Statistics, Knowledge and Governance [(*)]

Enrico Giovannini

Joaquim Oliveira Martins

and

Michela Gamba [(*)]

Abstract

This paper reviews the role of statistical information in economic and political systems. It discusses how the production of knowledge in a decentralized way is fundamentally different from the traditional production of information in a centralized way by National Statistical Offices (NSOs). An empirical case study using data from the Eurobarometer Survey shows that trust in the statistical system is related to trust in governance institutions (government, parliament and EU). A final section discusses different avenues for constructing indicators of societal progress.

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(*) OECD Statistics Directorate. Contact author: joaquim.oliveira@oecd.org. The views expressed are those of the authors and do not necessarily reflect those of the OECD or its Member countries.

1. Introduction

The functioning of a modern democratic society needs a common knowledge base about its economic, social and environmental characteristics. The comparison of the evolution of these characteristics over time and *vis-à-vis* other nations can highlight risks and opportunities and inform the public debate about policy actions. It is part of the governance system.

The importance of information in economic and political processes is widely recognised by modern theories. This information, coupled with the advancements in Information and Communication Technologies (ICT) has changed the way in which markets and societies work. Several studies have analysed the characteristics of the knowledge society, as well as its impact on the production of official statistics.

In this paper we will try to discuss the role of statistics in building a knowledge society and improving the democratic control of policy makers. This issue is especially important because the development of information and communication technologies (ICT) dramatically reduced the cost of producing statistics: therefore, nowadays a huge number of organisations are able to produce statistical figures and indices, frequently picked up by media, just for advocacy purposes and this contributes to create a sense of "confusion" often reported by citizens about the real state of the economy and of the society. This "noise" does not help at all citizens to make the best possible choices, including the electoral ones, and this is not a good thing for the functioning of economic markets and the democracy.

After reviewing briefly the role of statistical information in economic and political systems, an empirical case study using data from the Eurobarometer shows that trust in the statistical system is related to trust in the governance institutions at the national and the EU level. Then, we illustrate how the production of knowledge is fundamentally different from the traditional production of information in a centralized way by National Statistical Offices (NSOs). A final section discusses different avenues for constructing indicators of societal progress.

2. Role of Statistics in building a Knowledge Society

2.1 Information and Expectations in Economics: a brief overview

In the context of Walrasian equilibrium, economic agents are supposed to not only act in a perfectly rational way, but to also be fully *informed* about relevant economic facts, such as the quality of goods, prices, etc. This assumption has been frequently criticized. The introduction of asymmetric and incomplete information in economic models stimulated new approaches in microeconomic, macroeconomic and public economic analyses. For example, Akerlof (1970), studying the market for car "lemons" (i.e. the market in which the seller has private information about the quality of goods supplied, while the buyer has not) demonstrated that, in such a situation, the buyers have to make an expectation on the quality of the car and that, in equilibrium, only bad quality cars are sold. Rothschild and Stiglitz (1976) applied this approach to insurance markets and

the key common conclusion of these studies is that, under certain assumptions, a bad allocation of information could lead markets to failure.

Information plays a key role in the formation of expectations. When economic decisions are to be taken under uncertain conditions, expectations on future or uncertain events must be formulated, especially on events that are not completely under the control of the decision maker. In a very general sense, an expectation can be seen as a value coming from the joint probability distribution of the variables concerning the decision process. As Lucas (1976) wrote, "at a purely formal level, we know that a rational agent must formulate a subjective joint probability distribution over all unknown random variables which impinge on his present and future market opportunities"[1].

The problem here is that information is costly. Therefore, it is possible that, in practice, economic agents do not act as the theory predicts, for example by only looking at mean values or variance measures. In this case, simpler decision-making procedures (so called *naïve* procedures) can be used. For example, a "static expectation", i.e. an expectation on the future value of the variable X_t can be calculated as:

$$X_t^e = X_{t-1} \tag{1}$$

where X_t^e is the expected value. This simple model can be improved by considering the past trend and not only one period past value:

$$X_t^e = X_{t-1} + \alpha \cdot (X_t - X_{t-1}) \tag{2}$$

but what is clear is that in these naïve models the only relevant information set is based on the past history of the variable X_t and agents learn nothing from past errors.

This latter element is considered in the so called "adaptive expectations", developed first by Cagan (1956) and Nerlove (1958). In this case we have the following model:

$$X_t^e = X_{t-1}^e + \lambda \cdot (X_{t-1} - X_{t-1}^e) \tag{3}$$

where $(X_{t-1} - X_{t-1}^e)$ denotes the error term of past evaluating procedure, and λ is the coefficient of "error learning". So, in an adaptive expectation model the decision-maker learns from the past and his choice is sensitive to changes in the past information set. The adaptive model can be considered a step-by-step judgment correction, by continuous approximations, from a "wrong" expectation to the "correct" one. If we consider $E^o(X) = E(X|I_o)$ as the expected value of a variable constrained to start from the information set I_o, and then we move to another richer informative situation Z, then we have $E(X) = E(X|I_oZ)$, where $E(X)$ denotes the new expectation. From Bayes theory we know the latter could be written as:

$$E(X) = E^0(XZ)/E^0(Z) = E^0(X) \cdot E^0(X|Z)/E^0(Z) \tag{4}$$

This equation shows that the final probability is the normalised product of the starting probability $E^o(X)$ to likelihood factor $E^0(X|Z)$ and that the higher the likelihood value, the higher the knowledge of X validates Z information set. Therefore, learning from the

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[1] For example, a decision maker can look at distributional moments of prices and output level, and choose his strategies maximising his utility function and minimizing the risk beneath uncertainty.

past is a way by which the past information I_o, including past expectations, is enriched by new information set Z, containing the true value realised in the past.

