more strictly separated from the social development, both phenomena being reciprocally conditioned. Moreover, in order to think the economic development of a society, the economic growth should reflect the quality of individual life.

In the next section of the paper I will present certain arguments referring to the relationship between time use and economic and social development:

- Time is the main source of the personal development that is able to ensure the necessary living earning, but also the connection with family members and its social life.
- Time allotted to work could be analyzed from two points of view: time used for paid work and time spent in non-paid household activities. In the first category, time has an important individual value, because of the importance of earning a primordial element of individual wellbeing growth.

At the same time, the time spent in non-paid household activities could be a factor of individual and social progress. In other words, available individual time spent out of the market, used in a large variety of leisure is not a measure of physical time. Its value is more than the value measured in hours and minutes. Generally, people use leisure in connection with their personal needs and conviction, life experience and the context of their living and working condition. This approach permits to say that social values and predominant traditions of a society (or a community) can influence the pattern of time use; the social

interaction (of family, group, community or society members) constitutes one of the major factors of social and economic development¹.

Social values, shared mainly in leisure time also affect the role of trust in economic, social or political relationships. We cannot determine which of the two major components of time is more important for individual welfare, but certainly their junction must be in balance.

- The relationship between economic development and the use of time and money may be also argued in a macro perspective. The economic component of the total available time in a national economy is an indicator that can be estimated using labor force data, expressed generally by the number and weight in total working age population (15-64 years).

In volume, increasing the potential time for work in a national economy (measured in conventional units of time - seconds, hours, days, etc.) can be achieved by the action of positive influential factors (e.g. increasing the number of persons employed) and those with negative action (e.g. reducing underemployment, mainly unemployment, increasing migration). Labour supply in the national economy is limited by the size of the active population and (mostly) of its age structure. For example, in Romania, 9.2 million people are persons employed and they use to work 40.5 hours per week (according to LFS, 2009). What could therefore be the ways to increase fund for work? According to own calculations, whether in one working day the working age population would use a single minute in addition to work, it could be the equivalent of an extra working time – in the national economy - more than 250 thousand hours.

Wasting time is also an issue to be considered carefully. To support the affirmation, we must bring into question the phenomenon of migration and its impact on working time. In this respect, the situation of Romania in the last twenty years was considered. In the early '90s, labour migration to Western European countries, especially the migration of young population, created a fund to reduce working time. The imbalance created then was not felt immediately in an economy in recession. Perhaps if they had not chosen the path of migration, most of migrants would have been unemployed today. Currently, it appeared that the migration of workers in the '90s has incalculable negative effects in terms of wasting time on national employment potential, but also in many other directions of economic and social life. The problems are amplified when the migrants are highly skilled workforce, a waste of time manifested both by reducing the

¹ In sociology it is often said that mere membership in the group can be a resource in itself.

potential for effective work, but also by wasting time and financial resources invested in education and training of migrants who studied in Romania.

1. Labour productivity - A qualitative dimension of time use in relation to economic and social development

Regarding the relationship between time and development it is not sufficient to analyze only the quantitative dimension of time. Labour productivity is an indicator of particular relevance to the use of working time in relation to economic growth and social development.

To analyze the qualitative aspect of time, it needs first to distinguish between the efficiency at which it is used during all of the individuals and company at the micro level as economic entities, and the efficiency at which the available working time of the national economy is used on labour market. Individuals use their entire complex value of knowledge, training and skills accumulation to optimize the value of the total time available. At the company level, how time is used can be reflected in human capital and technological potential available to the company, but it can manifest itself through its own system of time management¹.

Both at the individual and the company level, the time depends - largely – on the type of economic activity. For example, recall into question the economic *value of labour used per minute*. Let us consider two persons employed: the first works in a financial institution and negotiates a transaction, and second is employed in a workshop processing metal parts, turned polished pieces. The time in which two different economic activities is valued differently, even if we look only after the ratio of average monthly wages to average number of hours corresponding to both economic activities² (3167.8 lei/142.4 hours, respective 981.9 lei/151.5 hours³).

