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CONFERENCE OF EUROPEAN
STATISTICIANS



CES/SEM.35/SIII/3
15 May 1996

Original: ENGLISH

Seminar on Official Statistics - Past and Future
(Lisbon, Portugal, 25-27 September 1996)

SESSION 3: STATISTICIAN: A PROFESSION?

BLUE AND WHITE COLLAR STATISTICIANS - A GAP REVISITED

BLUE AND WHITE COLLAR STATISTICIANS DO NOT MAKE UP
DIFFERENT PARTS OF THE SAME POPULATION

Report submitted by Statistics Canada */

1. Ten years ago Martin Wilk, 1/ ex-chief Statistician of Canada addressed the Royal Canadian Statistical Society (RSCS) in an after dinner speech and brought up the issue of lack of bridges between blue and white collar statisticians. White collar statisticians were in their majority academics working in a University or Research institution. Blue collar statisticians, were people like you and me who took part in running agencies where official statistics were produced.

2. I propose to re-address the matter for several reasons in addition to the obvious one which is that I believe that it is an intrinsically important subject. Firstly, I do not think there are any more bridges today than there were ten years ago. Secondly, I believe that there is greater need now for those bridges to be created than ten years ago. And lastly, I believe that

*/ Prepared by Mr. Jacob Ryten, Assistant Chief Statistician of Canada.

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there is more that "white collar" statisticians can contribute today than they could at an earlier stage.

3. For those who are not aware of the RSCS address I provide a short version which is also designed as an introduction to the rest of my paper.

- There are two distinct groups of people and both call themselves by the same name - statisticians. In principle, they should be concerned with similar issues even after making allowances for differences in interests between those who work for Government and those who are engaged in academic research.
- The names of the activities in which the two groups of statisticians are engaged are clues to the differences in their objectives and methods. One way of establishing these differences is to sample the names of those activities and to examine whether there is a reasonable overlap. The two lists provided in the RSCS address make it obvious that there is no such overlap. With the author's permission, I reproduce them here:

Examples of pursuits by the two
communities of statisticians

White collar activities

Abundance distributions
Critical values
Growth curve analysis
Multivariate linear model
Weighted least squares estimator

Blue collar activities

Gross National Product
Housing starts
Bank rate
Consumer Price Index
Hourly earnings

- Creating bridges between the two groups is important. Both share an over-riding concern even though this is not apparent either from the titles of what interests them or from the way in which they treat uncertainty. For it is uncertainty - the knowledge that there is error in the measurement and the estimation of the error's size - that provides the missing link between the two communities. But one set - that which works for Government behaves very often as if no error or no uncertainty existed. And yet it needs the talents of the other group of statisticians to agree on the procedures required to measure error without which it cannot convey to its constituency the limitations of its work.

Is it important to discuss the difference? _____

4. There are several issues raised by the "blue collar- white collar" address. I have already stated that I believe it is still an issue and should be sufficiently near the top of our agenda to warrant discussion in this forum. From this it follows that there is a requirement to build bridges between the two communities but we as a community of blue collar statisticians may not know how to build them and are collectively not doing much about it. A related question is whether anything has happened in the last while that would have given increased impetus to the need for the two

communities to find common grounds. And lastly - is the difference in the labels of the activities pursued in government offices and in university departments of statistics, a good indicator of a deep intellectual difference between the two groups.

5. The outline of my argument is as follows: I intend to show that designating as "statisticians" the two communities creates an unfortunate impression of coincidence in pursuits; that differences in names of activities are not a good way to establish more fundamental differences in outlook and methods; that nonetheless there is a gap that should be narrowed; and that a number of recent events have added urgency to the need. I show examples of things that can be done to prevent the gap from widening and in particular stress the institutional framework that can be built upon to narrow the gap. And finally, I go over some longer term measures that should be taken by statistical agencies anxious to narrow the gap, and that have to do with the academic training that its staff should have. That last point was not addressed in the RSSC paper and is the only new consideration to the discussion included in this contribution.