Based on Muth (1961), the concept of "rational expectations" was introduced in economic theory by Lucas in the 1970s. Muth considered adaptive process a way of wasting information, because not all relevant facts are taken into account in that kind of "step-by-step" process. The forecast based on the adaptive model is therefore suboptimal, due to the fact that individuals persist in systematic errors[2].

In contrast, in rational expectations models, expectations tend to equalise for the same information set the objective prediction of the theory. Therefore, the subjective probability distribution, on average, is equivalent to the objective one emerging from the econometric model that describes the expectations' formation process, because a rational agent exploits all available information, including the model which describes the interaction among variables.

The most important policy applications of this approach were identified by Lucas (1975), who included the rational expectations hypothesis into macro-economic models. His starting point was the work of Grumberg and Modigliani (1954) who suggest that public predictions could support private ones, warranting their true values. In particular, they assume that a public prediction is published by a public authority, or by a private agent with a better information position. The consequence of this distinction is that the response of individual agents to the publication of a public prediction may actually increase their predictive abilities. If individuals react to the public prediction, the event which will actually occur will be different from the one which would have occurred if no public prediction had been made. The authors also show that the assumption necessary to enforce public predictive warranty for individuals is that the forecaster includes in his model all variables relevant for the formation of agents' expectations.

In this context, if agents act in a rational way, a policy maker could not make a correct prediction of the impact of a specific decision using an econometric model based on the past economic structure without considering how the agents react to the new policy decision. In fact, agents will internalise the new policy decision in their models and will change their behaviour, therefore, making the models based on the latter totally obsolete.[3] It is important to note here that expectations may have important consequences for economic development as Krugman (1991) has shown.[4]

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[2] As Friedman (1962) wrote, "individuals are not fools – or at least some of them are not"

[3] First, economic policies cannot be based on traditional econometric models, but only on models that consider the reactions of the agents to policy changes. Second, policies based on fixed and announced "rules" are better than those based on discretional interventions, because random choices could not be included in agents' expectations, making econometric forecasts undetermined. Lucas then totally reverses the implications of Modigliani and Grumber model, due to the fact that for him all agents have the same information set and the same knowledge of how expectations are formed.

[4] Krugman (1991) showed that in a model displaying multiple *equilibria* a country may be lock-in by history depending basically in three conditions. When the future is heavily discounted, individuals will not care much about future actions of other individuals, and this will eliminate the possibility of self-fulfilling prophecies. In some sense, the greater the impatience, the more individuals will be prisoners of history. When external economies are small there will not be enough interdependence among decisions and history also dominates. Another case of strong path-dependence is when an economy adjusts slowly. If adjustment is slow, factor rewards will be near current levels for a long time whatever the expectations, so that factor reallocation always follows current returns. Krugman showed that in order to escape from

The importance of information and expectations for development provide a rational for the role of official statistics, which, of course, are integral part of the information set available to all agents. For example, if there is "confusion" or "noise" among economic agents about the "true" price level, both for specific products and for the whole basket of goods and services, this can bring about suboptimal decisions and produce macroeconomic effects, at least in the short run.

More generally, if economic agents do not trust available statistics, the economic system can suffer because of this uncertainty[5]. The connection between the credibility of official statistics and the functioning of economic markets is extremely important in modern societies, where media play a key role in influencing public opinion and expectations about future economic developments. Statistics have been developed to go beyond what individuals can observe at a reasonable cost and nowadays statistics produced by public institutions according to high quality standards, developed in an impartial way, disseminated to all agents at the same time are considered a "public good". Some international organisations have a role of watch-dog to verify that key statistics produced at national level are produced according to internationally agreed standards.

2.2 Information and the Political system

Information plays an important role not only in economic models, but also in "public choice" models, in the so called "positive political theory", based on rational choice modelling and on analytical conclusions reached by the economic theory. Downs (1957) first introduced rational models for the political choice of individuals, considering the election mechanism as a "market" in which politicians supply different political platforms which are demanded by voters, who have to decide whether and how to vote. To do that, the generic voter estimates a "party differential", *i.e.* the difference between the expected utility derived from the choice between various (normally two) parties' candidates. A voter whose differential between parties is non-zero subsequently takes into consideration the cost of voting: to vote, the cost of voting must be lower that the "discounted utility" of voting, calculated using the likelihood that his vote will make a difference in the election.

Importantly, one of the components of the voting cost is the cost of collecting information: acquiring information about candidates and policies can be very expensive and the value derived from this search must be discounted by the fact that the individual has little impact on the final outcome of the elections. Thus, the citizen is viewed as a "rational ignorant" and the obvious impact of missing or limited information on political issues is that the percentage of informed voters in elections could be very little - not a good thing for democracy.

Downs' conclusions are not only important to understand individuals' behaviour, but also to evaluate the nature of political outcomes in a democracy. Hotelling (1929) had already demonstrated that two political parties competing for the votes of citizens,

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such an underdevelopment lock-in, an expectation-driven equilibrium exists when $r^2 < 4\beta\gamma$, where r is the rate of discount, γ the speed of adjustment and β the strength of increasing returns.
[5] See Giovannini (2007) for an example of loss of confidence in official statistics based on the case study of the Euro changeover.

whose preferences were spaced along a one dimensional policy space, will converge on the median voter's ideal point. Building on this, Downs observes that a large measure of ideological consensus is necessary for a stable and effective two-party democracy, because a lack of information could encourage several parties to take up positions favoured by large clumps of voters, resulting in political instability.

Wittman (1973) better specifies this process, considering the fact that voters cannot perfectly monitor and sanction candidates, so the ability of politicians to adapt their own preferences in response to the voters' seems to be a negative function of the voter's awareness. Alesina (1988) argues that convergence between parties' electoral programmes depends on their ability to commit to campaign platforms, which may depend on the presence of indicators that permit citizens to hold politicians accountable for their campaign promises. Once they are elected, in the absence of indicators to monitor if their actions coincide with their campaign platform, parties' commitments during the campaign can be totally ignored afterwards.