The efficiency at which time is used is also a topic of great interest. But we do not refer strictly to the time used for work. Regarding working time, for example,

¹ *Company-level empirical studies conducted have shown that there is a direct relationship between the quality of human resources and firm productivity: employees in better health are the direct source of innovation, creativity, and hence competitiveness.*

² *NACE Code 64 - Financial intermediation, except insurance and pension funds, and NACE code 25 - Manufacture of metals and metal products, except machinery and equipment.*

³ *Own calculation based on LFS, NIS, 2008*

there are certain countries where the highest share of working hours is included in high added value of economic activities. These national economies are characterized by high levels of labor productivity and thus higher levels of development. Growth theories in economics have emphasized the existence of such correlations. According to Eurostat data, among the EU Member States, the highest recorded level of labour productivity is registered in countries such as Luxembourg (191.2 EUR/hour), Denmark (91.5 EUR/hour). There are significant differences between countries, particularly between the Old Member States (EU-15), the New Member States (the ten countries that joined the EU in 2004) and the economies of the last countries that joined the European Community (Romania - 20.5 EUR/hour and Bulgaria - 13.4 EUR/hour). In Luxembourg, for example, the share of gross value added of agricultural activities carried on in all activities in the economy is 0.3%, while in Romania, the indicator is 7.5%. On the opposite sides we find the business activities and financial services in Luxembourg that recorded a weight of 49% and 15.7% in Romania, European Union average (EU-27) being 28.2% (according to Eurostat data, 2008).

1.1. Correlation between economic development and time use

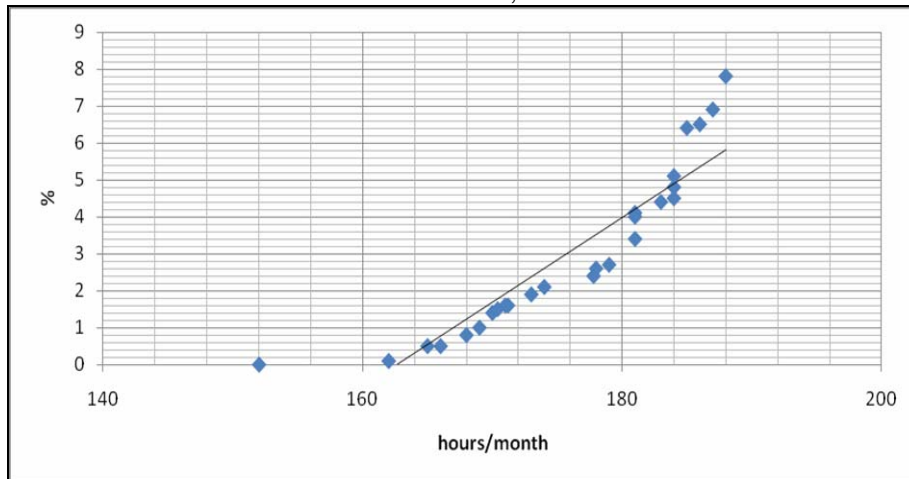
In general, the relations established between two or more economic variables can be described using mathematical models. Although economic and social phenomena are highly complex, being mostly oversized factorial design models and theories that simplify the real world can help us understand them more easily. The link between economic development and effective use of time in the economic process occurs through labour, in terms of two dimensions: quantitative and qualitative. Increasing the total available working time of national economy can be achieved by stimulating positive-acting factors (e.g. increasing the number of persons employed) and by counteracting the negative-acting (e.g. decreasing the unemployment).

To highlight the correlation between the level of economic development (measured by GDP growth rate) and time use, we construct a regression function:

$$Y = a_0 + a_1 X$$

where: Y is the growth rate of GDP in 2008, expressed in percentage compared to 2007, registered by the 27 European Union member states, X is the monthly average of employment, expressed in hours/month, and a_0 and a_1 are the regression parameters.

