Palgrave Entry on "Level Accounting," by Francesco Caselli

Suppose that country A is observed to produce more output than country B: is this because it employs a larger amount of labor? Or a larger amount of capital? Or a larger amount of some other input? Or because it somehow succeeds (or endeavors) to make more effective use of given inputs? Level accounting refers to a particular approach to attacking these questions. In this approach, one computes indices of the quantities of each input participating in production in different countries, as well as the shares of each input in total income. The contribution of inputs (or of a subset of the inputs) to differences in output is then given by a geometric average of the inputs, with the shares acting as weights. The difference between the cross-country difference in output and the cross-country differences in inputs, a residual, is interpreted as a cross-country difference in the efficiency with which the inputs are employed, or in total factor productivity (TFP). Level accounting is therefore the cross-country analog of Growth Accounting.

The earliest level-accounting exercises are a 5-country study by Denison (1967) and a 2-country comparison by Walters (1968). In the late 1970s Jorgenson and Nishimizu (1978) and Christensen, Cummings, and Jorgenson (1981) adapted the growth-accounting framework of Jorgenson's work with Griliches and Christensen to level comparisons between the US and 8 other advanced economies. They found substantial TFP differences.

More recently level accounting has been a popular technique in addressing the sources of the enormous differences in income observed between the richest and poorest economies of the world [King and Levine (1994), Klenow and Rodriguez-Clare (1997), Hall and Jones (1999)]. This trend has caused several authors to begin referring to it as "development accounting." While details vary, a consensus view emerging from the development-accounting literature is that observed inputs of labor and capital account for at best 50% of the observed variation in aggregate value added across a large sample (numbring about 100) of developed and developing countries. It is often argued that this evidence points to the need for developing countries to underemphasize saving and investment, and emphasize technical change and technology adoption.

Unfortunately residual variation in development accounting poses at least as many problems of interpretation as residual variation in growth accounting. The problems are compounded by the appalling coarseness of the data. Instead of accounting for compositional differences amongst a large number of education, gender, race, and age categories, as mandated by the Jorgensonian framework, development accountants to date have mostly had to limit themselves to a rough correction for average years of schooling. Perhaps more importantly, instead of allowing for imperfect susbstitutability among different types of capital, again as prescribed by best accounting practice, measures of the capital stock are based on linear aggregation. Caselli and Wilson (2004) show that this could be a fatal flaw. Finally, most development-accounting exercises assume constant capital (and hence labor) shares across countries.

Creative improvements in the measurement of labor quality have recently been proposed by Weil (forthcoming) and Jones and Schneider (2006). Weil

proposes a way to account for differences in the productive capacity of the labor force caused by differences in health, while Jones and Schneider bring to bear cross-country differences in IQ. Both succeed in reducing residual variation considerably. These appear to be two (rare) instances where level accounting has introduced innovations that could potentially also be usefully incorporated into growth accounting, instead of the other way around.

Another recent extension of the development-accounting framework is due to Caselli and Coleman (2006), who show how to decompose the cross-country residual into differences in the efficiency with which different inputs are used. Caselli (2005) uses this technique to show that most differences in efficiency are differences in the efficiency with which labor is used. Caselli and Coleman (2006) further trace these differences to differences in the efficiency of skilled labor.

Cross-country level accounting can also be performed at the industry level, and indeed this seems a necessary step towards shedding light on the sources of large residual variation at the aggregate level. Conrad and Jorgenson (1985), and Jorgenson, Kuroda, and Nishimizu (1987) presented industry-level productivity comparisons for the US, Japan, and Germany. Despite the richness of their data they found surprisingly large TFP differences. The more recent development-accounting literature has only attempted an agriculture-nonagriculture decomposition. The most convincing effort to date is possibly due to Vollrath (2006), who appears to be able to eliminate a significant amount of residual variation in aggregate GDP by accounting for the allocation of factors across these two sectors.

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