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Comment on William Baumol's "Toward a newer economics: The future lies ahead!"

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Abstract

20 years ago, William Baumol provided an interesting wish list that outlined his hopes for the future of economics over the next hundred years. Impatiently, this paper puts his wish list to the test by comparing the characteristics of publications that appeared in the American Economic Review before Baumol's contribution in 1991 (1984 to 1988) and those published 20 years later (2004 to 2008), and by looking at the Job Openings for Economists between 1991 and 2009. Focusing on issues such as the role of mathematics, the short-run orientation of macroeconomics, the emphasis of economic history versus the history of economic ideas, as well as a more concrete menu of wishes for applied economics, we observe that this was not just a wish list, but is in many ways a list that offers an accurate picture of what has changed over time and what has happened in recent years.

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1. Introduction

Twenty years ago, in January 1991, William Baumol published a very interesting article in *Economic Journal*. He pointed out in the abstract that "My title is about as far as I have ever been willing to go in the way of prognostication… Despite the comforting reassurance offered to the authors here that they will certainly be dead long before their forecasts can possibly be tested against reality, I feel obliged to confess that I can offer with any degree of confidence only one prediction – that the future will surprise me" (p. 1). In his conclusion he stresses that "I remain sceptical about our ability to foresee the future - certainly about the future extending a century ahead … Research is by its nature peculiarly resistant to foresight, if only because one of the investigator's most valued goals is to surprise the audience" (p. 8). He is more inclined to refer to his "wishes" or "hopes".

Now, we are too impatient to wait and see what happens a century after Baumol's contribution, so we have taken a look at what has happened with his wishes and hopes 20 years later. We clearly do not want be dead long before such forecasts can possibly be tested against reality, even though we are both still relatively young academics. Encouraged by ABBA's catchy lyrics of "there's no hurry any more when all is said and done", we felt the urge to put Baumol's wish list to the test so that we may happily and peacefully wait, independently of our success, to see what will happen with the list over the next 80 years.

2. Methodology

Now, how can we analyse Baumol's wish list? We have decided to take a closer look at the publications in one of the world's premier economics journals, namely *American Economic Review*[1], publishing generalised and representative state-of-art economic analysis. It is important to choose a generalized journal for our analysis as it is clear that specialized journals such as *Journal of Economic Theory* are supposed to focus on mathematically-oriented approaches. We turn our attention to two separate time periods, 20 years apart, namely 1984 to 1988 and 2004 to 2008. The period 1984 to 1988 provides an overview as to the state of research before Baumol published his paper in *Economic Journal* in 1991. The period 2004 to 2008 offers us an accurate picture what is happening in recent years or in other words 20 years later. In our investigation we include articles, comments or replies, but we exclude the *Proceedings* issues or invited contributions due to the fact that those articles do not undergo the same review process as non-invited articles or articles in other issues.

3. Role of Mathematics

Let us work through Baumol's wish list in the order in which they are discussed in his paper. The first aspect in Baumol's wish list is regarding the role of mathematics. He refers to the time where one was "expected to begin with a few words of apology, arguing, or at least asserting, that employment of this tool did not necessarily make the resulting work less 'realistic' or less relevant. Even so, it was customary for the algebra to be relegated to an appendix where it would not disturb the sensibilities of the normal reader" (p. 2). He stated in his contribution that he had worked with some determination in order to change this situation

[1] It is worth mentioning as a side note that Baumol has been able to publish so far (till the end of 2010) 29 times in *American Economic Review* (leading articles and articles in the *Papers and Proceedings*; without the *Papers and Proceedings* 22 times). Only Joseph Stiglitz has more publications in *AER* (35 with *Papers and Proceedings*; 24 without). In other words, there is hardly a better way to test Baumol's wish list! However, one can criticize that taking AER as representative of the entire economics discipline can be misleading despite the fact that the AER attempts to publish papers to the general well-tooled economist.