McKelvey and Ordeshook (1986a, 1986b) show that the presence of some uninformed voters does not change equilibrium behaviour. When voters are totally uninformed, the democratic process ensures equilibrium as if they were totally informed, in the sense that median voter behaviour will emerge from elections even with limited information sets. This could suggest that the democratic mechanism is a way to minimise information costs, in the same way that the perfect market does. As an economic agent only needs to know the prices of goods he wants to consume or produce, a democratic voter only needs to know the candidates and the election mechanism[6].

The case of incomplete information leads to the introduction of the principal-agent theory into the political process. Political elections are seen as incomplete contracts between a principal less informed (the voter) and an agent (the politician) who has to achieve the principal's goals in an incomplete information structure. If a representative democracy is a form of state in which people have the control of government choice, through elections voters have the opportunity to achieve four major objectives: aggregate their personal preferences, making clear to politicians their welfare function; aggregate dispersed information about the correct political decisions; solve an adverse selection problem by selecting the best candidates; mitigate moral hazard problems by holding elected officials accountable for their actions.

The major problem is that, contrary to the principal-agent link in a market, the principal does not have a proper indicator at a reasonable cost (such as price), that can drive the politician's actions. The most politicians can commit is an input (public expenditure, tax

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[6] This consideration comes out from Condorcet theorem, demonstrated in the 18th century. Condorcet assumed a group of voters facing a binary judgment problem, such as: he is accused - is he innocent or guilty? Each voter is supposed to be correct with a probability of p ≥ 50%. Assuming that the voting mechanism is the majority rule and that voters vote *independently* (i.e. without being informed of others' ballots), then a majority will be correct with a probability greater than p, and the probability that the majority is correct approaches 100% as the size of the group tend to infinite. Judgment accuracy is improved merely by using majority rule. The most critical hypothesis here is that voters vote independently: however it is clear that someone votes together with positive correlation, and this correlation is a positive function of information lacking. In this case majority rule out-performs the average individual judgment as long as this correlation is low. But if public information is not available for all voters, probably the less informed voters will follow opinion leaders, or public polls, or eventually will not vote at all, with a clear degradation in the democratic process.

rates, etc.), not an output (economic growth, low inflation, etc.), a programme not a result. They can commit themselves on variables they control, but the promised results depend on the reliability of the commitment and the solidity of the theory used to identify instruments and evaluate expected results.[7]

The stick and carrot (*i.e.* the sanction of no re-election, the premium of being re-elected) mechanism only works if there is a proper measure of outputs/outcomes delivered by a certain policy. Of course, statistical information plays a great role in this process: in fact, in a world of costly information, rational citizens will spend more time informing themselves about their own private purchases than about public policies, for which their efforts will have little effect. Therefore, voters, like shareholders of a large firm, face the difficult task of monitoring the activities of large hierarchies staffed by people who have information and expertise that is unavailable to the average voter.[8]

3. Statistics and Trust: a case study based on the Eurobarometer survey

From the previous discussion, the relation between the trust in statistics and in governance institutions is therefore an important point that to assess empirically. To this aim, we used the Standard Eurobarometer. This survey carried out by the European Commission covers the population of the respective nationalities of the EU member states, resident in each member state aged 15 years old and over.

The Survey consists in a total of 30,224 individuals interviewed between the 10th April and 15th May 2007. The questionnaire consisted of 74 questions- 58 questions attempting to measure wide aspects of the community life, spanning from global warming, to the sentiment of EU citizens towards policy issues such as globalisation, trade, trust in institutions as well as in official statistics; and 16 demographic questions contextualizing the socio-economic lives of the respondents. Based on this dataset, we test whether there is any significant relationship between the importance of statistics and the trust people have in official data, as well as in EU institutions such as the Parliament, the European Union and the national government.

A selection of OECD countries among the EU group was made, which reduced the sample to 22,624 observations.[9] A selection of seven questions from the core part of the questionnaire plus eight questions (control variables) from the demographic and socio-economic questions were carried out. Since almost all questions in the questionnaire return qualitative closed-answers based on a Likert scale, all the variables selected have been transformed into binary variables (0, 1) assigning 1 to the event of interest (*i.e.* trust in EU institutions) and 0 to the opposite event (*i.e.* no-trust).[10] To avoid potential multicolinearity, we created an aggregated variable for the trust in institutions (government, parliament and EU). Indeed, these three variables are highly correlated to each other (see Table A.2 in the Annex). This variable takes the value of one when the individual has trust at least in two institutions among the three considered. Figure 1

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[7] If the theory (i.e. the process through which political inputs generate outputs/outcomes) is weak, there will be incredulity about the results that are supposed to be provided.

[8] A similar relationship exists between politicians and bureaucrats (see Niskanen, 1971 and Holmstrom, 1979).

[9] Note that OECD accession candidate countries, such as Estonia and Slovenia were left in the sample.

[10] See Annex for the correspondence between the Eurobarometer questions and their coding in our dataset.

displays the positive bi-variate relation between trust in statistics and trust in institutions on cross-country basis. The relationship is rather strong. In the top right of the chart, countries such as Netherlands, Finland and Denmark emerge as having the strongest percentage of respondents having both trust in statistics and institutions, whereas France, the U.K and Hungary have the lowest percentage of positive opinions. In Poland and the Czech Republic, trust in statistics is not matched by trust in institutions.

