

Table of Contents

Introduction

Methods and data

Results

Conclusion



Are the prices right? Deflation procedures and an input-output productivity measure

**Fabrício Pitombo
Leite**

Introduction

Methods and data

Results

Conclusion

References

- ▶ The debate about deflation procedures and productivity measures is not new in Economics. In fact, it is not new even in the field of Input-Output Analysis. But when a NBER Working Paper attributes the recent slow growth in manufacturing productivity to mismeasurement in deflators and alleges to use an input-output framework to estimate the correct measure for productivity growth, one should pay attention.
- ▶ This plea from Atalay et al. (2025) for a total factor productivity (TFP) measure is gathering some recognition and it is done by contrasting consumer-facing and producer-facing price indices under the presumption that consumer price indices can measure quality improvements more comprehensively, observing that consumer price indices for computers and electronic products indicate less inflation than their producer and import counterparts.



Are the prices right? Deflation procedures and an input-output productivity measure

**Fabrício Pitombo
Leite**

Introduction

Methods and data

Results

Conclusion

References

Figure: Atalay et al. (2025)

Why Is Manufacturing Productivity Growth So Low?

Enghin Atalay, Ali Hortaçsu, Nicole Kimmel & Chad Syverson

WORKING PAPER 34264

DOI 10.3386/w34264

ISSUE DATE September 2025

We examine the recent slow growth in manufacturing productivity. We show that nearly all measured TFP growth since 1987—and its post-2000s decline—comes from a few computer-related industries. We argue conventional measures understate manufacturing productivity growth by failing to fully capture quality improvements. We compare consumer to producer and import price indices. In rapidly changing industries, consumer price indices indicate less inflation, suggesting mismeasurement in standard industry deflators. Using an input-output framework, we estimate that TFP growth is understated by 1.7 percentage points in durable manufacturing and 0.4 percentage points in nondurable manufacturing, with no mismeasurement in nonmanufacturing industries.



Are the prices right? Deflation procedures and an input-output productivity measure

Fabício Pitombo Leite

[Introduction](#)

[Methods and data](#)

[Results](#)

[Conclusion](#)

[References](#)

Table of Contents

Introduction

Methods and data

Results

Conclusion



Are the prices right? Deflation procedures and an input-output productivity measure

Fabício Pitombo
Leite

Introduction

Methods and data

Results

Conclusion

References

- ▶ The proposed productivity measure is based on the dominant eigenvalue of the technical coefficients matrix for the world as a whole, as it possess some desirable characteristics:
 - (i) it is not open for criticisms about the impact of imported inputs and exchange rates;
 - (ii) it is insensitive to relative price changes and, for the matter of world tables, to exchange rates changes; and
 - (iii) it is the perfect fit to comparing productivity changes that would occur if the same deflator was used for final demand and for intermediate inputs – as the measure would be the same at current prices and at prices so obtained by double deflation – and productivity changes with final demand and intermediate consumption correctly and independently deflated.



Are the prices right? Deflation procedures and an input-output productivity measure

Fabício Pitombo
Leite

Introduction

Methods and data

Results

Conclusion

References

By defining $\mathbf{Z}$ as the matrix of intermediate consumption and $\mathbf{x}$ as the gross output vector, the technical coefficients matrix ($\mathbf{A}$) can be computed by

$$\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1} \quad (1)$$

As the world as a whole has been taken, the column-vector $\mathbf{x}$ has 598 lines for the long-run version for the period 1965–2000 (25 countries plus a proxy for the rest of the world and 23 sectors) and has 2464 lines for the 2016 release for the period 2000–2014 (43 countries plus a proxy for the rest of the world and 56 sectors). Correspondingly, square matrices $\mathbf{Z}$ and $\mathbf{A}$ are 598×598 and 2464×2464 respectively.



Are the prices right? Deflation procedures and an input-output productivity measure

Fab rio Pitombo Leite

Introduction

Methods and data

Results

Conclusion

References

In addition to reference books that made use of dominant eigenvalues as an important topic for the theory of production (Pasinetti, 1977; Kurz & Salvadori, 1995), some authors, identifying that that measure is representative of the technical coefficients matrix, assert that it provides a global measure “of the aggregate intensity of the demand for intermediate goods” (Marengo, 1992, p. 52) or “may be used as an overall linkage indicator” (Dietzenbacher, 1992, p. 424). Indeed, Perron-Frobenius theorems for indecomposable non-negative matrices guarantee that dominant eigenvalues are an increasing function of the elements of $\mathbf{A}$.



