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Reestimating Brazil's GDP growth from 1900 to 1980*

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Contents

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GDP growth, real output, national accounts, Getulio Vargas Foundation

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Abstract · **Resumo**

We present evidence of overestimation of Brazil's GDP growth both by the Getulio Vargas Foundation from 1947 to 1980 and by Claudio Haddad from 1900 to 1947. The main reason is selection bias in favor of higher-growth goods-producing activities to the detriment of slower-growing service activities. We develop and apply methods to include such services in the real output series. As a result, we suggest haircuts that reduce the GDP yearly growth rate from 7.4% to 6.2% in the 1947–1980 period and from 4.4% to 4.0% in the 1900–1947 period. For the whole 1900–1980 period, our suggested haircuts reduce the GDP yearly growth rate from 5.7% to 4.9%.

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1. Introduction

Accepted historiographic wisdom is that Brazil's economy grew extremely slowly in the 19th century (cf. Maddison Project Database, 2020), followed by some of the fastest growing rates in the world up to 1980 (cf. Haddad, 1980), only to revert to very slow growth in the last forty years to date (cf. Bacha & Bonelli, 2016).

It is our belief that part of these extraordinary structural breaks is statistical illusion. In a companion paper (Bacha, Tombolo, & Versiani, 2023), we provide new statistical evidence on the Brazilian economy in the 19th century to conclude that the country's performance was better than stated in the Maddison Project Database.

This paper argues that currently accepted figures overestimate Brazil's GDP growth from 1900 to 1980 and provide new tentative estimates for the period. The next section considers the 1947–1980 period, when the country's national accounts were produced by the Getúlio Vargas Foundation (FGV). Section 3 deals with the 1900–1947 period, for which the most widely used GDP growth estimates are Haddad's (1978). Conclusions are summarized in section 4.

2. The 1947–1980 period

From 1947 to 1985, Brazil's national accounts were estimated by the FGV. The Brazilian Institute of Geography and Statistics (IBGE) took over this responsibility in 1986 and reconstructed the series from 1980.

For the history of national accounting in Brazil, see Hallak Neto and Forte (2016), IBGE (1990, pp.81–100), and Veloso and Souza (2007). For the evolution of the methodology of the national accounts at the Getúlio Vargas Foundation, see Centro de Contas Nacionais (1962), FGV (1972), and IBGE (1989).

This section first considers the evolution of the FGV methodology of real output measurement. Next, we discuss the numerical consequences of selection biases that were identified and propose new GDP growth estimates. The section concludes with an additional argument for the haircut we propose on FGV's real output growth from 1947 to 1980.

2.1 Evolution of real output measurement

Until 1969, FGV calculated real GDP by aggregating production volumes of several sectors producing goods and services. Weights were given by the value added of these sectors in base-years for which national censuses were available (1939, 1949, and 1959). Production volumes were calculated in a variety of ways.

Farming, industry, and transportation plus communications were calculated by aggregation of outputs of (or inputs to) these sectors. Trade activities ("commerce") were estimated as a weighted average of farming, industry, and imports. Outputs of government and services were calculated from their respective number of employees, and rental income was made proportional to urban and rural population, with urban population carrying a higher weight. For the methodology, see Centro de Contas Nacionais (1962); for the real output series from 1947 to 1966, see FGV (1967, p.121).[1]

In 1969, a new real output series was introduced by FGV for the period 1947–1967. For the statistics, see FGV (1969, p.64); for the methodology, see FGV (1972). The numbers for farming, industry, commerce, and transportation plus communications did not differ much from the previous series, but "due to conceptual problems and the unavailability of statistical sources, the sectors of financial intermediaries, government and rentals could not be estimated separately, and thus were not included [in the national accounts] at constant prices" (FGV, 1972, p.68, our translation).[2]

Other services (which we presume to include the same activities as services in the old series)[3] temporarily remained as part of real output in the new series, but with their production volumes estimated not by number of employees as previously done, but by deflating their nominal income by a cost-of-living index. In the old series, in the 1947–1966 period, the yearly growth rate of services was 2.3 pp less than that of real output as a whole (3.0% vs. 5.3%). In the new series, other services surprisingly grew at a higher rate than aggregate output (6.3% vs. 6.1%) in the same period. The volatility of the new other services series was also very high.