(e.g., being in favour of some grounding in mathematics as a standard of a postgraduate curriculum), but in the article he raises the criticism that "things may have gone a bit far in the opposite direction", pointing out that "few specialised students are allowed to proceed without devoting a very considerable portion of their time to the acquisition of mathematical tools, and they often come away feeling that any piece of writing they produce will automatically be rejected as unworthy if it is not liberally sprinkled with an array of algebraic symbols" (p. 2). He acknowledges that mathematical methods have provided invaluable contributions in many economic fields and that there is "no reason to impede or discourage the work of even the most abstraction-minded and esoteric of mathematical economists" (p. 2). However, the "trouble is that if individuals are not respected for the pursuit of alternative approaches, if only those whose writings are pockmarked by algebraic symbols receive kudos, one can expect a misallocation of resources like that which always results from a distortion of relative prices" (p. 2). In addition, "not only can we expect more than optimal amount of study and publication to be based on mathematical methods, but we can expect people to be induced to adopt this approach even though they are relatively poorly endowed with the requisite talents". Graduate programmes, for example, will be burdened with a spate of dissertations that qualify primarily as mathematical (or econometric) exercises whose sole *raison d'etre* seems to be the opportunity they afford to their authors to display whatever facility they can muster in manipulation of the tools of abstraction. Even the most mathematically-oriented of our colleagues will undoubtedly agree that this is what has already happened" (p. 3).

Having heard Baumol's argument for alternative approaches to economic analysis, we now use the record of publications in the *AER* to explore whether the role of mathematics has changed in last 20 years. *Table 1* uses the number of equations as a proxy for mathematical tools used in papers. We also report a two-sample Wilcoxon rank-sum (Mann-Whitney) test indicating whether the differences between 1984-1988 and 2004-2008 are statistically significant. We observe that in 1984-1988 a paper had on average 11.9 equations in the main text and 1.37 equations in the appendix. In 2004-2008 we observe an increase to 14.64 in the main text and 7.49 in the appendix. In both cases the difference between 1984-1988 and 2004-2008 are statistically significant. However, this may be due to the length of the articles. The average length per article increased from 9.59 in 1984-1988 to 19.38 pages in 2004-2008. Once we correct for the length of articles, the total equations per article (main text and appendix) have demonstrated a very small decrease (although not statistically significant). Thus, it seems that the role of mathematics has hardly changed in the last 20 years, contrary to Baumol's hopes for some changes to the degree of reliance upon mathematical tools. Now, the question therefore remains what will happen in the next 80 years, or in other words the full century after Baumol compiled his wish list. However, we suspect that the stagnation in this regard over the last 20 years would not surprise Baumol at all, although when referring to two aspects of his wish list he did indicate that "current fashions in economics, like fashion in other fields, will wane after a time. But I look for them only to wane – to give up their undisputed position at the summit of the hierarchy – not to vanish or to remain only as minor vestiges" (p. 4).

Table 1: Exploring the Role of Mathematical Tools.

Variables	Period 1984 to 1988 N = 585	Period 2004 to 2008 N = 497	z - score
Numbers of equations in the main text per article	11.90	14.64	4.881
Number of equations in the appendix per article	1.37	7.49	10.006
Total equations per article	13.27	22.13	6.850
Total equations / length of the article	1.27	1.11	-0.301

Note: We considered an equation to be a mathematical formula that either is numbered in the article or is clearly separated from the text (placed by itself on a line).

4. Applied Econometrics

The next item on Baumol's list was that university curriculum would put more emphasis on econometrics "stressing its techniques, practice in its use and avoidance of its pitfalls" (p. 4). To get some sort of a proxy of applied econometrics we analyse the number of published tables and figures per article, as tables and figures are usually derived using an empirical approach. *Table 2* reports statistics of tables and figures for both time periods, and the number of tables in the main text have increased from 1.73 to 3.30 (difference is statistically significant). Similarly, we observe an increase in the use of tables in the appendix, but again, this effect might be due to an increase in the length of the articles. However, when correcting for the length of an article we still observe a statistically significant increase in the use of tables between 1984-1988 and 2004-2008. The same trend can be observed for figures. The number of figures per article increased from 0.98 to 3.07 in the main text and the appendix and the effect remains robust when controlling for the length of the article. This indicates that more applied econometrics or empirical approaches were published in *American Economic Review* (may also be correlated with use of the tool among economists). Thus, it looks as if we are moving closer to Baumol's wish list. There seems to be a *relative* shift towards more applied econometrics compared to mathematical applications.[2]

[2] One should note that our proxy (equation) may also cover econometric techniques. However, one can be sure that it should be a good proxy for terms that Baumol uses in his contribution (e.g., "algebraic symbols" (p. 2), (reliance upon) mathematical tools or "abstract analysis" (p. 4)).

Table 2: Exploring the Role of Applied Econometrics/Empirical Analysis.