Figure 1. Trust in Statistics vs. Trust in Institutions
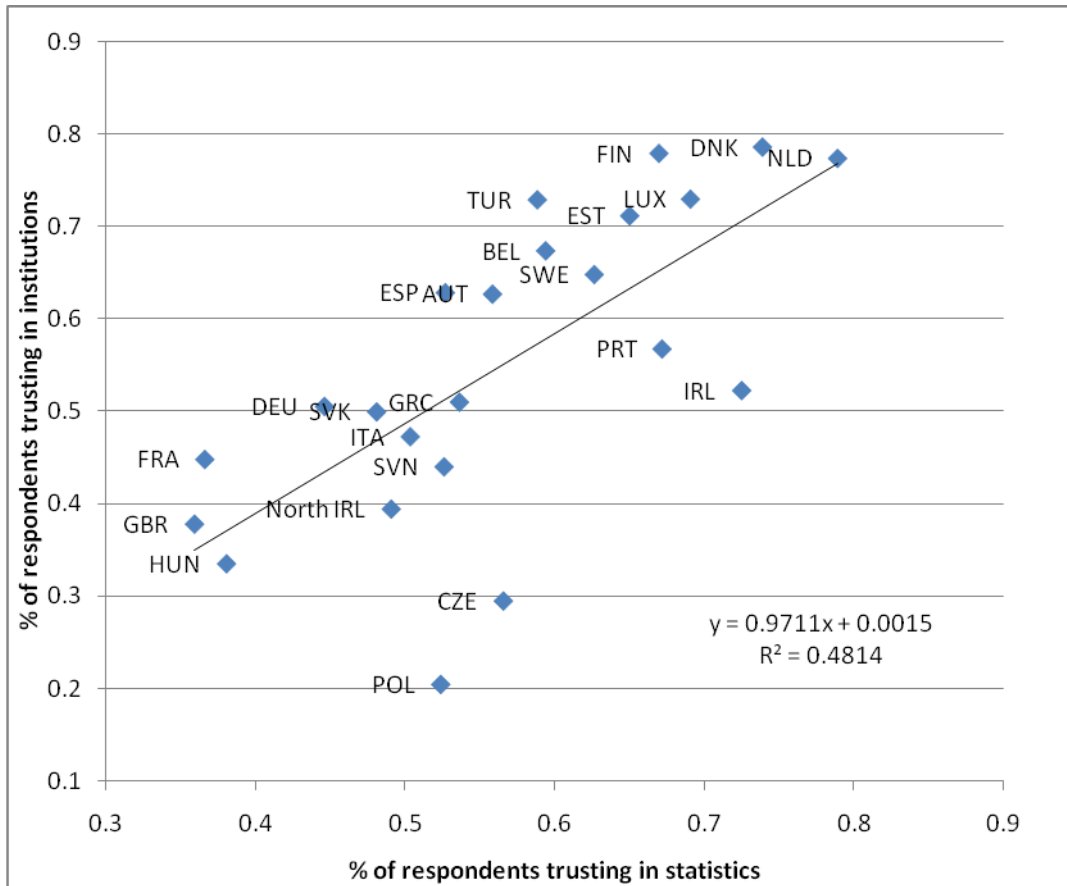
Source: Eurobarometer Survey

For the econometric test, all countries are pulled together and no geographical areas have been identified so the outcomes refer to Europe as a whole. We estimated the relation using both simple OLS and a logistic regression approach (Logit) over the dependent binary variables of the model. We control for a number of demographic and socio-economic factors, such as civil status (married or not), children, education level, gender, age, employment situation and use of ICT equipment. We also included in the regression a latent variable capturing whether the individual feels that his/her situation has improved over the recent years. In order to control for possible endogeneity among the three variables, we also carried out an instrumental variable estimation using the GMM method (Tables 1 & 2).

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Table 1. Effect of Trusting Statistics on Trusting Institutions

Dependent variable : *Trust in institutions*	(1) OLS	(2) OLS with country FE	(3) Logit	(4) Logit with country FE
Trust in Statistics	0.282***	0.253***	1.200***	1.169***
	(0.0073)	(0.0073)	(0.033)	(0.035)
mood_improv	0.104***	0.0841***	0.472***	0.417***
	(0.0076)	(0.0077)	(0.035)	(0.038)
rural	0.0284***	0.0147*	0.131***	0.0718*
	(0.0080)	(0.0079)	(0.037)	(0.039)
ICT	0.0290***	-0.0135	0.132***	-0.0664
	(0.0082)	(0.0085)	(0.037)	(0.042)
edu	0.0381***	0.0331***	0.174***	0.162***
	(0.0057)	(0.0057)	(0.026)	(0.028)
status	0.0144*	0.0225***	0.0655*	0.111***
	(0.0078)	(0.0076)	(0.036)	(0.038)
children	0.0253**	0.0194**	0.116**	0.0997**
	(0.0098)	(0.0094)	(0.045)	(0.047)
age	0.00311***	0.00209***	0.0142***	0.0104***
	(0.00034)	(0.00034)	(0.0016)	(0.0017)
sex_male	0.0212***	0.00956	0.0987***	0.0505
	(0.0073)	(0.0071)	(0.034)	(0.035)
managers	0.0562***	0.0571***	0.267***	0.299***
	(0.017)	(0.016)	(0.078)	(0.081)
other_white_collars	0.0174	0.0348**	0.0792	0.176**
	(0.017)	(0.016)	(0.077)	(0.080)
manual_workers	-0.0133	-0.0248*	-0.0578	-0.116
	(0.015)	(0.015)	(0.069)	(0.072)
house_person	0.0867***	0.0468***	0.397***	0.229**
	(0.019)	(0.018)	(0.087)	(0.089)
unemployed	-0.0293	-0.0317	-0.125	-0.145
	(0.020)	(0.020)	(0.092)	(0.096)
retired	-0.00132	0.0119	-0.00634	0.0576
	(0.016)	(0.016)	(0.074)	(0.078)
student	0.0808***	0.0649***	0.367***	0.319***
	(0.020)	(0.019)	(0.091)	(0.095)
Constant	0.0856***	0.318***	-1.854***	-0.909***
	(0.024)	(0.034)	(0.11)	(0.18)
Observations	17781	17781	17781	17781
R-squared	0.12	0.19	.	.