Figure 1. The correlation between GDP growth rate and working time in EU Member States, 2008



Source: own calculation, Eurostat Data Tree, 2009

The statistical significance of these results is provided by a smaller probability than the minimum threshold of significance ($p < 0.05$), which explains the 95% certainty that an average increase of one hour per month working time, the growth rate GDP would increase by 0.27 percentage points.

Table1. Regression Output

Dependent Variable (Y)	GDP Rate (%)	
Independent Variable	Working Time (hours/month)	
(a_j)	a_0 (-45.0036819)	a_1 (0.272427134)
Probabilities (P-value)	<0.05	
Observation: n=27		
R = 0.95		
R ² = 0.90		

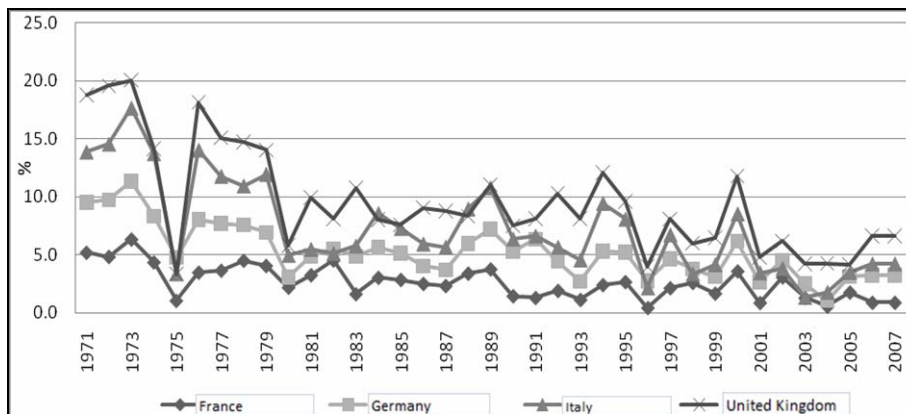
This relationship is not satisfied by P-value; on long-term it is one of the biggest problems that such a statistical model faces.

1.2. Correlation between economic growth and productivity

Also, growth theories have emphasized the existence of a strong correlation between labor productivity and national production levels. The productivity level reflects economic progress, and how a nation uses its available time may be one of the sources of growth. Always, people have strived to improve working tools, to create new ones with superior characteristics, improve methods of production organization in order to enhance the results of their efforts. In reality, all these efforts have found expression in the tendency to use available time effectively and increase productivity, basic conditions of economic development and overall progress of society. From this point of view, we may say that any economy can be reduced, ultimately saving time. The savings realized as a result of reducing the time required to produce one unit of product is undoubtedly the essence of all forms of efficiency, the most relevant utilization and exploitation of available factors of production. Employment and achieving higher yields per unit of time are key factors of economic growth, which directly contribute to the revival of national economy and hence social welfare.

According to the basic indicators calculated by the International Labour Organisation (*Key Indicators of the Labour Market* - KILM), in the period 1980-2007, labor productivity increased in most developed European economies (Figure 2).

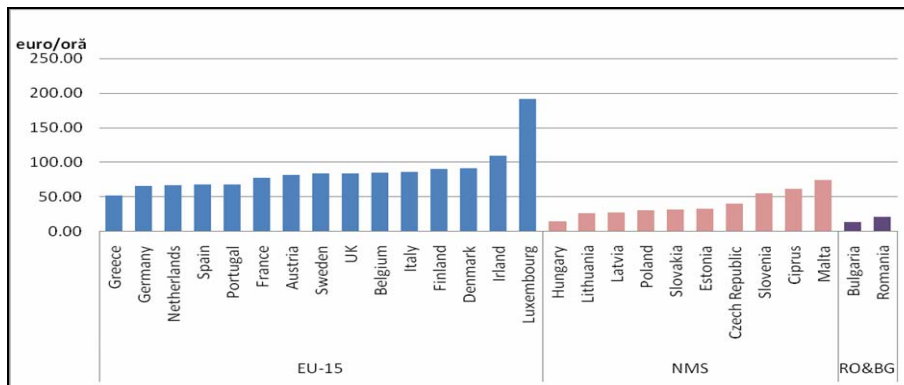
Figure 2. Annual growth rate of productivity in certain EU Member States (%)



Source: www.oecd.org/statistics/productivity.