The consequence of: (i) the exclusion of government, financial intermediaries, and rentals from the series; and (ii) the adoption of a new method of estimating the production volume of other services was a jump in aggregate real output growth in the 1947–1966 period. It was 5.3% per year in the previous series and became 6.1% in the new series.

[1] In Centro de Contas Nacionais (1962), services in current prices include domestic services, members of religious organizations, workers in hotels, restaurants, hospitals, schools, liberal professionals, etc. The components of services in constant prices are not specified in this publication.

[2] We could find no reference to the inclusion of financial intermediaries as part of real output in the "old" FGV methodology. If they were included, the presumption is that their output volume was calculated from the number of employees in the sector.

[3] In the chapter of FGV (1972, p.49), explaining the new methodology for the national accounts in current prices, other services comprise auxiliary trade services, lodging and housing, personal services, and services of hygiene, conservation and reparation, entertainment, and broadcasting. In the chapter explaining the methodology for national accounts in constant prices (FGV, 1972), other services comprise trade-related services, liberal professionals, members of religious organizations, and domestic services.

Other services under the new computation method remained in the real output series only until 1967. Starting in 1968, they too were excluded from it.[4]

In the following years, from 1968 to 1980, real output in the FGV series consisted of only farming, industry, commerce, and transportation plus communications. When the computation of national accounts moved from FGV to IBGE, the whole real output series was reconstructed with the inclusion of only these faster-growing sectors for the entire 1947–1980 period.[5]

Starting in 1980, IBGE reincluded public administration, financial intermediaries, and other services in the real output series, with production volumes calculated according to number of employees. Rentals were excluded from the real output series and were assumed to grow at the same rate as all other activities.

Thanks to the introduction of new periodical surveys, from 1995 onward, IBGE updated its procedures for computing production volumes, particularly for services and commerce. Production volumes are now calculated according to a variety of procedures, only rarely based on the number of their employees or production levels of other sectors.[6]

2.2 Overcoming selection bias

Had the slow-moving service sectors been maintained as part of the national accounts since 1947, the growth rate of the Brazilian economy in the 1947–1980 period would be lower. The comparison we previously made of the "old" FGV real output series of the 1947–1966 period with its "new" one—introduced in 1969—suggests that the average real output growth rate would be 0.8 percentage points (pp) lower (5.3% instead of 6.1%).

There is an alternative more direct way to arrive at basically the same result, which sheds additional light on the relationship between output growth rates under the "new" and "old" (FGV) methodologies.

In Simonsen (1974a, Table 2.1, p.39), there is a table for the yearly output growth rate by sectors of activity, in successive periods from 1920 to 1971, following the "new" FGV methodology, that is, including only farming, industry, commerce, and transportation plus communications.[7] According to these figures, GDP grew at an annual rate of 6.1% from 1947 to 1967.

[4] Cf. FGV (1970, p.96). We could not find an explicit explanation for the exclusion of other services from the real output series. We may presume it was the same as that for the exclusion of government and rentals previously, i.e., "conceptual problems and the unavailability of statistical sources".

[5] Cf. IBGE (1990, pp.132–133).

[6] Cf. IBGE (2014–2016).

[7] Simonsen (1974a, p.23), says that in 1968 FGV constructed a new output series going back to 1920, but he does not refer to a specific publication for this. We have been unable to find such publication.

In Simonsen (1969, Table 12, p.45), there is a similar table except with the "old" FGV methodology, that is, including government, services, and rentals in real output growth as well. Unfortunately, the two tables are not directly comparable because the numbers for farming, industry, commerce, and transportation plus communications do not coincide (due to revisions made by FGV between 1969 and 1974).