Variables	Period 1984 to 1988 N = 585	Period 2004 to 2008 N = 497	z - score
Tables in the main text per article	1.73	3.30	8.195
Tables in the appendix per article	0.06	0.22	6.405
Total tables per article	1.79	3.52	8.834
Total tables / length of the article	0.16	0.18	3.664
Figures in main text per article	0.96	3.00	13.235
Figures in appendix per article	0.03	0.07	3.101
Total figures per article	0.98	3.07	16.586
Total figures / length of the article	0.10	0.15	9.584

5. Macroeconomics

The next aspect of Baumol's wish list is more challenging to investigate. He criticizes the short-run orientation of Macroeconomics, stating that there "are at least two major grounds for encouragement of increased attention to the longer run by academic economists. First, of course, is the inherent importance of developments for which substantial periods of time are required… The second reason it is incumbent upon academic economists to devote some attention to the longer run is that there probably is no one else available to do it. Business persons, politicians and civil servants all too often find themselves forced to work from crisis to crisis, and to struggle incessantly to bring today's and tomorrow's problem under control" (p. 3). It is difficult to empirically analyse in depth this part of his wish list. We attempt to quantify the changes by constructing *Table 3* which offers an overview of the topics discussed in these two time periods based on JEL codes[3] reported in the published papers. The next step checks some of the topics that may cover a longer macro time horizon (e.g., JEL Code O: Economic Development, Technological Change, and Growth). Looking at JEL codes provides an additional opportunity to focus on further and more concrete aspects of Baumol's wish list for "applied rather than basic economics, starting from the desire for a return to the wealth of nations as a leading focus for the economist's research… But the past decade has shown that understanding of means that promise to achieve relatively rapid increases in productivity and per capita income are critical not only for the LDCs". … The fact that others have come from behind and achieved growth rates greater than theirs has also drawn attention to our limited knowledge of means that can effectively stimulate growth" (p. 7). *Table 3* shows the *relative* importance of the different JEL code topics in these two time periods. Interestingly, we observe a substantial and statistically significant increase of the relative importance of the area JEL code O over time (from 3.8% to 6.4%). On the other hand, the relative importance of Macroeconomics and Monetary Economics (JEL code E) has

[3] Comparing JEL codes over time might be problematic due to a substantial increase of field journals over time. However, several important field journals such as *Journal of Mathematical Economics* (first published in 1974), *Journal of Public Economics* (first published in 1972) or *Journal of Labor Economics* (1983). On the other hand, other journals such as *Journal of Economic Growth* were first published afterwards (1996).

decreased over time (from 12.3% to 10.1%). This could be interpreted as an indication that we are observing a relative shift towards more long-run orientation of Macroeconomics.

Table 3: Subject-Matter Distribution of Papers over Time.

Variables	Period 1984 to 1988 N = 1490 (584 Articles)	Period 2004 to 2008 N = 1884 (497 Articles)	z - core
(A) – General Economics and Teaching	1.74%	0.42%	-3.873
(B) - History of Economic Thought, Methodology, and Heterodox Approaches	2.08%	0.16%	-5.196
(C) - Mathematical and Quantitative Methods	3.62%	6.53%	9.644
(D) - Microeconomics	20.07%	25.21%	20.905
(E) - Macroeconomics and Monetary Economics	12.28%	10.08%	-14.560
(F) - International Economics	7.38%	5.79%	-11.180
(G) - Financial Economics	3.96%	6.16%	9.849
(H) - Public Economics	8.32%	4.25%	-10.954
(I) - Health, Education and Welfare	2.42%	5.10%	8.307
(J) - Labor and Demographic Economics	12.42%	8.97%	-14.731
(K) - Law and Economics	0.34%	2.49%	5.568
(L) - Industrial Organization	13.02%	8.12%	-14.177
(M) - Business Administration and Business Economics; Marketing; Accounting	1.95%	1.91%	-6.245
(N) - Economic History	1.01%	2.28%	5.916
(O) - Economic Development, Technological Change, and Growth	3.83%	6.37%	10.050
(P) - Economic Systems	1.54%	1.06%	-5.196
(Q) - Agricultural, Natural Resource: Environmental, Ecological Economics	2.75%	1.17%	-5.745
(R) - Urban, Rural, and Regional Economics	1.28%	1.86%	5.477
(Y) Miscellaneous Categories		No observations	
(Z) Other Special Topics	0%	2.07%	-
Total	100%	100%	

Note: JEL codes related to the papers. It seems that authors report more JEL codes over time.

6. Economic History and History of Economic Thoughts

We can also examine what became of Baumol's hopes for the "reintroduction of emphasis on the teaching of economic history… It seems to me that many institutional areas lend themselves to study via historical materials, and in some it may not even be possible to carry out effective research without them. Besides, for those whose forte is not a high level of abstraction, history is apt to prove a very good source of ideas and is apt to contribute considerably to general understanding. It should also provide vital practice in the empirical analysis of messy and complicated problems of which economic history has an endless supply" (p. 5). When looking at *Table 3* we indeed observe an increase in the relative importance of economic history (JEL code N). The incidence of papers from code N has increased from 1.0% to 2.3%.