Are the prices right? Deflation procedures and an input-output productivity measure

Fabrício Pitombo Leite

Introduction

Methods and data

Results

Conclusion

References

Then, specifying the dominant eigenvalue of a matrix $\mathbf{A}$ of the technical coefficients matrix as λ_d , inverse functions as $1 - \lambda_d$ or $\frac{1}{\lambda_d}$ also had been used for productivity or technical change indicators, always highlighting that such dominant eigenvalues are independent of relative prices (Rampa, 1981; Sánchez-Chóliz, 1987; 1989; 1990). The proposed measure used here is very simple and yet possess the desirable qualities of being insensitive to relative prices and situated between zero and one:

$$\text{Productivity} = 1 - \lambda_d \quad (2)$$

Someone could recognize the affiliation of this measure with Sraffa's (1960) standard system and it is well known that once Sraffa's (1960) standard commodity is adopted, all the concerns about relative prices vanishes since his composite commodity "is one which consists of the same commodities (combined in the same proportions) as does the aggregate of its own means of production – in other words, such that both product and means of production are quantities of the self-same composite commodity" (Sraffa, 1960, p. 19). If $\mathbf{q}^*$ represents the standard commodity – the right eigenvector associated to the dominant eigenvalue –, $\mathbf{p}$ a price vector and R the maximum rate of profits, the precise relationship is as follows:

$$1 - \lambda_d = \frac{\mathbf{p}'(\mathbf{I} - \mathbf{A})\mathbf{q}^*}{\mathbf{p}'\mathbf{q}^*} = \frac{R}{1 + R} \quad (3)$$



Are the prices right? Deflation procedures and an input-output productivity measure

Fabício Pitombo Leite

[Introduction](#)

[Methods and data](#)

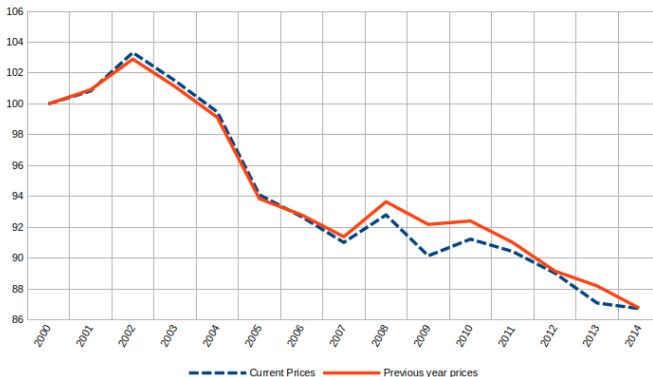
[Results](#)

[Conclusion](#)

[References](#)

For the period 2000-2014, the results indicate that the productivity index computed from the data at current prices is barely discernible from an index computed from the data at previous year prices, both pointing to a fall in productivity.

Figure: World productivity 2000–2014



Are the prices right? Deflation procedures and an input-output productivity measure

Fabício Pitombo Leite

Introduction

Methods and data

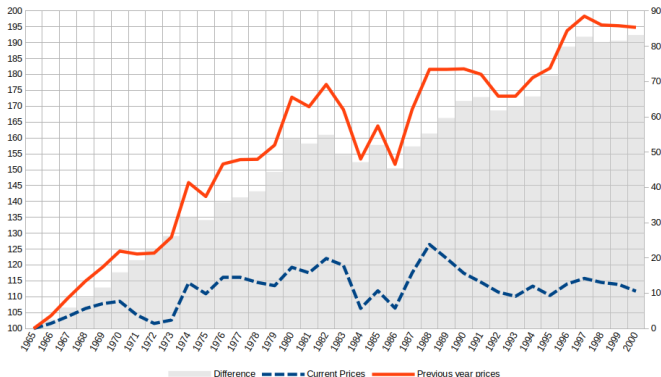
Results

Conclusion

References

But, for the period 1965-2000, the measure computed at previous year prices shows a much larger productivity growth, comprising a period of rapid growth until the early eighties, then a fall and a recovery by the end of the decade, closing the entire period at a level almost 95% higher than in the beginning of the series. In contrast, the productivity measure computed from data at current prices ends the series close to 12% higher, so that a crescent abyss between the two series can be spotted.

Figure: World productivity 1965–2000



Are the prices right? Deflation procedures and an input-output productivity measure

Fabrice Pitombo Leite

[Introduction](#)

[Methods and data](#)

[Results](#)

[Conclusion](#)

[References](#)

- ▶ In both cases, the thesis sketched by Atalay et al. (2025) is not confirmed for the proposed productivity measure when the World Input-Output Database is used.
 - ▶ In the first case, by the mere observation of an indistinguishable behavior between the series obtained with or without a deflation procedure.
 - ▶ And, in the second case, by the opposite result advanced by the authors: the productivity growth computed from the data at previous year prices is much larger than from the data at current prices, implying that the deflators applied to intermediate inputs were much higher than the ones applied to the final demand for the period 1965–2000.



Are the prices right? Deflation procedures and an input-output productivity measure

Fabrício Pitombo Leite

Introduction

Methods and data

Results

Conclusion

References

Table of Contents

Introduction

Methods and data

Results

Conclusion



Are the prices right? Deflation procedures and an input-output productivity measure

**Fabrício Pitombo
Leite**

Introduction

Methods and data

Results

Conclusion

References



Are the prices right? Deflation procedures and an input-output productivity measure

Fabrício Pitombo
Leite

Introduction

Methods and data

Results

Conclusion

References

Thank You!

Fabrício Pitombo Leite
fabricao.leite@ufba.br

URL <https://doi.org/10.34894/A7AXDN>

URL https://www.rug.nl/ggdc/html_publications/memorandum/gd190.pdf



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Leite**

Methods and data

Conclusion

References