

Digitization changes everything: improving economic measurement in an era of radical innovation and transformation

Editor's note: This essay is part of a series being published to help commemorate the Monthly Labor Review's centennial (July 1915–July 2015). The essays—written by eminent authorities and distinguished experts in a broad range of fields—cover a variety of topics pertinent to the Review and the work of the Bureau of Labor Statistics. Each essay is unique and comprises the words and opinion of the author. We've found these essays to be enlightening and inspirational. We hope you do as well.

The digitization of goods and services has fundamentally transformed how business is transacted. Traditional economic measures worked well in the industrial era, yet they fall short in measuring economic value in the present era of radical innovation. For example, with the substantial upfront investments in software development, economic activity is more appropriately measured by income earned than spent.

Digital services— i.e., search and social media—create value, yet users access them for free. Music and book services are available at lower prices, causing income loss to musicians, authors, and publishers. These significant shifts caused by digitization raise important questions. For economists, one major challenge is how to measure economic activity in an era with fewer physical objects to count.¹

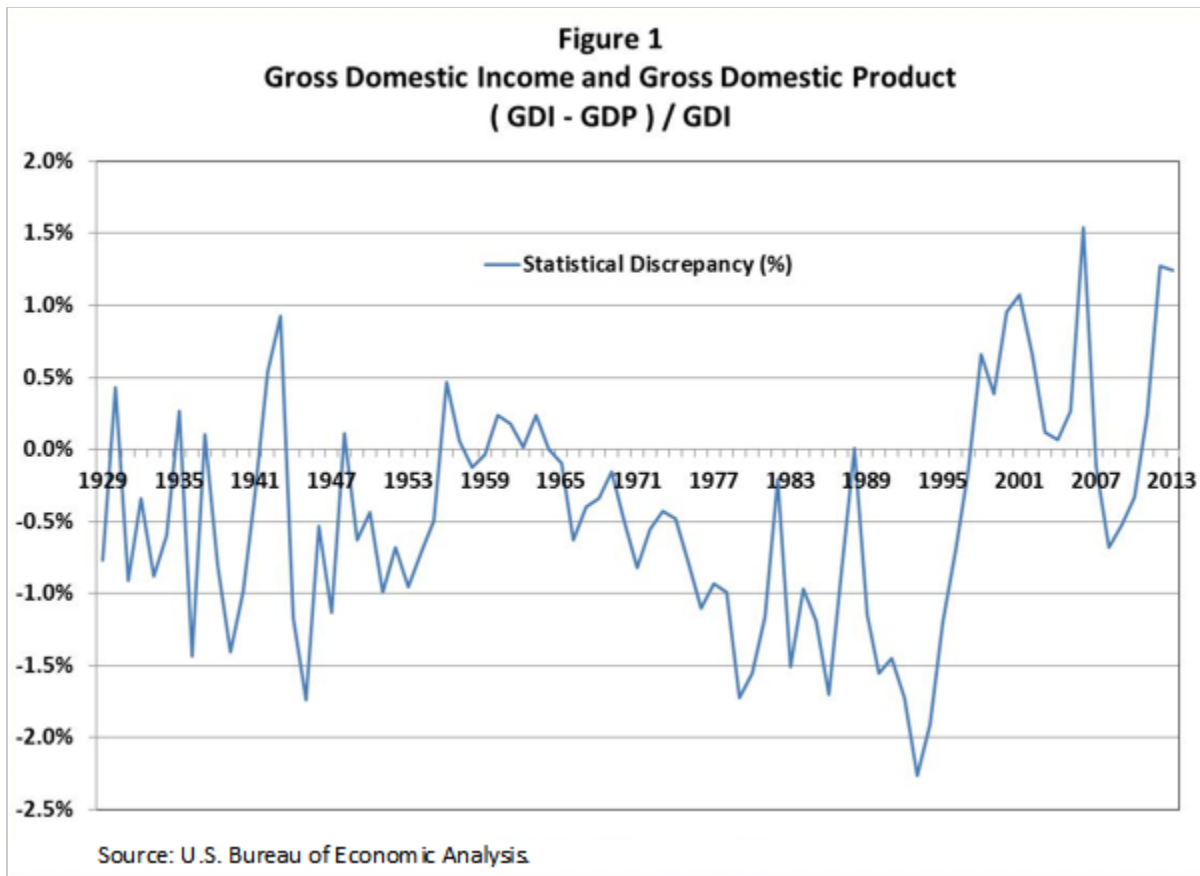
Gross domestic product (GDP) relies on the ability to measure expenditures. It is well suited for agriculture and manufacturing, but less so for services, software, and intellectual property. Gross domestic income (GDI) measures income by summing labor and capital income earned in producing output. Gross value added (GVA) measures the value each industry adds. Conceptually, all three measures will arrive at the same total; however, there are statistical discrepancies.