On the other hand, Baumol is more sceptical regarding the history of economic ideas: "Yet, though I have taught such a course for many years, I am much more sceptical about any attempt to inveigle more students in that direction. It is my belief that much attention is paid to the work of the past only in fields where there is currently little progress at the frontier… Still, there are undoubtedly matters of greater urgency demanding the student's very scarce time, and so it is my predisposition to leave the area to those who are attracted to it (or to any other specialised research area) by what Veblen described as 'idle curiosity'" (p. 5). Interestingly enough, *Table 3 shows* a decrease in the relative importance of History of Economic Thought (see JEL code B). He also emphasised the importance of an "intensive examination of topics such as the economics of education which have largely escaped the attention of mainstream economists. Not only concern with the LDCs requires us to understand more fully just what education contributes to growth, what types of education are critical for the purpose, and what allocation of educational expenditure can be most effective in facilitating growth. In several other countries, notably the United States, the growing proportion in the labour force of groups traditionally associated with inferior education constitutes a threat not only to themselves but also to the remainder of the society" (p. 7). Education is covered under JEL code I, and here we also observe a substantial increase in its relevance. In general, all these results indicate that the changes observed over the last 20 years are not that far away from Baumol's wishes and hopes.

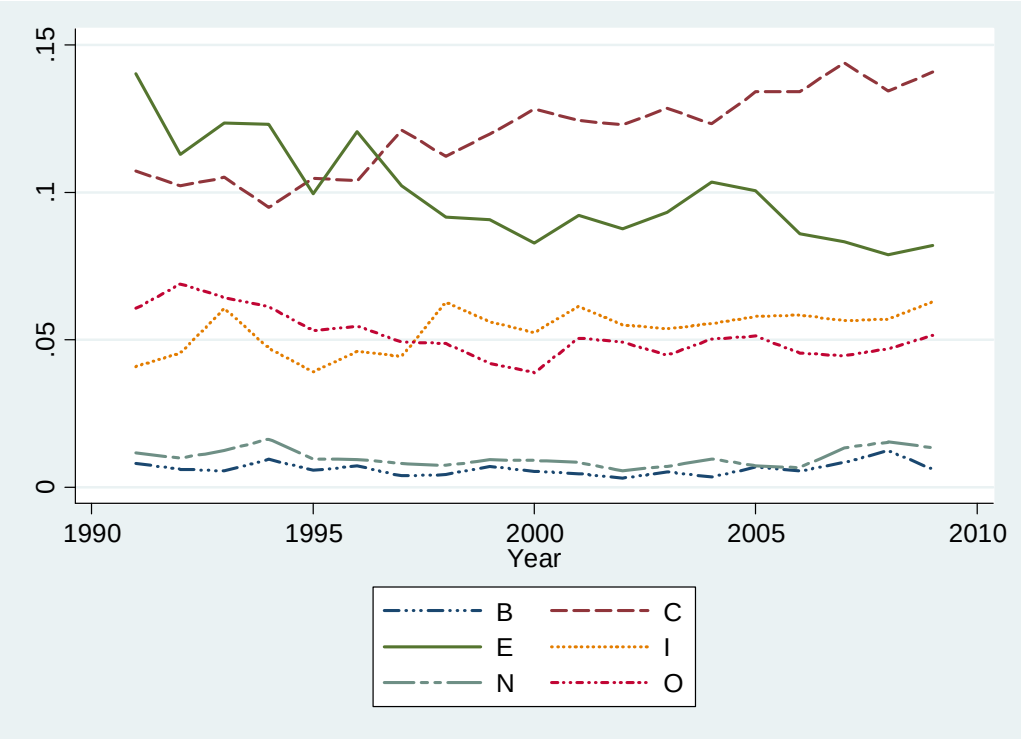
7. Mathematical and Quantitative Methods

Looking at the JEL code C (Mathematical and Quantitative Methods) in Table 3 we are able to get an idea about the importance of theoretically and methodologically driven articles. Baumol declares his hopes "that the future will bring some decrease in the display of technique for its own sake, with models constructed so as to increase what they tell us about the workings of the economy rather than just displaying the properties of some analytical procedure" (p. 6). On the other hand, papers in that area may reflect an aspect that Baumol was keen to see, namely the "greater emphasis on econometrics, stressing its techniques" (p. 4). Looking at *Table 3* we observe a substantial increase within the JEL code field C. There is a relative increase of papers from 3.6% to 6.5%.

