Chapter 1

A brief history of Brazil's growth

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This chapter focuses on the Brazilian growth experience and begins with a brief overview of events that marked the country's development from its discovery in 1500 to the 19th century. The chapter then divides the years between 1900 and 2008 into four periods, based on the methodology developed by Bai and Perron (1998, 2003) to identify structural breaks in statistical series. We identify regime changes in 1918, 1967 and 1980. Growth accounting is subsequently used to analyse the behaviour of productivity in the post-World War II period and suggests that high inflation might have been a reason for a decline in productivity between 1980 and the mid-1990s.

The chapter shows that the terms of trade have played a significant effect on economic growth and on fluctuations in output. Other factors (such as fiscal stimuli or easy access to foreign finance) also matter for output growth in the short run. From 2004 to 2008, improvements in the terms of trade and government debt reduction underpinned economic progress. The emergence of a new economic era in the years to come will depend on wiser fiscal policies than those of the past.

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Introduction

The most significant part of the economic divergence that currently exists between wealthy and poor nations took place between 1750 and 1900.[1] Countries with good institutions, such as the United States, were able to take advantage of the Industrial Revolution and grew rapidly, whilst the inheritors of exploitative institutions from their colonial past, such as Brazil, were left behind.

The United States entered the 20th century with a GDP per capita 10 times higher than that of Brazil. The gulf in relative living standards between Brazilians and Americans was reduced over the course of the century to 1980. It increased again after 1981. However, thanks to rapid growth between 1918 and 1980, Brazil finished the 20th century with an average income per capita (measured on a par with purchasing power) that was approximately one-fifth of that of the United States. Brazil therefore started the 21st century better off than it did the 20th century. From 2004 to 2008, improvements in the terms of trade and debt reduction ushered in further progress. Will it last?

We address this question in the concluding section, after examining Brazil's economic growth in three steps. The chapter begins with a brief overview of events that marked Brazil's development from its discovery to the 19th century. The years between 1900 and 2008 are divided into four periods, reflecting structural breaks in 1918, 1967 and 1980, which were identified according to the methodology developed by Bai and Perron (1998, 2003). The analysis turns to sustained growth and uses a growth accounting methodology to analyse the behaviour of productivity in the post-World War II period. We then discuss output fluctuations and shows that changes in the terms of trade have played a significant effect on economic growth and output fluctuations. The importance of factors other than changes in the terms of trade is evident in the recessions of 1942-45, 1956-57 and 1964-65, which coincided with improvements in the terms of trade. The section also explores the importance of abundant liquidity in international financial markets for both the economic "miracle" of 1967-79 and its debacle. Finally, the section looks at growth oscillations from 1980 to 2008, when the country moved from severe macroeconomic instability until mid-1994 to prosperity in more recent years. High inflation might have been a reason for a decline in productivity between 1980 and the mid-1990s.

Structural breaks in economic growth

This section focuses on the history of Brazil's economic growth by presenting a stylised picture of the country before the 20th century.

Before the 20th century: "Yes, we do have bananas!"

"The seas are plentiful, infinite. And the earth, likewise, is so bountiful that, should one just care to use it, it can provide everything". Pero Vaz Caminha wrote this description of the land (where Portuguese caravels arrived in April 1500) to the King of Portugal, D. Manuel. In his letter, Mr. Caminha addressed the owner of the new findings as the "The Lucky One", since the curse of natural resources was unknown at the time.

For centuries, Brazilian exports reflected cycles of boom and bust for different commodities. Sugar exports peaked in the 1650s. Competition from the Caribbean reduced sugar prices and Brazil's north-eastern region lapsed into subsistence agriculture. The discovery of gold in the 1690s and diamonds in the 1720s in Minas Gerais created new opportunities. The gold industry peaked around 1750, with gold production at about 15 tonnes a year. As the richer deposits were exhausted, exports declined. When gold production collapsed, Brazil turned back to agricultural exports. At its independence in 1822, the country's three main exports were cotton, sugar and coffee.

At the end of the 19th century, the country experienced a boom from rubber exports, to which the Manaus Opera House still testifies. The Amazon region lived a fleeting dream of wealth. Between 1840 and 1911, when industrial uses for rubber multiplied, the price of rubber rose from £45 to £512 a tonne - an annual increase of almost 15%. Rubber exports increased fivefold between 1870 and 1911. Manaus drowned itself in luxuries. It was the first city in South America to feature a tram. Its residents would send their laundry to be done in Lisbon. Architects, contractors, painters and sculptors came from all over Europe to build the Manaus Opera House, the central point of Werner Herzog's film, *Fitzcarraldo*, set in 1896. The film helped to spread the myth that Enrico Caruso performed there. A quick check of the website www.visitamazonas.com.br, which lists the musical companies that performed at the Opera House, denies the fantasy created by Mr. Herzog with the help of Bellini's opera *I Puritani*. Yet, even without Bellini's music, at the beginning of the 20th century "*lucevano le stele*" (the stars shone) in Manaus, at least until the collapse of rubber prices ended the feast, emptied the theatre and extinguished the stars.