However, this second table shows quite clearly that in the periods 1947–1956, 1956–1961 and 1961–1967, yearly growth rates for government, services, and rentals were invariant, that is, 2.4% for government, 3.0% for services, and 3.6% for rentals. The weighted average yearly growth rate (denoted by S) for the three sectors is 3.1%, slightly higher than the 2.9% yearly population growth rate in the whole period.[8]

In the 1947–1966 period, the average shares of government plus services plus rentals in domestic income was 30%.[9] Using this figure for the whole period, we obtain an equation to calculate the yearly growth rate of output under the "old" methodology (Y_o) from the yearly growth rate of output under the "new" methodology (Y_n), as follows:

$$Y_o = 0.7 * Y_n + 0.3 * S.$$

That is, the output growth rate under the "old" methodology is a weighted average of the output growth rate under the "new" methodology and the excluded services growth rate, with weights set at 0.7 and 0.3, respectively.

In the period under consideration (either 1947–1966 or 1947–1967), with $S = 3.1\%$ and $Y_n = 6.1\%$, we obtain 5.2% for Y_o.

After 1971, the real output series underwent subsequent revisions, the most recent one in the IBGE volume on Brazil's historical statistics (IBGE, 1990, pp.118–119). This revision shows Brazil's GDP growing at 6.6% in the 1947–1966 period, a rate higher than the 6.1% calculated by FGV in 1971. Applying the formula above under the assumption of an invariant 3.1% for S, we conclude that with the inclusion of government, services, and rentals, in the 1947–1966 period Brazil's GDP yearly growth rate would have been 5.6%, rather than the 6.6% shown in the national accounts.

The question is: can this same procedure be extrapolated to the subsequent period (1966–1980)? With some adaptations, our answer is yes.

The variable Y_n was equal to 6.6% per year in the 1947–1966 period, as we have seen. In the 1966–1980 period, it was much higher at 8.6% per year

[8] The weights were the averages of the sector shares in GDP at factor cost (including imputation of financial services) in 1947 and 1966. See IBGE (1990, pp.125–126).

[9] Domestic income defined as GDP at factor cost including the imputation of financial services. The shares were 31.75% in 1947 and 28.32% in 1966. See IBGE (1990, pp.125–126).

(IBGE, 1990, pp.131–133). We have no direct information on the behavior of S in this period. One alternative, extending the "old" FGV methodology, is to assume that each of its component grew at the same rate as in 1947 to 1966. In this case, with weights based on the average shares of these activities in national income in 1966 and 1980, we would conclude that S was 3% in the 1966–1980 period. Another alternative is to use the subsequent growth rates of the service sectors reincluded by IBGE in the real output series from 1980, namely, financial intermediaries, public administration, and other services. In the 1980–1989 period, the average growth rate of these sectors was 3.2%.[10] We will use this second higher figure for S in the 1966–1980 period.

The average of the income shares of government plus rentals plus services in 1966 and 1980 was 27%.[11] In this case, the yearly output growth rate under the "old" methodology would be: $0.73 * 8.6 + 0.27 * 3.2 = 7.1\%$ —1.5 pp lower than under the "new" methodology. Rather than 8.6%, Brazil's yearly GDP growth in the 1966–1980 period was 7.1%. If this is correct, the "economic miracle" commemorated by Simonsen (1974b) would not have been that miraculous after all.[12]

Aggregating the results for the periods 1947–1966 and 1966–1980, for the whole period from 1947 to 1980, rather than the 7.4% per year shown in Ipeadata (Ipea, 2022), the Brazilian economy more likely grew by some 6.2% per year[13]—1.2 pp less.

2.3 Additional argument

Bacha (1971) provides an additional argument in support of the proposed haircut. This paper argues that the national accounts overestimated real manufacturing output growth itself. A table in that paper compares the evolution from 1950 to 1969 of manufacturing real output in the FGV national accounts with an index

[10] This figure was computed from Table 7A (GDP at factor cost according to classes and sectors of economic activity) and Table 9 (indexes of real output [base 1980=100], according to classes and sectors of economic activity) for the 1980–1989 period. Available at https://www.ibge.gov.br/estatisticas/economicas/contas-nacionais/9052-sistema-de-contas-nacionais-brasil.html?=&t=downloads [2005 → Consolidado.zip → tab80_89.xls]. To calculate the average growth rate of the three sectors we used as weights the average of their shares in GDP at factor cost (including imputation for financial intermediaries' services) in 1980 and 1989.