Final demand and intermediate consumption

6. Government statisticians (blue collar workers) are engaged in the assembly of what the jargon calls "information products". Their concern is to make as large a number of constituencies as possible aware of the facts relating to the social and economic concerns about which they have to make up their minds and take decisions. Of course, the reference to facts is simplistic. Facts only acquire some meaning if they are placed in a context that makes it possible to interpret them. The supply of the context and the ascribing to the facts the relative information content that they should carry is also the task of the blue collar community.

7. In order to carry out this task, government statisticians rely on the combined contribution of a number of disciplines - economics, demography, geography, anthropology, law and accounting, computer science and statistics. The methods used to establish the facts rely heavily but not exclusively on mathematical statistics and the nature of the measurement is such that the results are subject to uncertainty. The measurement of that uncertainty and of the factors that contribute to create it are also part of the blue collar statistician's stock in trade.

8. Once government statisticians have established the facts, estimated the amount of uncertainty that accompanies their determination, set the facts in some logical frame and advanced an interpretative hypothesis, their task becomes limited to changing their interpretation should subsequent findings suggest that the initial determination of facts was in error. In other words, the "information product" is what is supplied by government statisticians to the constituencies that have expressed a need for the final "information products". Once those "products" are in the public domain they become like any other information product, the subject of intermediate

consumption for the creation of something else ranging from a decision to the fashioning of a new hypothesis about the way in which society behaves.

9. It follows that the government statistician pursues activities that are more akin to those of an "information contractor" and that the results of those activities have the names that are proper to items designed for final consumption - consumer expenditure, university enrollment, unemployment rate, and changes in stocks held but not owned by manufacturers.

10. As for the white collar statistician, his activities are to designed to produce methods that make it possible to establish the facts under given circumstances, to estimate how much uncertainty surrounds the estimation of the facts, to suggest how much weight of interpretation the facts established in certain way can bear, and how much risk there is in acting on the basis of "facts" that are determined with that much uncertainty. More importantly, it is the task of the white collar statistician to either ensure that the methods put forward follow from a set of axioms according to rules of inference or else to show that there are counter-examples that invalidate accepted methods which should therefore be discarded. Of course, in actual practice blue collar statisticians transgress - in the sense that they, or members of their community do everything that is defined as the task of white collar statisticians and for that matter white collar statisticians have more than occasionally dealt at close quarters with the very "information products" to which in principle they only supply a part.

11. But the point of this discussion is to suggest that the work assigned to each of the two communities is clearly demarcated and need not overlap. This does not say that there is nothing in common between the two. Here are some examples of what is common and what is not:

- both groups subscribe to the notion that the result of their activities is objective and either testable empirically or else refutable by ordinary deductive methods;
- both groups subscribe to the notion that their methods are replicable - even though in practice what Government statisticians do is not replicable for reasons of law and logistics;
- both groups subscribe to the notion that mathematical probability is the framework in which they work and that one of their tasks is to subject their findings to some measure of probability;
- blue collar statisticians attempt to have their programme of work defined by what is of current concern socially, politically and economically to the society round them but white collar statisticians tend to follow an agenda for which the concerns of pure science tend to weigh more heavily; and
- white collar statisticians are ultimately accountable but no more than anyone else engaged in pure scientific research whereas the

activities of blue collar statisticians are under the direct scrutiny of the elected representatives of taxpayers.

12. If the above is an acceptable description of the body of norms and aims which are common to both blue and white collar practitioners and that the way in which blue collar statisticians work is akin to construction contractors, two consequences follow:

- the first is that we should not be surprised if the labels of the activities pursued by each of the two groups differ from those of their counterparts as established in the RSCS address;
- the second is that we should be surprised if the two groups do not talk to each other in spite of the fact that they subscribe to a great number of common number of beliefs.