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Trust in institutions combines trust in national government, parliament and the EU. Coefficients for country dummies are not shown. The meaning of the acronyms for control variables is provided in the Annex.

Table 2. Effect of Trusting Statistics on Trusting Institutions, with control for endogeneity

Dependent variable : *Trust in institutions*	(1) IV-GMM method
Trust in statistics	0.464***
	(10.3)
mood_improv	0.0696***
	(7.76)
rural	0.0167**
	(2.01)
status	0.0173**
	(2.17)
children	0.0173*
	(1.74)
age	0.00220***
	(6.34)
sex_male	0.00454
	(0.60)
managers	0.0458***
	(2.74)
other_white_collars	0.0228
	(1.35)
manual_workers	-0.0349**
	(-2.29)
house_person	0.0249
	(1.30)
unemployed	-0.0355*
	(-1.72)
retired	-0.00340
	(-0.21)
student	0.0571***
	(2.87)
Constant	0.306***
	(7.88)
Observations	16984
R-squared	0.15

Notes: Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Trust in institutions combines trust in national government, parliament and the EU. Coefficients for country dummies are not shown. The meaning of the acronyms for control variables is provided in the Annex. The instruments used are importance_stat, edu and ICT.

These results illustrate the strong linkages between statistics and governance institutions. The trust in statistics (Q58, "Do you trust in official statistics in your country") is statistically significant among these respondents that trust in institutions (Table 1). The results show a strong robust and positive relationship between these two variables for the different types of specifications tested. In addition, the trust in institutions appears to be also influenced positively by the mood of the individual (whether his/her situation has improved over the last 5 years), the level of education and the use of ICT equipment. This shows also the importance of the human capital and technological dimensions.

4. The evolving role of statistics as a public good

4.1 Challenges for the Official Statistical Systems

Because of the power of information in our societies, all individuals need more than ever statistics to make their decisions, including the voting ones. In this context, the value added of official statistics depends on its capacity of creating knowledge in the whole society, not only among policy makers. In addition, globalisation, technological revolution and cultural change are generating new challenges for the official statistical systems.

Globalisation fosters the demand for internationally comparable statistics, as well as national data. This demand for very timely data, with a detailed sectoral and geographical breakdown, is mainly due to the growing role of multinationals and international investors, which need to make decisions about the re-location of production processes or the investment of available funds. But also millions of enterprises need data to decide where are the most dynamic markets, the most skilled workers, etc.

The development of a culture of "evidence-based decision making", together with the transfer of some decisions from the State to individuals and the growing opportunities created by globalisation, has stimulated an unprecedented growth in the demand for statistics by individuals. Millions of people are looking for the best opportunities to study, to work, to spend their life once retired from work, etc.

An increasing demand is also generated by the monitoring policy outcomes through statistical indicators is a common practice in a growing number of countries and at international level. This is one of the key elements of the peer-pressure mechanisms.

The development of statistical methods and ICT have reduced the cost of producing statistics, fostering the presence of new "agents" in the market of statistical information, including NGOs, private companies, lobbies, etc. This multiplicity of sources may produce a "cacophony" in our societies, where users feel bombarded by data and have a growing difficulty to distinguish high and low quality statistics. Often, mass media love "numbers" and quote them as much as possible, without paying attention to their quality.

New ICT tools and the success of Internet are deeply changing the way in which people, especially new generations, look for and find data. According to the Internet experts, 95% of those who use Google do not go beyond the first page of occurrences; once they reach a particular site, a similar percentage of users do not click more than three times to find what they want: if after three clicks they have not found what they are looking for, they quit the site.

4.2. From "information providers" to "knowledge builders"

Looking at these pressures coming from global changes, some actions can be suggested. First, it seems important to create a forward/outward looking culture in statistical institutes, to be able to provide the most relevant information for the whole society and

its different parts. Stimulate scientific attitude, creativity, courage and communication at all levels, to become and be recognised as part of the "knowledge industry", and not of the bureaucratic public sector. Maximise direct communication with the final users using new ICT tools and re-discuss with mass media the way in which they disseminate official data. Engage emerging players (NGOs, youth associations, etc.) in the use and re-dissemination of statistical information. Develop a dissemination platform designed for a global audience and include more international comparisons in standard statistical products. Re-think the way in which statistical releases can be useful to build "personal information" (for example, putting emphasis on detailed data and on variability – across sectors, across regions, etc. – instead of giving prominence to averages). Take a more aggressive communication attitude against sources characterised by very low data quality. Investigate how the society looks at official statistics and try to fix the specific problems that emerge from this analysis. Regularly discuss with political masters the risks and the opportunities for the statistical function in a fast changing society. And, finally, dedicate more resources to initiatives aimed at developing statistical culture in the population, especially in new generations.

All these suggestions are coherent with a vision of NSOs and international organisations as "knowledge builders" and not simply as "information providers". Therefore, the job of official statisticians should not be limited to produce and disseminate data, but to make statistics actually used to build knowledge by all components of the society, and therefore to be used in as many decision-making processes as possible. In some sense, statistical information may become a public good produced in a more decentralized way. This requires innovative thinking, re-orientation of resources, alliances with new partners, revision of the skills needed to perform these new functions, changes in the legal and institutional set ups, better integration between national and international organisations. In this way, statistics can become more relevant than ever. This evolving role of statistics is depicted in Figure 2 and could be summarised in the term "Societistics", i.e. a statistical framework that is geared for the society and is part of the overall governance system, rather than focusing mainly on providing information tools for public policy makers.