Exporting commodities, in particular semi-manufactured goods that add value to primary products, does not seal a country's fate. Notwithstanding the unhappy ending of the rubber boom, a positive terms-of-trade shock could have bequeathed a more solid legacy, although it did not necessarily turn the country into a Venezuela or a Nigeria; in these countries, despite abundant oil, economic policy errors, despotism and corruption leave the majority of the population behind and in poverty.

In 1876, Sir Henry Wickham harvested 70 000 seeds from Brazil's rubber trees and sent them to Asia. Malaysia, Indonesia and Thailand are currently responsible for 90% of the world's production of natural rubber. Although these three countries are now specialised in exports of electronic goods, rather than natural rubber, they still sell 42 different natural rubber products, ranging from surgical latex gloves to furniture.

There is no shortage of examples of countries that have made good use of their natural resources and survived the turnabouts of the terms of trade. Australia (with a per capita GDP more than three times higher than that of Brazil) exports agricultural and mineral goods. Minerals make up 45% of Australian exports, and meat, dairy and forestry products account for 40% of New Zealand (also wealthier than Brazil) exports. Chile prospered by exporting copper and agricultural products. It transformed its grapes into wine and stuck labels on its tomatoes, in the same way that New Zealand transformed the milk from its cows into the best butter in the world.

The successes demonstrated by Australia, New Zealand and Chile did not depend on magic formulas. They resulted from sensible economic policy, the use of tax revenues to invest in education and R&D, and determination not to inhibit the development of more dynamic sectors through trade protection for the laggards. This is because the opening of the economy invites investment in new technologies, which has a positive influence on productivity; it also boosts competition, provides incentives for efficiency and reduces inflationary pressures. The paper returns to this discussion in the next section, which gauges the importance of terms-of-trade oscillations for Brazil's output fluctuations during the 20th century.

As a result of the abolition of slavery in 1888 and mass inflows of immigrants, the money supply was insufficient to deal with the new reality of salaried labour. Thus, in 1889, after the proclamation of the Republic, the government encouraged banks to print money and promote credit. As a result, business and financial speculation took over the Republic's first year. Companies were founded: some real, others fictitious. Stock exchange speculation increased, and so did inflation.

In 1890, when people thought money grew on trees, inflation ceased to be a mystery. Machado de Assis[2] notes in *A Semana* (16 December 1894): "At the time, whoever placed a basket, bowl, barrel or receptacle of any kind out in the moon - or starlight - and awakened to find himself with five, ten or twenty thousand coins, soon understood that the only way to make money down here is through forgery". For Machado de Assis, any money not based on gold was false and, therefore, created inflation. But, even if that was not quite the case, there is little doubt that inflation during the first years of the Republic resulted from an excess of credit at a time when there was no central bank and accompanying financial regulation.

The period referred to by Machado de Assis is known as *Encilhamento* and ended with the crash of stock prices and the bankruptcy of banks and companies in 1891, when British capital fled Brazil in the wake of a crisis in Argentina. As a result, the Campos Sales administration agreed to an external loan in 1898, which was collateralised by revenue from Rio de Janeiro's Customs and Excise department. Furthermore, it committed itself to a programme of deflation, incinerating part of the currency in circulation.

At the time, the State of São Paulo had already moved ahead of other regions, launching the kind of development characterised by agricultural diversification, urbanisation and industrialisation. Between 1890 and 1900, the population of the city of São Paulo grew at a rate of 14% per year, increasing from 64 000 inhabitants in 1890 to 239 000 in 1900. The coffee businesses set the stage for the first wave of industrialisation by raising incomes, creating a market for manufactured goods and promoting investment in railways and immigration. Approximately 3.8 million immigrants settled in Brazil between 1887 and 1930.

Over the course of the first Republic (1889-1930), the majority of loans and investments continued to be sourced in England. The United States represented the main market for the most important Brazilian export of the time: coffee. And coffee reigned until 1930.