Current pressures

13. There are current pressures that suggest that a dialogue where one does not exist is becoming steadily necessary. Last year, US government statisticians collectively were taken to task for a variety of sins. These included:

- the accusation that official systems of measurement of the output of all goods and services produced for final demand left out a significant portion of intangibles and as such was understated;
- the statement that over the last two decades the quality of a number of intangibles such as information and communications had improved enormously but this improvement had hardly been taken into account in the official statistics;
- that as a logical consequence of the above the official measurements of productivity change were doubly biased as they left out some product and overstated price change;
- that as another logical consequence the "facts" that underpinned macro-stabilization policy were wrong and as a result equally wrong policy steps were taken. The implication was that if only the facts had been right, Treasury departments in the United States and elsewhere would have behaved differently; and
- most importantly, general welfare would have increased were it not for the wrong headed approach followed by blue collar statisticians.

14. When asked to provide an estimate of the degree to which current measurement techniques may have distorted the "correct" magnitudes, the argument

turns on fractions of a one percentage point per annum. Take the CPI as an example. Everyone knows that the CPI estimation produces a pure number which in turn is the ratio of two expenditures: one expenditure typically at an earlier period using the prices and expenditure patterns of that period and one expenditure flow that uses the same patterns of expenditure revalued at today's prices.

15. The CPI however is no longer used in this fashion. Rather it is used as a ratio of two indexes and typically over a period of twelve months. That ratio is published usually as a percentage change with one decimal. For example, the statement "...in Canada, the latest twelve month relative change in the CPI was of the order of 1.2 per cent and compared favourably with..." is typically in the lead paragraph when the CPI estimates are announced to the public. The criticism itself turns on the degree to which the "1.2 per cent" may be overstated and in the case of Canada (where a discussion similar although less heated than in the United States has taken place) critics claimed that over the last ten years say, the overstatement had a ceiling of .5. The index is therefore being taken to task for errors the order of magnitude of which is of one in a thousand.

16. My argument is not that the one thousandth over which the criticism turns is irrelevant or does not have important social consequences. Of course it does. Indeed, the cumulative impact of an error of this type can be replete with welfare consequences of enormous magnitude. Examples are in the social payments that are driven by the CPI for which an error of one thousandth can imply excess or under- payment of hundreds of millions of dollars. But the CPI was not designed with any standard of measurement in mind which is where it differs from counterpart constructs in the social sciences. Even where the measurement of tolerance is difficult, engineers and physicists would attempt to set up a standard and in all likelihood try to better it so as to minimize risk. Nothing of that sort exists in the case of social and economic statistics.

The assets of white collar statisticians

17. There are two contributions that white collar statisticians can make to pre-empt a debate that can only end at the expense of official statistics and official statisticians. The first and the most obvious is to develop means of measuring error where no such measurements exist and to ensure that new measurement tools are designed to a standard which in turn is made widely known to the user constituencies. The rigour that white collar statisticians bring to their task can at first appear to be misplaced particularly by government statisticians used as they are to the compromises that their applied discipline has asked them to adopt. But in the end the absence of rigour is what has led criticisms to be levied at the official numbers and in many cases has left official statisticians unable to provide an acceptable reply.

18. The second contribution is more subtle than the first. Probably in a majority of cases the public - the single largest constituency for official "information products" - has a split personality when it comes to the credibility it attaches to official statistics. For those numbers that have no

immediate consequences, credibility *de facto* is probably very high. For example, quotes can be found about the number of enterprises that exist in a country - a statistic that at the best of times has little sense- how many of them are small, how many VCR's exist in households, and what the average tourist spends on one day of his tour. These references are typically made without qualification, showing little regard for the fact that the underlying figures are affected by very considerable uncertainty. But on the other hand there is no experienced reason to disbelieve them.