Figure 2. From Statistics to 'Sociestics'

	Information ⟶ Knowledge	
Government	Domestic information provider	
Society		Global knowledge builder
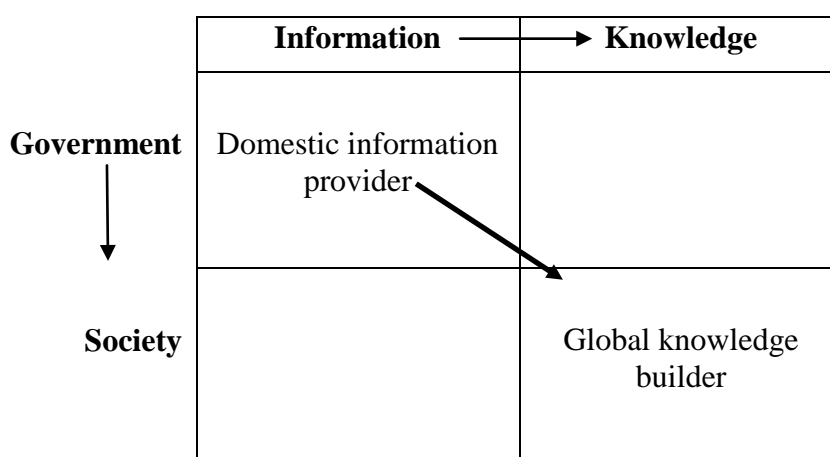
5. The search for indicators of societal progress

As we have seen in the previous sections, reliable statistics are fundamental to modern democracies. Citizens, as well as politicians, need data on which to base their decisions. Every day, millions of individual and collective decisions are taken on the basis of statistics. Without a comprehensive and articulated knowledge-base founded on robust evidence and agreed by the various components of society, many of those decisions will inevitably be flawed. But in the "information age", the availability of information can no longer automatically be equated with increased knowledge. Disinformation and incorrect interpretation of statistics can spread rapidly via the Internet. In this context, it seems fundamental to develop a system of indicators that enable monitoring (or rephrasing) progress societies in such a way that they could feed-in and improve governance mechanisms.

5.1 The measurement of Well-Being

The OECD has recently published a review of various approaches to the measurement of well-being/progress (Boarini, Johansson and Mira D'Ercole, 2006).[11] In a nutshell, the following approaches are envisaged:

- the extension of the basic national accounts schemes to cover social and environmental dimensions;

- the use of a wide range of indicators referring to economic, social and environmental dimensions. The use of composite indicators to summarise them in a single number is also possible;

- the use of "subjective" measures of well-being, life-satisfaction or happiness.

The extension of national accounts is, of course, a very attractive approach, but it requires a large investment, both in terms of data collected and of resources necessary to make them coherent. Notwithstanding the most recent developments (especially, the System of Environmental and Economic Accounts and Social Accounting Matrices), it still encounters theoretical and practical difficulties in expressing some aggregates in monetary terms, such as environmental resources. And while this approach may be very powerful analytically, for example to simulate economic, social and environmental effects of various policy alternatives and evaluate trade-offs, it is hard to see how such an approach could be used by citizens.

To provide an overview of the progress of a country that includes non-monetary aspects of well-being, *sets of indicators* have been developed in several countries. In recent years, improvements in statistical systems have made possible the implementation of "key indicators" which involve economic, social and environmental goals. They are statistical measures that reflect people's objective circumstances in a given cultural or geographic unit. The hallmark of these indicators is that they are based on objective,

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[11] See also Gadrey and Jany-Catrice (2006) and the papers presented at the conference organised by the OECD in June 2006 on the measurement of wellbeing (www.oecd.org/oecdworldforum).

quantitative statistics rather than on individuals' subjective perceptions of their social environment. As a result, it is very easy to make comparisons over time and/or countries, using them as "benchmarks". However, key indicators can suffer from several weaknesses: first, they can provide a misleading view of certain phenomena (for example, it is known that rape incidents are underreported to the police and therefore crime indicators based on administrative data can be misleading). Second, looking at a multiplicity of indicators it is not easy to derive a synthetic view about the overall progress of a country (normally, some indicators improve, others worsen).

Composite indicators aggregate "sectoral" indicators using weights and aim to provide a comprehensive picture of a country, comparable over time and between countries. They allow the ranking of countries as well (very appreciated by the media), making it possible for the public to evaluate overall policy results. However, composite indicators suffer from important weaknesses and can be misleading for policy evaluations, pushing people to draw simplistic conclusions. For example, the construction of a composite indicator involves stages where judgments have to be made (especially concerning the weights structure, the selection of sub-indicators, the aggregation method, etc.), thus uncertainty and sensitivity analysis are needed to test the robustness of results, but this complicates their presentation to non experts (Giovannini et al., 2005). In addition, in order to be representative of society's point of view, the choice of the weights structure cannot be delegated to statisticians or to politicians. Therefore, the use of composite indicators for measuring the overall progress is often criticised.

Finally, *subjective indicators* are based on the assumption that well-being depends on the degree of utility that individuals perceive in their social environment, i.e. how people react to and experience the events and situations in their lives. Several studies recognise that there is little correlation between objective measures of well-being and subjective ones and this may be due to several factors: for example, people can adapt themselves to their living standards, or can adjust their cognitive attention and expectations to external circumstances in ways that are advantageous for themselves. When the prospects of social comparison are not favourable, individuals often rearrange their scale of satisfaction, redirecting their attention to tasks and situation that are better for them. This concept has to be underlined if subjective indicators are used in political processes: if they are "endogenous" they lack the necessary link to actual outcomes and politicians could be tempted to spend more resources to try to change citizens' perceptions using propaganda rather than to change the social well-being itself.[12]