Finding structural breaks in 20th century growth rates

Jones and Olken (2008) investigate extremes of growth experiences within countries and examine the changes that occur when growth starts and stops. Their growth accounting reveals that physical capital accumulation plays a negligible role in growth takeoffs and a larger, albeit still modest, role in growth collapses, which typically come on the back of reduced manufacturing production and investment amidst increasing price instability. Growth takeoffs are primarily associated with large and steady expansions in international trade.

Jones and Olken use the methodology developed by Bai and Perron (1998, 2003) to identify changes in growth regimes and study these periods using growth accounting. The Bai and Perron methodology considers a multiple structural break model, with m breaks ($m+1$ regimes). The null hypothesis of no structural break is tested against the alternative of an unknown number of breaks. The tests are used to determine if at least one structural break is present. In addition, a maximum number of breaks is chosen. If the tests show evidence of at least one structural break, then the number of breaks can be determined by the Schwartz Bayesian Information Criteria (SBC).

This section applies the Bai and Perron methodology to the growth rate of GDP per capita in Brazil between 1900 and 2008. The maximum number of breaks is 9 when the authors choose a minimum period of 10 years between breaks. Table 1.1 shows the values of the SBC statistics, the number of breaks and the corresponding years. The lowest SBC value is 808.75 and identifies the number of breaks as three, corresponding to four periods: 1900-17, 1918-66, 1967-79 and 1980-2008.

Table 1.1. Growth rate of GDP per capita: Structural breaks

Number of breaks	SBC statistics	Year of break
0	817.74	
1	815.00	1980
2	810.16	1918, 1980
3	808.75	1918, 1967, 1980
4	810.09	1918, 1967, 1980, 1992
5	811.36	1918, 1928, 1967, 1980, 1992
6	812.66	1918, 1928, 1942, 1967, 1980, 1992
7	813.89	1910, 1928, 1942, 1955, 1967, 1980, 1992
8	814.97	1918, 1928, 1942, 1955, 1967, 1977, 1987, 1998
9	816.66	1916, 1926, 1936, 1947, 1957, 1967, 1977, 1987, 1998

Source: IPEA (IPEADATA) and authors' estimations.

Growth accounting

This section uses growth accounting to analyse the different growth regimes identified in the previous section. A variety of ways of carrying out the same exercise, undertaken by several authors, generally demonstrates that total factor productivity (TFP) grows until the end of the 1970s before dropping sharply over the following decades.[3]

Methodology and data

Methodology

The theoretical framework is basically the same as that used by the pioneering estimations of Gomes, Pessoa and Veloso (2003). The first equation specifies a Cobb-Douglas production function with human capital such that:

$$y_t = A_t k_t^{\alpha} H_t^{1-\alpha} , \tag{1}$$

where y_t is output per worker, k_t is capital stock per worker, H_t is human capital (education) per worker, A_t is TFP, and t is a time index. Estimation of human capital follows the Mincerian approach, as in Bils and Klenow (2000), such that:

$$H_t = e^{\phi(h_t)} , \tag{2}$$

where h is the average years of schooling of the labour force, and

$$\phi = \frac{\theta}{1-\psi} h^{1-\psi} , \tag{3}$$

where $\theta > 0$ land $0 < \psi < 1$.

Log-differentiation of equation (1) yields:

$$\frac{\dot{A}}{A} = \frac{\dot{y}}{y} - \alpha \frac{\dot{k}}{k} - (1-\alpha) \frac{\dot{H}}{H} . \tag{4}$$
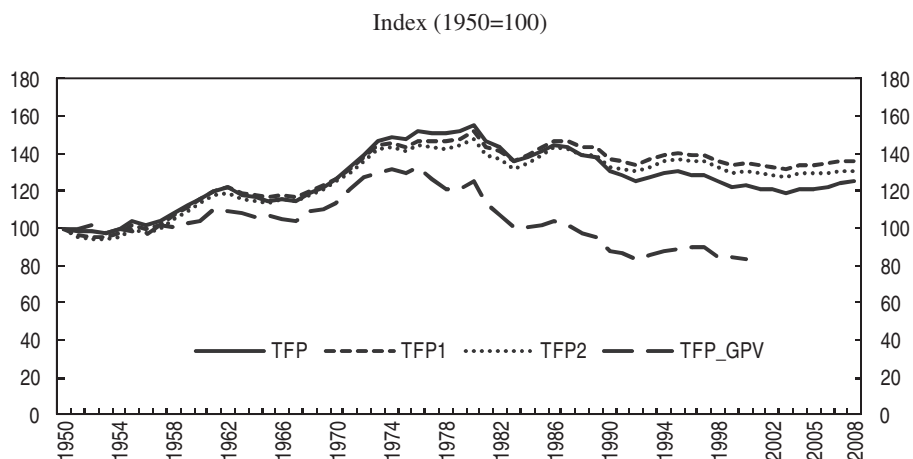
Data