Among the Member States of the European Union, the highest level of labour productivity is recorded in Luxembourg (EUR 191.23 per hour).

Figure 3. Productivity in certain EU countries, 2008



Source: calculation based on Eurostat data, 2009.

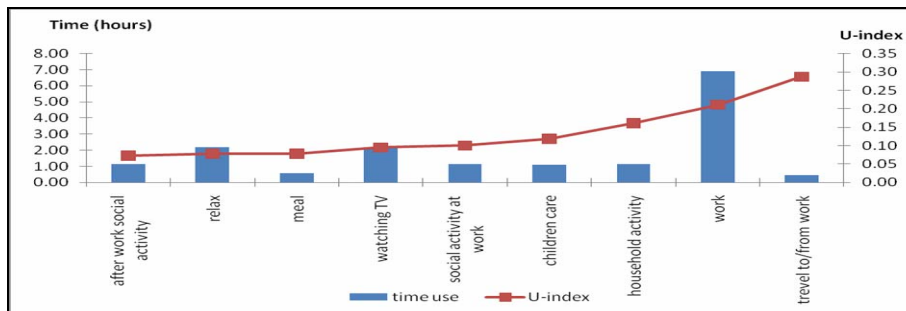
We notice significant differences between countries in terms of productivity levels, especially among the Old Member States (EU-15), the New Member States (NMS) and the economies of the last countries integrated into the EU (Romania and Bulgaria).

2. Time Accounts

To compare different levels of socio-economic development and welfare economics we have remove the criteria for assessing those with too high a degree of subjectivity, as welfare is most often measured by the GDP per capita. To capture as many components of wealth in recent years, some researchers studied different aspects of time use and proposed alternative methods of measurement, based on data from national surveys. In a recent study (Kahneman and Kruger, 2006), the authors calculated the so-called U-index, the ratio of time spent in activities that do not affect individual satisfaction to time spent in activities that bring them satisfaction (expression of the subjective measurement). The authors showed that respondents, who said they are less satisfied with the quality of individual life, use a larger share of available time in activities that give no satisfaction. The highest values of this index were calculated for work-related activities (Figure 4), which means that they are the

least desirable activities (e.g., over 30% of the time shift at work is spent in a dominant negative state).

Figure 4. The time spent in some daily activities and values of U-index



Source: Alan Krueger and Daniel Kahneman, "Development in the Measurement in Subjective Well-Being", 2006.

Box 1. Measuring subjective well-being

The findings show that the female population employed in the United States spend, on average, 17.7% of the time available in a day (24 hours) in activities that bring no satisfaction. U-index varies inversely with household income. Also, the level of welfare varies according to age, function in the form of a U-shaped curve: those of group 18-24 years spend on average 22% of the daily activities that do not bring satisfaction, compared with 19 % for persons 25-44 years group and 21% for 45-64 years. The level of satisfaction was rated on a scale from 0-6 for a sample of 909 employed female persons in the U.S.

Source: Alan Krueger and Daniel Kahneman, "Development in the Measurement in Subjective Well-Being", *Journal of Economic Perspectives*, vol. 20, p. 3-24, 2006.