5.2 The need for a holistic approach: The OECD Project on "Measuring the Progress of Societies"

In the search for more reliable "common knowledge", sets of indicators, rather than single composite indicators or subjective indicators, seem to be the best tool to support policy making systems and to allow citizens to make more informed decisions. In fact, they cover a wide area of political subjects (economy, environment, society, etc.), are not subject to the problem of establishing weights, can take into account the complexity of modern societies and the multiplicity of societal goals and can provide a manageable picture of a country's overall performance. Of course, the choice of "key indicators" has

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[12] The OECD has recently organised an international conference on the measurement of happiness and policy making (see www.oecd.org/oecdworldforum).

to be done in a very transparent way, involving statistical experts, civil society, subject-matter experts, media and policy makers. This is the approach followed by several OECD countries, where commissions are established by governments involving various components of the society to select the list of key indicators: once the selection is made, the statistical office is then put in charge of producing a periodic report, widely disseminated to citizens. From the available experiences it is clear that the strength of key indicators lies in their capability to address three fundamental issues: present a simplified, but reliable, view of society, contribute to a shared knowledge among citizens, and make politicians accountable for their actions.

One of the first countries involved in developing "key indicators" was Australia. In 2002, a publication of the Australian Bureau of Statistics (ABS) called "Measuring Australia's Progress" presented a comprehensive framework for the measurement of well-being and a rich set of key indicators. In ABS's view, progress is closely related to these three concepts:

- *well-being or welfare*, which is generally used to mean the condition of being well in life. It typically includes material, physical, social and spiritual aspects of life;

- *quality of life*, which is linked to well-being, but with the difference that what is highlighted here is the capability of society to respond to people's wants and needs;

- *sustainability*, which considers whether an activity or condition can be maintained indefinitely. It is mostly been used to describe the impact of human activities on environmental and social systems.

The domains of progress were chosen during initial phases of the project and after consulting government, civil society, experts, academics, business councils, community organisations and individuals. The choices were tested through several further rounds of consultation to make the final selection, taking into account of the full spectrum of views. External advisors were present in an expert reference group, comprised of academics, scientists, and the heads of two prominent civil society organisations, one who seeks to combat poverty and inequality, and the other an independent public policy research institute. This suggests that the focal point was not the policy making process or international benchmarking, but primarily the expectations and opinions of citizens.[13]

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[13] The Australian experience is just of one the several initiatives that are underway in OECD countries and beyond. To analyse and compare them, the OECD organised in 2004 the first World Forum on Key Indicators "Statistics, Knowledge and Policy" (see www.oecd.org/oecdworldforum). The Palermo Forum was just one of the initiatives taken by the OECD to foster the use of "key indicators" to analyse overall countries' performances. Extremely important in this respect has been the creation of the *OECD Factbook: Economic, Environmental and Social Statistics*, a publication that presents, in an innovative way, a carefully selected range of 150 indicators covering broad thematic areas: Population and migration, Macroeconomic trends, Economic globalisation, Energy, Prices, Labour market, Science and technology, Environment, Education, Public policies and Quality of life. In addition, every year, the *OECD Factbook* includes a special section focusing on a current "hot topic". The on line 2008 Edition of the FactBook is also accessible through dynamic charts and is available through a Gapminder interface. The OECD also launched a Global Project on the measurement of the progress of societies and, as a part of it, the OECD organised the second World Forum on "Statistics, Knowledge and Policy" (June 2007, Istanbul, Turkey), in co-operation with the European Commission (EC), the Conference of Islamic Countries (OIC), the United Nations (UN) and the World Bank (WB) and with the support of several other institutions (see www.oecd.org/oecdworldforum).

6. Summary and conclusions

In this paper, we have considered different research avenues for the interaction between statistics and governance. We started by surveying the economic and political science literature on the role of information and expectations for a well-functioning society. We then provided empirical evidence on the positive link between trust in statistics and trust in institutions using the European Barometer Survey. The importance of statistics for the governance mechanisms and the current rapidly changing environment create specific challenges for the official statistical institutions. We argued in this paper that a new design of statistical systems more geared towards the society as whole rather than mainly for public decision-makers was needed. Among others, the creation of new indicators of societal progress would be an important step in this direction.

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Annex: EUROBAROMETER Data and Variable Definitions

The basic sample design applied in all states is a multi-stage, random probability sample, where for each country, a number of sampling points was drawn with probability proportional to population size (for total coverage) and to population density. The sampling points have been drawn from each of the administrative regional units after stratification by individual unit and type of area. As such, the sampling points represent the whole territory of countries surveys according to the Eurostat NUTS II[14]. All interviews were conducted face-to-face in people's houses and in the appropriate national language. The CAPI system was used to capture data. Table A.1 reports the sampling units over population aged 15 and over, for the selected EU-OECD countries chosen for this study.

Table A.1 Sampling units by country

Country	No Interviews	Population 15+ [(1)]
Austria	1.011	6.848.736
Belgium	1.011	8.650.994
Czech	1.043	8.571.710
Denmark	1.002	4.411.580
Estonia	1.005	887.094
Finland	1.038	4.348.676
France	1.013	44.010.619
Germany	1.513	64.361.608
Greece	1000	8.693.566
Hungary	1.006	8.503.379
Ireland	1000	3.089.775
Italy	1.010	48.892.559
Luxembourg	511	374.097
Netherlands	1.009	13.030.000
Poland	1000	31.967.880
Portugal	1.011	8.080.915
Slovakia	1.106	4.316.438
Slovenia	1.013	1.720.137
Spain	1000	37.024.972
Sweden	1.005	7.486.976
Turkey	1.005	47.583.830
United Kingdom	1.319	47.685.578

[(1)] - The universe was derived from Eurostat population data or from national sources.

For all surveys countries, a national weighting procedure using marginal and intercellular weighting was carried out based on the universe. Gender, age, region and size of locality were all used in the iteration procedure.

Table A.2 provides the list of questions from the Eurobarometer Survey retained in our dataset.