19. The same does not apply to those figures with very obvious financial implications nor those that apply to every day experience. Typically, these include the Consumer Price Index (CPI) and the unemployment numbers. In such cases, the credibility that goes along with the number is much less and the suspicion that the figure is manipulated by government interference could be correspondingly much greater. Of course, there is a *prima facie* reason for government to prefer certain outcomes to others. For a government elected on a platform of unemployment reduction, a high unemployment rate may cost it a substantial fraction of its popularity rating not to mention the next elections. Likewise, a government elected on a promise to reduce price hikes, takes a sharp price increase measured by the CPI as bad political news.

20. While memory of personal experience is often at variance with what was actually experienced and even more so with what was experienced "on average", certain measurements lend themselves to much sharper criticism than others. For example, personal memories of weather change tend to be selective and biased. However they do not prompt the public to claim that official weather records are the result of manipulation by interested parties. Moreover, it is felt that weather measurements result from the intervention of a scientific community the methods of which are both objective and impartial.

21. There is of course no easy way for government statisticians to copy the experience of weather offices at least in the sense of making their statistics as "neutral" as those relating to the weather. But these is a point to keep in mind. The more the public gets the notion that behind something that is understandable and communicable, there lies a serious intervention on the part of the scientific community - a community that in our countries is by and large perceived to be objective - the fear of manipulation or of gross error may be correspondingly attenuated.

An institutional framework

22. In the RSSC address, Martin Wilk gave a few examples of the measures that Statistics Canada has taken to harness the advice and expertise of the white collar community in order to improve the quality and the credibility of its everyday activity. These examples stand and a word about them is in order. Statistics Canada has continued to benefit from the advice of its largely academic group of "white collar" statisticians and to test the plausibility, efficiency and theoretical soundness of its methods by systematically presenting them to its advisors.

23. Secondly, Statistics Canada has benefited from this scheme by successfully networking with members of the committee and enlisting the increased support of the Canadian academic community. Of course, these are not measures that produce quick effects and that get to the public's consciousness immediately. They are more in the nature of changes to culture and perception and they will take a while before it becomes widely accepted that the government's statistical agency appeals regularly to members of the academic community for advice and quality control.

The institutional framework: external

24. In addition to those measures which agencies such as Statistics Canada can take or indeed have taken there are broader measures that recommend themselves. For example, there is an obvious alliance that the international statistical community should promote energetically. In the International Statistical Institute, the possibility exists for the "blue collar" community to interact regularly, informally and formally, with the white collar community. This framework should be used to its full advantage in order to promote at least the following for the benefit of the "blue collar" community:

- advice on advanced methods of relevance to survey design, to statistical inference, to measures of uncertainty;
- quality control of implemented methods in a progressive way with consequent exposure to the public on the views - critical and otherwise - derived from the process of consultation;
- forum for professional challenge with resulting effects on staff training, motivation, and assurance that the knowledge of techniques and methods in the official agency do not get obsolete; and
- possibility to ensure that throughout the statistical agency the knowledge, appreciation and respect in which mathematical statistical methods are held increases.

25. The advantages however are not one sided. Advantages can also accrue to the "white collar" community if it keeps in permanent touch with its counterparts. For example:

- an official statistical agency is the largest and most comprehensive statistical laboratory in any country. No applied statistician can forego intimate knowledge of what all the official agency has to offer and only by maintaining close professional relations can the diffusion of such knowledge be assured;
- designs in the real world have to be compromises reflecting all kinds of complications that are not envisaged in a world where everything is frictionless. Those complications can be modelled and allowed for theoretically. But in order to do so "white collar" statisticians must become familiar with them;

- in spite of the apparent unfriendliness of the existing statistical legislation - barring access to its holdings by all outsiders - many agencies have found ways which are perfectly in line with legislation and yet assist researchers in a variety of ways. Those methods can no doubt be made better and more widely known; and
- there is a place within professional statistical agencies for "white collar" statisticians to develop and to encounter professional challenge even if they belong to the "whitest" set of the community. Indeed, there are examples of professional agencies promoting theoretical research that might otherwise escape the attention of academic circles. For example, the field of time series analysis owes much to the keen interest displayed by government agencies.