Based on the study mentioned above, in 2007, Krueger has devised a system of time accounts as a tool for measuring subjective well-being¹. The system is a set

¹ Alan Krueger (coord.) *National Time Accounting: The Currency of Life*, Princeton University & NBER, 2008.

of methods for measuring, comparing (spatially and temporally) and analyze the ways in which people use their available time. Krueger's arguments in favour of the usefulness of a system of time accounts, as an alternative method of measuring welfare is based on the fact that macroeconomic aggregates (such as: Gross Domestic Product, National Income), determined by the System of National Accounts, are partial measures of welfare. One of the limits of national accounts is that it quantifies the value of social activities, although the time allocated to inter-human relations can have significant effects on subjective well-being. In Table 2 we present some results of the study, such as U-index values and durations of time allocated - on average - on employment activities, as a percentage of total daily activities. The research was conducted on a sample of employed female persons (810 U.S. and 820 in France), aged between 18 and 68 years.

Table 2. U-index and the participation rate in some daily activities in France and the United States of America

Daily activity	U-index		Participation rate (%)	
	USA	France	USA	France
walking	0.04	0.09	0.63	1.69
exercise	0.06	0.03	0.88	1.21
games	0.07	0.02	1.47	1.26
reading (outside work)	0.09	0.07	2.97	4.36
dinner	0.10	0.09	5.22	11.11
watching TV	0.12	0.14	7.07	7.32
relaxing	0.13	0.13	2.88	2.85
meal preparation	0.14	0.13	2.92	3.29
verbal communication (outside work)	0.14	0.12	9.35	11.58
household work	0.18	0.23	5.91	5.16
sleeping	0.18	0.15	2.70	2.32
shopping	0.22	0.20	4.86	4.35
personal computer (outside work)	0.23	0.22	2.52	2.28
care of children	0.24	0.11	6.85	4.50
travel to/from working place	0.27	0.26	2.22	1.68
paid work	0.29	0.26	22.10	20.12

Source: Alan Krueger, *National Time Accounting: The Currency of Life*, 2006.

The table shows some differences between the two countries, the level of satisfaction of the female population, determined on the basis of data on time use. Thus, females in the U.S. spend, on average, 24% of the time used for child care in a mainly negative state, compared with those in France who consider this work more enjoyable (U-index = 11%). Also, household activities are considered less agreeable to the population of France (23%) compared with the U.S. (18%). Of total daily time available (24 hours), 22.1% is used by the U.S. female population for paid work, while the participation rate of women in such activities in France is two percentage points lower.

Conclusions

The process of deindustrialization of the Romanian economy in the period 1990-2010 and the future "reindustrialization" recommended by experts raise an entirely new way of thinking as regards the use of time, including the review of policies and directions of educations and training of skilled workers, through an economy based on knowledge, entrepreneurship and creativity.

In a competitive economy, the quality of human capital contributes in a substantial manner to the increase of economic performance and social progress with a significant added value resulting from the better use of working time and its management. The reindustrialization of Romania, in the context of internal and external factors of influence, has a direct impact on the development pace of the national economy, represents a "sui generis" challenge which addresses needs a new vision and approach to time efficiency. Assumptions of this approach are given below:

- Relatively low level of socio-economic development of Romania, which requires more intensive and productive use of available national time to cope with economic needs of convergence, solidarity, cohesion and social inclusion stated by the major objectives of the EU economic and social policy;
- Knowledge-based society, digital divide, globalization process and sustainable development requirements impose new standards of quality in efficient use of time and closer connectivity of Romania to the global processes;
- Romania's EU accession requires the implementation of the "Acquis Communautaire" norms and standards within a complex SWOT analysis revealing strengths, weaknesses, opportunities and threats of the integration

process under the new auspices of time use philosophy and of European social model, competition and cooperation;

- The negative impact of international financial and economic crisis and the national waste of time, which accentuates the problems of structural unemployment, whether spontaneous or seasonal, it needs a long term priority in the field of training, skills and job creation in the labour market.

A more efficient use of time depends on the quality of the national education system, lifelong learning, quality of life, and labour migration political and economic stability.

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