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[14] In each of the selected sampling unit, a starting address was drawn at random; further addresses were selected by standard *random route* procedures from the initial address.

Table A.2 Correspondence Eurobarometer questions with list of variables

#Question	Original variables in the Eurobarometer Questionnaire	Recoding
qa5	If you compare your present situation with five years ago, would you say it has improved, stayed about the same, or got worse?	**mood_impr**
	1 improved 2 stayed about the same 3 got worse 4 DK	1= improved 2= not improved
qa16	I would like to ask you a question about how much trust you have in certain institutions. For each of the following institutions, please tell me if you **tent to trust**, **tend not to trust** or **DK**:	**trust_ GOV, trust_Parl, trust_EU**
	5 the government 6 the parliament 7 the European Union	1= trust 0= do not trust
qa28	Could you please tell me for each of the following, whether the term brings to mind something very positive (1), fairly positive (2), fairly negative (3), very negative (4) or DK (5).	**free_trade, global flex**
	4 free trade 6 globalisation 11 flexibility	1= positive feeling 0= negative feeling
qa29	There are multiple consequences of the globalisation trade. When you hear the word "globalisation", what comes first to your mind?	**globalisation**
	1 opportunities for national companies in terms of new outlets	1= positive feeling (1+2)
	2 foreign investments in the country	0= negative feeling (3+4
	3 relocation of some companies to countries where labour is cheaper 4 increased competitions for national companies 5 other 6 DK	
qa56	Do you agree/disagree with the following statement concerning economic figures: "it is necessary to know these figures"?	**imp_stat**
	1 totally agree	1= important (1+2) 0=not important (2+3)
	2 tend to agree 3 tend to disagree 4 totally disagree 5 DK	
qa57	Some people say the statistical information play an important role in business, public and political decision making. Personally, do you think that, in your country, political decisions are made on the basis of statistical information?	**decision_on_stat**

	1 yes certainly 2 yes probably 3 no probably not 4 no certainly not 5 DK	1= yes (1+2) 2= no (3+4)
qa58	Personally, how much trust do you have in the official statistics in your country, for example the statistics on unemployment, inflation or economic growth? Would you say that you tend to trust these official statistics or tend not to trust them? 1 tend to trust 2 Tend not to trust 3 DK	**trust_stat** 1= trust (1) 2= don't trust (0)
	DEMOGRAPHIC and SOCIO-ECONOMIC CONTROLS	
D7	Current status situation: 1 married 2 remarried 3 unmarried, living with partner 4 unmarried, never lived with partner 5 unmarried, previously lived with partner, but alone now 6 divorced 7 separated 8 widowed 9 other 10 refusal	**status** 1= married (1+2) 0= unmarried(form 3 to 10)
D8	How old were you when you stopped full-time education? 1 less than 15 yrs old 2 between 16-19 3 still studying 4 no full time education 5 refusal 6 DK	**EDU** 0=basic education 1=secondary education 3= tertiary education
D10	Gender 1 male 2 female	**sex** 1= male 0= female
D11	How old are you? continuous variable left unchanged	**age**
D15a	What is your current situation? 1 self-employed 2 managers 3 other white collars 4 manual workers	**work** 8 variables created accordingly to the 8 working categories here on the left

	5 house persons	
	6 unemployed	
	7 retired	
	8 students	
D25	would you say you live in a	**rural**
	1 rural area or village	1= rural
	2 small or middle sized town	0= non rural
	3 large town	
	4 DK	
D40b	Could you tell me how many children less than 10 yrs old live in your household?	**children**
		1= yes, at least one child in the household (2+3+4+5)
	1 zero	
	2 one	0= none
	3 two	
	4 three	
	5 more than 4	
D46	Which of the following goods do you have?	**ICT**
		1= yes, (at least 4, or 4+5)
	4 computer	
	5 an internet connection at home	2= none

For each latent variable of interest, the 'DK' category, corresponding to those respondents that chose to answer "don't know", returned a very low percentage rate (less than 10% almost for all), therefore ignored during the dummy process (Table A.2). The matrix of correlation among these variables is given in table A.3.

Table A.2 Frequencies for latent variables

Variables	Coded as 0 (%)	Coded as 1 (%)	Missing (%)
mood_impr	58.9	41.1	0.8
trust_ GOV	48.8	51.2	5.3
trust_Parl	45.7	54.3	5.81
trust_EU	34.9	65.1	9.82
free_trade	18.6	81.4	7.72
global	45.9	54.1	11.18
flex	16.1	83.9	10.49
globalisation	57.4	42.6	14.85
imp_stat	26.8	73.2	8.18
decision_on_stat	29.6	70.4	9.97
trust_stat	43.8	56.2	8.08
status	47.3	52.7	1.1
sex	56.1	43.9	-
rural	27.0	73.0	0.46
children	79.8	20.2	-

	ICT	50.6	49.4	-

Table A3. Correlation matrix

	mood	trust_gov	trust_parl	trust_EU	free_trade	global	flex	importance_statistics	decision_based on statistics	globalisation	trust_stat
mood	1.00										
trust_gov	0.19	1.00									
trust_parl	0.18	0.75	1.00								
trust_EU	0.18	0.41	0.42	1.00							
free_trade	0.15	0.13	0.13	0.17	1.00						
global	0.16	0.16	0.16	0.20	0.25	1.00					
flex	0.14	0.11	0.12	0.17	0.28	0.21	1.00				
importance_statistics	0.03	0.05	0.05	0.11	0.04	0.03	0.02	1.00			
decision_based on statistics	0.10	0.15	0.17	0.12	0.09	0.10	0.07	0.17	1.00		
globalisation	0.09	0.10	0.08	0.14	0.13	0.31	0.10	0.03	0.05	1.00	
trust_stat	0.18	0.28	0.28	0.27	0.12	0.15	0.13	0.15	0.29	0.10	1.00