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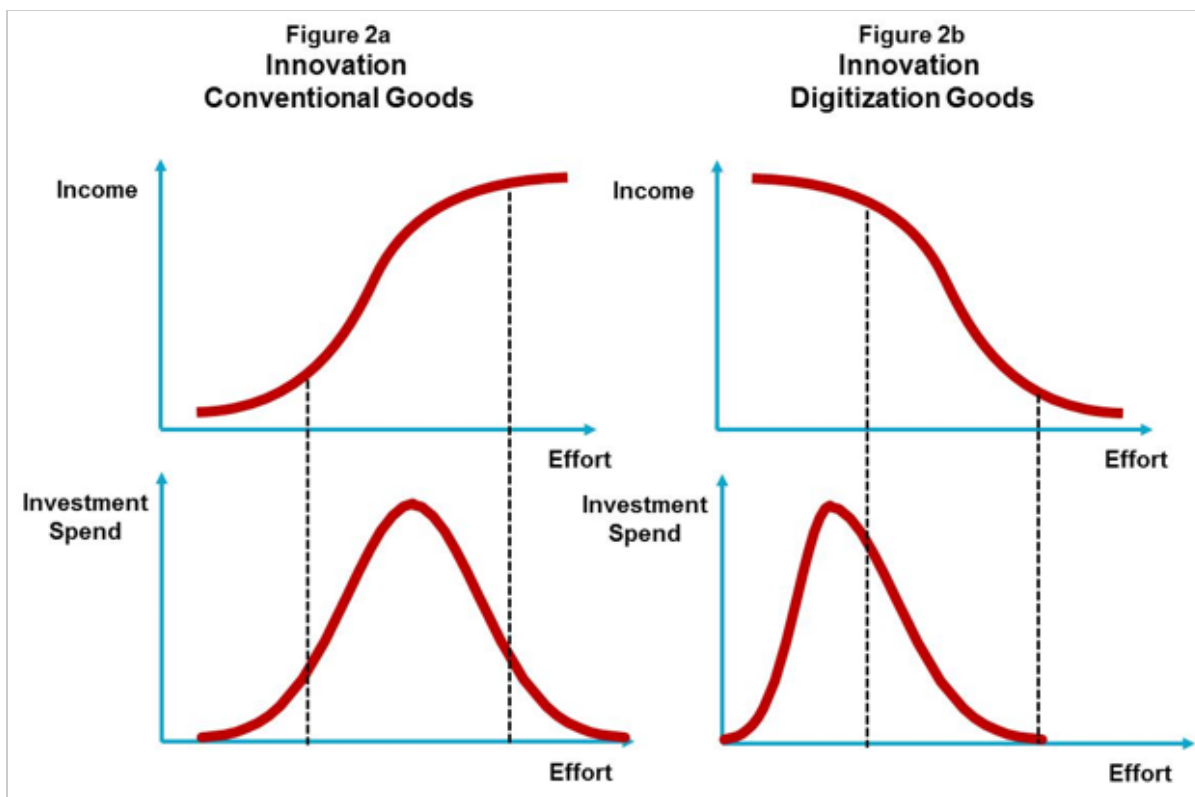
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Figure 1 shows the difference between GDI and GDP over a period of 84 years. For the past 15 years, estimates of income have exceeded estimates of spending by an average of 0.4 percent. The shift from a negative to a positive gap suggests that, as technology has evolved, spending has become more difficult to track.²



The challenge facing economic measurement is that the nature of economic activity and the innovation process have fundamentally changed. With conventional goods, more effort resulted in increased value. The “time to value” was short and innovation cycles tended to be fairly brief.

The S-curve relationship between effort and result demonstrates that success and income generation arrives with a suddenness that is often difficult to anticipate.³ As success occurs, capital investment is often required to build scale and production volume. (See figure 2a.)



Historically, learning-by-doing was an important method of value creation. Economic historians have observed these dynamics in the power loom, steamship, steel, and typesetting industries.⁴ As newly created products were sold with a known price, the nominal value of spending was an effective way to measure innovative activity. The digitization of goods has turned the innovation and value creation process on its head. For digitized goods, the majority of effort occurs before users see the offering. The S-curve is reversed, with the maximum effort and the greatest income earned before the product or service reaches users. (See figure 2b.) This is typical of most software development. Innovation often requires substantial capital investment before success is realized. Measuring economic activity by monitoring spending is less effective for software and intellectual property, where the income is earned during the development process.

Economic measurement needs to understand where income is generated and value is created. Monthly payroll, wage rate, benefits, and price data allow for estimation of income generation. Private sector payroll providers have the data necessary to measure labor income. The monthly Bureau of Labor Statistics payroll survey and Internal Revenue Service income tax data, combined with private sector data, could provide a more accurate view of innovation, growth, and economic activity.

Business and political decisionmakers need a reliable view of global economic activity. As innovation and technology evolve, the challenge is to think differently about economic activity, now and in the future.

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NOTES

[1](#) See Anna Breman and Anna Fellander, “Diginomics: new economic drivers,” translation of “Diginomics—nya ekonomiska drivkrafter,” published in Swedish in *Ekonomisk Debatt*, October 2014, https://www.swedbank.se/idc/groups/public/@i/@sc/@all/@lci/documents/publication/cid_1621507.pdf.

[2](#) For a detailed treatment of these measurement issues, see Jeremy J. Nalewaik, “The income- and expenditure-side estimates of U.S. output growth,” *Brookings Papers on Economic Activity*, spring 2010, pp. 71–127.

[3](#) For a discussion of S-curve innovation, see Richard Foster, *Innovation: the attacker’s advantage* (Summit Books, April 1986).

[4](#) See James Bessen, *Learning by doing: the real connection between innovation, wages, and wealth* (Yale University Press, forthcoming, April, 2015). Bessen’s work traces an S-curve for the 19th-century power loom industry.

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