8. Job Openings for Economists (JOE)

Next, we also take a look at the number of new jobs listed per year by field of specialization focusing on the Job Openings for Economists (JOE). It helps measuring departments' preferences and needs for particular field. Looking at the same areas, we observe that there has been a substantial relative increase in demand the area I (Health, Education and Welfare) with an increase from 4.1% in 1991 to 6.3% in 2009. This is consistent with Baumol's wish list. We also observe a clear trend in Macroeconomics and Monetary Economics (E), namely a decrease over time (from 14.0% to 8.2%), while such a trend is not observable in the field Economic Development and Technological Change (O). Although we observe a decrease in the 1990s with the lowest value in 2000 (3.9%), its demand has again increased in the last 10 years. Thus, it seems that also here we are not that far away from Baumol's wish list. On the other hand, we don't see substantial differences between Economic History (N) and History of Economic Thought (B) over time. Both report relatively stable values over time. In addition, we observe in line with previous results clear upward trend for Mathematical and Quantitative methods (from around 10.7 to 14.1%).

Figure 1: Job Opening Fields of Specialization (in %, 1991-2009).



Notes: Values in % relative to all the fields. B: Methodology and History of Economic Thought; C: Mathematical and Quantitative Methods; E: Macroeconomics and Monetary Economics; I: Health, Education and Welfare; N: Economic History; O: Economic Development, Technological Change. Data derived from the annual Proceedings issues (Report of the Director, JOE).

9. Behavioural Economics

When discussing subjects for tomorrow's basic research Baumol argued that the "desire for economic pertinence of our constructs is *not* tantamount to a wish for unworkable complication. The contrary is apt to be closer to the truth" (p. 6). As an illustration he uses behavioural economics: "Behavioural economists have been disappointed by the quiet reception that has greeted their findings, and the fact that there has been little effort to incorporate those results in the central corpus of mainstream analysis. I believe one reason those results have tended to be ignored is that there has been too little analytic work examining whether and, if so, where, and to what extent, such behavioural anomalies can be expected to affect the behaviour and performance of markets … One should hope that the future will provide a more general theory that investigates more clearly where such behavioural considerations can be expected to make s significant difference for market behaviour and which indicates the nature of the difference it is likely to make" (p. 6). Meanwhile, 20 years later, one can be safe in pointing out that behavioural economics is a central corpus of economics. Researchers such as Samuel Bowles, Colin Camerer, Ernst Fehr, Bruno Frey, Herbert Gintis, Uri Gneezy, Charles Holt, John Kagel, Daniel Kahneman, David Laibson, George Loewenstein, John List, Matthew Rabin, Al Roth, Vernon Smith, Richard Thaler, and Amos Tversky have each made substantial contributions, not only successfully establishing with rigour, creativity and pertinence this area of research in mainstream economics, but also influencing today's face of economics. Together they have published 140 *AER* articles so far (till the end of 2010 including the *Proceedings*; 98 without *Proceedings*).

10. Concluding Remarks

In 2007 the movie Bucket List was released staring Jack Nicholson, a corporate billionaire called Edward Cole, and Morgan Freeman, a working class mechanic named Carter Chambers. While sharing a hospital room together they decided to do all the things they have ever wanted to do according to their bucket list before they die. They head off on a road trip with the wish list and in the process, both of them heal each other, become unlikely friends, ultimately finding joy in their lives. William Baumol is currently Professor of Economics and Director of the C.V. Starr Center for Applied Economics at New York University. Twenty years ago at the age of 68 he developed this wish list, and we have tried our best to empirically explore the outcomes. In his concluding remarks he mentioned that if he "could foresee tomorrow's discovery I would no doubt be tempted to begin work on it at once; what better way to achieve priority! Here I have, consequently, adopted a more-modest stance, describing my wishes rather than my expectations. Yet if there is an element of rationality in the investigator's choice of topics the two may not prove entirely unrelated. At least so one would hope" (p. 8). Looking back at the results obtained here we indeed observe such a tendency. Thus, we would like conclude by adding a point to our wish list: We wish William Baumol many further successful years as a leading economist, full of expectations and wishes, or in the spirit of William Shakespeare: We wish him all the joy he can wish.

Reference

Baumol, William J. "Toward a Newer Economics: The Future Lies Ahead!" *Economic Journal* **101 (404)**, 1-8.