For the physical capital stock, we use the series calculated by Morandi and Reis (2004), which is available at www.ipea.gov.br, IPEADATA. For human capital, we use the series of five-yearly averages by Barro and Lee (2001) interpolated to deal with missing observations. As in Gomes, Pessoa and Veloso (2003), the values of θ and ψ are 0.32 and 0.58, respectively. Instead, Gomes, Pessoa and Veloso constructed the physical capital series using the perpetual inventory method.[4] The work by Morandi and Reis (2004) is, however, more precise because they used more reliable depreciation information for each point in time and assessed the accumulation of capital by sector, instead of at the aggregate level, taking

into account differences in the quality of capital. Furthermore, separate series for construction and machinery and equipment, are now available, avoiding a bias in capital prices during the 1980s, as well as distinguishing public from private capital. With this in mind, we calculated three TFP series, using total net stock of capital (TFP), total net stock of machinery and equipment (TFP1) and net stock of private sector machinery and equipment (TFP2).

We set α equal to 0.4, as in Gomes, Pessoa and Veloso, which is comparable to the estimate reported by Ferreira, Issler and Pessoa (2004). The number of workers used to calculate y and k was obtained by building a series of the population aged over 25 using data from the 1950, 1960, 1970, 1980, 1991 and 2000 censuses and performing a polynomial interpolation to fill in the missing years. On the basis of this calculation of k and y, the different TFP indices can be computed (Figure 1.1).

Figure 1.1. Total factor productivity, 1950-2008

Index (1950=100)

Source: IPEA (IPEADATA) and authors' calculations.

If the economically active urban population (urban EAP, obtained from IPEADATA) is used to calculate y and k, the results depicted in line TFP_GPV are similar to those of Gomes, Pessoa and Veloso. However, it is inappropriate to use the urban EAP to calculate k and y because the average years used to compute H, which is obtained from Barro and Lee, is

not calculated for the same base. Barro and Lee provide data for average years of schooling of the total population aged over 25. This figure would only be similar to the human capital stock of the urban EAP, for example, if human capital were the same in rural and urban areas. In addition, the rate of growth of the urban EAP differs from that of the population aged over 25 because of the rural-urban migration that took place over the period of study. Finally, a significant part of economic growth is due to advances in agricultural productivity; as a result, using the urban EAP could affect drastically the measurement of Brazilian TFP. In addition to the reasons for using a different series for the labour supply, there is an important methodological question to take into account. The calculation of TFP uses output and the capital stock divided by EAP and years of schooling, divided by the population aged over 25 to ensure compatibility.

Thus, we have a strong preference for the results shown in the TFP, TFP1 and TFP2 lines. Although our estimations reflect similar patterns to previous studies, these results show that, when the number of workers is consistent with other measures, the drastic drop in productivity after the 1970s is significantly lower.

Capital and productivity in three post-World War II periods

Before turning to the decomposition of the growth rate of output per worker, we report the average growth rates of output, population, labour supply, output per capita and per worker, physical capital per worker, human capital per worker and productivity per worker (Table 1.2).

On average, the growth rate of output per capita is positive in all periods (the growth rate of output is higher than the rate of population growth); however, the growth rate of output per worker is negative in the last period because the growth rate of labour supply is higher than the growth rate of output. Although the growth rate of output per worker declines in the last period, total output grows at a rate that is still high enough for output per capita (which grows much more slowly than in the previous periods) to grow at positive rates. Also, the growth rate of human capital is comparatively very high in the last period. The growth rate of capital per capita is both positive and high in the first two periods and negative in the third. Productivity growth is exceptionally high in the second period and negative in the third.

Table 1.2. Growth outcomes, 1951-2008

Period averages, annual growth rates (%)

Period	Growth rate of:							
	Out-put	Popul-ation	Employ-ment	Output per capita	Output per worker	Human capital	Physical capital per worker	Total factor product-ivity
1951-66	6.36	3.02	2.99	3.24	3.27	0.41	5.16	0.96
1967-79	8.90	2.52	3.05	6.22	5.67	-0.02	6.51	3.08
1980-2008	2.47	1.69	2.86	0.77	-0.38	1.35	-0.14	-1.13

Source: Authors' calculations.

The contributions of each factor of production to productivity growth are depicted in Figure 1.2. The decomposition uses the population aged over 25 as the labour supply and the net capital stock as the capital measure. The vertical lines indicate the structural breaks listed in Table 1.2.