[11] Cf. IBGE (1990, pp.126–127).

[12] In *Brasil 2001*, Simonsen (1969, pp.293–297) lists distortions in the "old" real output index (including services) that would cause it to overestimate the "real results of development" in the 1956–1961 period. However, in Simonsen (1974a, p.1), commenting on the high values of the "new" output index (excluding services) for the 1968–1973 period, he ignores possible distortions and writes "the supposed miracle in reality is the corollary of the adoption of an economic model theoretically well-structured and accompanied by a good dose of pragmatism."

[13] This is the weighted geometric average of the values for 1947–1966 and 1966–1980.

of manufacturing valued added deflated by wholesale industrial prices. With both indexes equal to 100 in 1950, real manufacturing output reaches 473 in 1969, whereas deflated manufacturing value added reaches only 333, implying a difference in yearly growth rates of 2 pp.

A probable reason for this difference is as follows. Consider an activity with a single final product and a single input: Q is the quantity of the final product, V is its value added in real terms (i.e., deflated by the output price), and J is the quantity of the input it uses. Then: $V = Q - pJ$, where p is the price of the input relative to that of output. Use a as the base-year input-output ratio, J/Q. Then: $V = Q(1 - p \cdot a)$. Thus, if the current-price input-output ratio $(p \cdot a)$ increases, the growth of Q will overestimate that of V, which seems to be what happened in Brazil in the post-WW-II period of rapid import-substitution industrialization. A particularly telling illustration is provided by Bacha (1971); from 1954 to 1955, the chemical industry production volume jumped 134% when input-intensive oil refineries, a novelty in the country, started operations in 1955. Meanwhile, real value added in this industry increased by only 13% between 1954 and 1955.

Thus, in addition to the selection bias in Brazil's national accounts in favor of high-growth activities, there is the issue of double counting of intermediate goods. These goods entered the overall output index both as part of final goods and also on their own—because real output was computed by aggregation of production volumes rather than real value added. This procedure tends to overestimate output growth rates in periods when intermediate inputs grow faster than final outputs, as illustrated in Bacha (1971) for the mid-1950s.

3. The 1900–1947 period

Prior to 1947, a complete set of national accounts did not exist. There were only a few GDP estimates by individual analysts, of which Haddad (1980) was the most complete and most widely accepted.[14] Haddad (1980) contains a revision of the original series in Haddad (1978). His real GDP figures for the 1900–1947 period were consolidated with those of IBGE for the 1947–2021 period in Ipeadata.[15]

Haddad followed the same methodology as the Vargas Foundation, aggregating production volumes of goods and services in farming, industry, transportation plus communications, commerce, and public administration.[16]

[14] See Malan, Bonelli, Abreu, and Pereira (1980, Appendix 2) and IBGE (1990, pp.94–97).

[15] Ipeadata. Produto interno bruto (PIB) a preços de mercado: índice real.

[16] Haddad estimated public administration output using the salaries paid to civil servants, deflated by a general price index. This is a peculiar choice for a methodology based on production

Haddad's sample of goods and services was more limited than Vargas', particularly in the first two decades of the century. Hence, the criticism of selection bias that apply to the FGV national accounts are even more valid for the figures that Haddad obtained for real output in the 1900–1947 period.

