

## **Growth Accounting: Total Factor Productivity**

Growth Accounting attempts to equate GDP (output) to numerical functions combining (at least) Capital and Labor (as inputs). But an exact match has always required additional variables (of which Total Factor Productivity is the best known) conjectured to be associated with technology or innovation. But in the absence of a separate direct measurement of either technology or innovation such models have necessarily proliferated and become ever more complex.

However the DINTEC™ database now provides the otherwise missing independent measurement of innovation needed for 100% Growth Accounting.

From its financial and marketing data (a) the innovation metric **p/c** can be calculated to show that (b) **p/c** is the sole output from **D** (of R&D) as input (with less time lag for non-durable than for durable goods)<sup>†</sup> and (c) that **p/c** can be summed across products to deliver an industry metric, and across industries to produce a sector metric where sums of (c) themselves sum algebraically and therefore exactly to GDP, without leaving any residual.

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<sup>†</sup> The lag is four years for durable goods. Because 1969 was the peak year of very substantial development spending associated with the Apollo space program, its downturn most likely caused the Productivity Slowdown observed after 1973. Without DINTEC™ this explanation was beyond what Zvi Griliches could have achieved in his 'Productivity Puzzles and R&D: Another Nonexplanation' in Journal of Economic Perspectives, **2**, (Fall 1988).