26. The time is right for greater collaboration and for active steps to be taken to promote it. Statisticians of the "blue collar" persuasion have been claiming for some time that their resource capacity relative to the challenges they face is getting much to constraining. But surely one of the questions to be put to their "white collar" counterparts relates to how to become more efficiency oriented.

27. The public has been reacting with some skepticism to a number of official measures perhaps because of rising awareness that those measures influence policy and policy influences payments by government as much as its claims on the private sector. While nothing much can be done in the short run to allay concerns it is important to start investing in confidence building and part of the process consists in seeing that in the eyes of the public the methods used by official agencies are as scientifically respectable as possible and that they have the approval and endorsement of the scientific community in all cases.

The institutional framework: internal

28. Statistical offices have their white collar statisticians particularly those offices that have the resources and the inclination to promote pure research. They are likely to have the experience of encouraging communication between their pure research community and the community that supposedly will be the ultimate beneficiary of the research carried out. They are also likely to have encountered obstacles to communication not least because the two communities do not share a common language and because their objectives - at least on the surface - are so utterly distinct.

29. Where this is the case - and I am sure it is not limited to one or two experiences - it is the host institution that suffers in the sense that one community may be anxious to promote change to vindicate theory whereas the other may tend to perpetuate if not error at least inefficiency for the sake of minimizing risk. It follows that ways should be sought on how to ensure a more fruitful coexistence between the blue and white collar communities. Those ways are ultimately linked to education and training rather than to any institutional device to for example "stimulate communication". If neither community has a

deep understanding of the methods of their counterparts communication cannot be stimulated.

30. Of course, this implies that much greater care has to be taken in the selection and recruitment of the future leaders of a government statistical agency. If their training in quantitative methods is insufficient - whatever the discipline which they will be called upon to apply - no amount of institutional engineering will ensure that the language that the two communities must share is actually known by both.

31. Conversely, if the white collar statisticians have not learnt at least one application of theory in sufficient depth to appreciate the concerns of their counterparts, little will be gained if the language of discourse is entirely one sided. However, as a general impression from contact with many offices that major effort to select and train and create intellectual bridges between the two communities still falls very short of the mark.

32. Here are some practical suggestions that follow from an analysis of needs:

- in view of the fact that a number of current pressures felt by statistical offices require a greater use of quantitative methods and that these in turn need to be solidly backed by research and by the credibility that professional researchers can bring to their results, statistical offices should take an interest in promoting a more effective symbiotic relationship between the communities of white and blue collar statisticians;
- a better relationship requires that several measures be adopted - some internal and some external. Among the latter, there are some useful experiences. These include the formal networking with the white collar community; ways in which that community can get better access to the information collected by official agencies and so on;
- other possible measures include the creation of a "white collar" community within a statistical office with the possible responsibility of publishing a learned journal to which access is given to both insiders and outsiders. Statistics Canada has such a journal;
- among the longer term measures to be taken these include a much more rigorous selection and recruitment process, one in which quality would always favour quantity and one in which aptitude for research and for working in applied environments were both within the reach of the selected candidate;
- university programmes should be affected so that the statistical office can look at a pool of graduates who have actually gone through the formal training in those disciplines that will ensure effective communication between the research and the applied arms of the office.

33. Through a judicious combination of short and long term measures, internal and external changes to current methods and institutions much can be done to promote the central objective of our organizations which is that given the selection of the issues about which statistical information must be developed, that it be so with a maximum of professionalism and efficiency and that the using public not be misled about both the information content and the uncertainty that surrounds those measures.

34. There are examples of how such a climate of opinion can be established and there is an international framework that is open to all of us and can be more actively used. The conclusion of this paper is that the opportunity should not be ignored nor the examples set aside.

ENDNOTES

1/ Proceedings of the Royal Canadian Statistical Society 1985. Martin Wilk: Blue and White, etc.