An independent issue is raised by Reis (2019), who argues that GDP growth measured from the output side neglects the importance of informal and handicraft activities. This neglect is explained by the intrinsic difficulties of measuring goods and services that were produced and marketed in each locality and almost always in small home establishments, artisanal and informal, when not at the marketplace itself. Since these activities evaded local taxation, were not transported and did not cross fiscal barriers, they were therefore without statistical records of any kind. Empirically, Reis deals with the statistical invisibility of informal activities using the Demographic Census of 1920 to estimate GDP from the income side, at least in principle incorporating a large part of all activities, both formal and informal. Reis's observations contribute to the perception of overestimation of GDP growth in the earlier part of the century.[17]

Haddad's estimates of GDP growth in the 1900–1947 period can be split into two sub-periods: 1900–1919 and 1919–1947. This distinction is because both his estimated yearly output growth rate for the first period is much lower than the second (3.8% vs. 4.9%) and the yearly population growth rate (a critical variable for our estimate of the growth rate of services not included in Haddad's series) was much higher in 1900–1919 than in 1919–1947 (2.5% vs. 1.5%).[18]

From the perspective of the "old" FGV methodology for 1947–1966, the only two sectors that Haddad does not include in his computation are services (defined *strictu sensu*, as in the "old" FGV methodology) and rentals. According to Loeb and Van Der Meiren (1954, p.156) in 1939 these sectors' share in net national product was 20%. We use this value for the whole 1900–1947 period and assume that these two sectors grew according to population plus 0.2pp. This 0.2pp was the difference in the 1947–1966 period between the yearly population growth rate (2.9%) and FGV's estimate of "government-plus-

volumes, since the real wage of government employees can be expected to increase over time, resulting in higher growth rates for public administration than the estimates of FGV, which are based solely on number of government employees.

[17] The overestimation of GDP growth led to underestimated per capita income levels in the early decades of the century. Exactly how much is an ongoing object of dispute in the literature. Reis's estimated per-capita income in 1920 was 36% higher than Haddad's. Bértola, Castelnovo, and Willebald (2012), who also used the 1920 Census to evaluate Brazil's per-capita income, estimated it to be 53% higher than Goldsmith's (1986), which in turn was 5% higher than Haddad's.

[18] Population growth rates were obtained using Mortara's (1941) series for 1900–1915, and Ipeadata's for 1916–1940. With this procedure, we are accepting Mortara's observation that the 1900 Census—which was used by Ipeadata—underestimated the population in residence.

-services-plus-rentals" yearly growth rate (3.1%). That is, we assume that Haddad's excluded service sectors grew at the annual rates of 2.7% and 1.7%, respectively, in the periods 1900–1919 and 1919–1947.

In this case, our estimate for the yearly output growth rate in the 1900–1919 period is: $3.8 * 0.8 + 2.7 * 0.2 = 3.6\%$, whereas in the 1919–1947 period it is: $4.9 * 0.8 + 1.7 * 0.2 = 4.3\%$. In the first period, our estimate of 3.6% is only 0.2 pp lower than Haddad's 3.8%, whereas in the second period our 4.3% is 0.6 pp lower than his 4.9%. Averaging out these results, for the 1900–1947 period we obtained a yearly output growth rate of 4% compared to Haddad's 4.4%.

4. Conclusions

We presented evidence of overestimation of Brazil's GDP growth, both by the Getúlio Vargas Foundation in the 1947–1980 period and by Haddad in the 1900–1947 period. The main reason for these overestimates is the exclusion of slow-growing service activities, the growth rates of which are presumed to follow those of the higher-growth activities included in the GDP growth estimates.

We obtained alternative output growth estimates by reintroducing the excluded services in the computation of Brazil's real GDP. To do this, we started by uncovering earlier FGV estimates of GDP growth for 1947–1966 that included these services. We observed that in these series, the yearly growth rate of such services was 3.1% in the 1947–1966 period, 2 pp higher than the population growth rate in that period. From FGV's estimates of domestic income by sectors of activity, we obtained an average share of these services in domestic income in the 1947–1966 period. The next step was to verify the latest official estimate of the yearly output growth rate for 1947–1966 (which excluded the relevant service sectors) and average it out with the yearly growth rate of the excluded services. As weights, we used the domestic income shares of included and excluded sectors in the period. We thus obtained new estimates for the yearly GDP growth rate in the 1947–1966 period.

Next, we dealt with the 1966–1980 period. As before, from the domestic income series by sectors of activity, we estimated average domestic income shares of included and excluded sectors. As a proxy for the growth rate of excluded services, we used their yearly growth rate for 1980–1989, when these services were reintroduced into the computation of Brazil's real output. Averaging out the growth rates of included and excluded sectors, we obtained a new estimate for the yearly GDP growth rate in the 1966–1980 period.

Finally, we dealt with the 1900–1947 period, for which we had an estimate of domestic income shares by sectors of activity only for 1939. We assumed that such shares applied to the whole period. To estimate excluded services

growth rates, we called upon the observation that in the 1947–1966 period, their average growth rate was 0.2 pp higher than that of the population. We applied this same add-on to the yearly population growth rates in the periods 1900–1919 and 1919–1947, which are the two periods in which we split Haddad's analysis of Brazil's GDP growth.

In all subperiods, the estimated growth rates of the excluded sectors were lower than those of the included sectors, so our procedure implied haircuts in existing GDP growth rates for the entire 1900–1980 period. For 1947–1980, we came up with haircuts to FGV's estimates that reduced yearly GDP growth from 7.4% to 6.2%. For the 1900–1947 period, our haircuts reduced yearly GDP growth from Haddad's 4.4% per year to 4%. Adding up these results, our conclusion is that from 1900 to 1980, Brazil's GDP yearly growth rate was 4.9% and not the 5.7% shown in Ipeadata. Table 1 compares our estimates of GDP and GDP per capita with those in Ipeadata.

Table 1. GDP yearly growth rates, total and per capita (pc)

	GDP		GDPpc	
Period	Ipeadata	This paper	Ipeadata	This paper
1900–1980	5.7	4.9	3.3	2.5
1900–1947	4.4	4.0	2.4	2.0
1900–1919	3.8	3.6	1.2	1.0
1919–1947	4.9	4.3	3.1	2.5
1947–1980	7.4	6.2	4.5	3.3
1947–1966	6.6	5.6	3.6	2.6
1966–1980	8.6	7.1	5.9	4.4

Our estimates are derived from very simple add-ons to the Ipeadata accounts in a period-by-period basis. Our intent is to encourage specialists to reconsider Brazil's national accounts in the 1900–1980 period, incorporating the currently excluded economic activities, using more sophisticated methods and alternative data sources.

Presuming that our findings will be confirmed in a more extensive revision, some consequences would follow for Brazil's economic historiography:

1) During the import-substitution industrialization period, Brazil grew less than currently believed.
2) Our period-by-period reestimation does not change the ordering of the periods according to their respective GDP growth rates. For example, the yearly GDP growth rate for 1966–1980 continues to be the highest and that for 1900–1919 the lowest. But the higher the currently accepted GDP

growth rate the higher is our suggested haircut. For example, for 1966–1980 our haircut reduces the yearly GDP growth rate by 1.5 pp (or 17.4%) while for 1900–1919 our haircut is only 0.2 pp (or 5.3%).

3) In the period 1950–1980, Brazil did not meet the requirement of a "success story of sustained, high growth" (25 years of GDP growth higher than 7% per year) as purported by the Commission on Growth and Development's *Growth Report* (2008, p.21).

4) Despite our haircut, Brazil's GDP growth in 1900–1980 was a respectable 4.9% per year, much higher than the 3.2% of the global economy in the period according to the Maddison Project Database (2020).

5) There is not as sharp a difference as presently understood between Brazil's per-capita GDP growth rates in the 19th and 20th centuries. In Bacha, Tombolo, and Versiani (2023), we argue that Brazil's per-capita GDP grew faster in the 19th century than presumed in the Maddison Project Database (2020).

6) A higher estimate of Brazil's GDP growth in the 19th century does not lead to "implausibly low per-capita income levels" in the earlier part of that century as claimed by Abreu, Lago, and Villela (2022, p.52), for the results of this paper imply that Brazil's per-capita GDP in the early 20th century was higher than currently believed.

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