Figure 1.2. Decomposition of growth of GDP per worker, 1951-2008

Year-on-year growth (%)
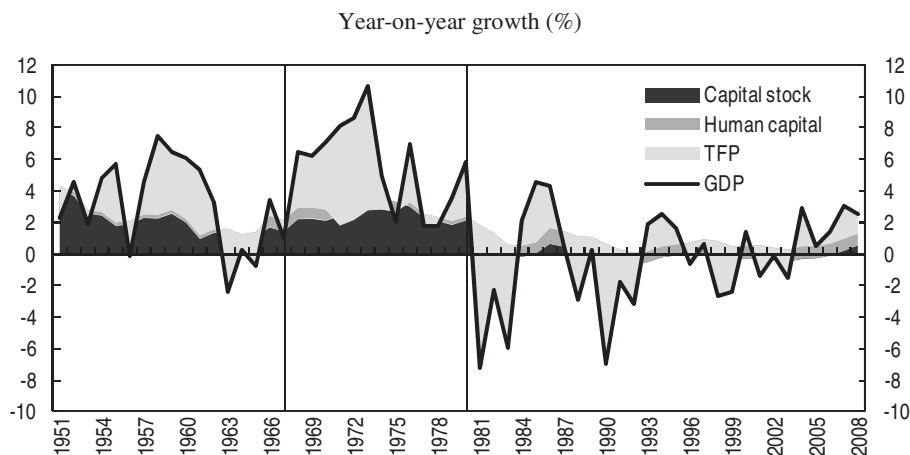
Source: Authors' calculations.

The increase in the rates of output growth from the first regime (1951-67) to the second (1968-80) is due exclusively to higher TFP growth. The rates of growth of physical and human capital do not change much across regimes. The contribution of these variables to growth of

output per worker is approximately 2% per year in both periods. This result, which shows that economic growth does not arise from policies aimed at increasing investment, casts doubt on a policy recommendation to increase savings and investment as a means of stimulating growth. However, the third regime (1981-2008) is marked by a fall in both the growth of productivity and the rate of accumulation of capital by worker, whose contribution is less than 1% for all the years in question. This could mean, for example, that periods of fast and slow growth are driven by different factors, as suggested by Jones and Olken (2008). According to this logic, the increase in risk, both political and economic, experienced by the Brazilian economy since 1980 would have inhibited investment and constrained economic growth.

This asymmetry between growth accelerations and decelerations could be explained differently. A fall in productivity naturally implies a fall in the marginal product of capital and, consequently, investment. Thus, the deceleration of capital accumulation could be a consequence of the fall in productivity, as could the fall in economic growth. This may be a better description of the Brazilian experience, as the contribution of TFP to growth continues to outweigh that of the other factors.

The Brazilian economy's long-term growth dynamics depend closely on variations in productivity growth. Mussolini and Teles (2010) attribute this finding to the behaviour of public infrastructure investment. Using various measures of TFP and public capital, they obtain a highly robust result: the stock of infrastructure capital co-integrates with TFP, and infrastructure capital Granger-causes TFP, although the converse does not hold true. One of the explanations for the increase in productivity during the second regime is the increase in public infrastructure spending. The fall in productivity over the third regime could therefore be partly explained by the fall in this expenditure.

Output fluctuations

External turbulence amplified domestic policy mistakes during the 19th and 20th centuries. In the 1930s and 1940s, the Great Depression, with its protectionist policies, and World War II isolated the country from the rest of the world and import substituting industrialisation (ISI) followed from a lack of external financing. The 1950s, not only in Brazil but also in Latin America in general, was characterised by voluntarism and the belief that State intervention was better than the market. The ideology of the period centred around the theoretical model of imperialism and centre-periphery models, such as the theory of dependence (developed at the

United Nations' Economic Commission for Latin America (ECLA), based in Chile).

The growth of trade during the 1960s and 1970s ushered in a debate on land and tax reforms. The Alliance for Progress and the Inter-American Development Bank participated in reforms during this period. With the availability of inexpensive credit from petrodollars in the 1970s, the government and the private sector borrowed heavily, which generated high but unsustainable economic growth. When oil prices increased, both in 1974 and in 1979, and interest rates rose in 1980, the country's external debt proved unsustainable, giving rise to a debt crisis. The result was almost 15 years of low growth and hyperinflation. Failure of the heterodox stabilisation programmes led to the emergence of the Washington Consensus and praise for the Asian economic model. Privatisation and trade liberalisation took place in the 1990s. The accumulation of problems from high levels of debt and inefficient State-owned enterprises led Brazil to rethink its growth strategy and to adopt a more market-driven and trade-oriented approach.

Brazil's post-1900 growth history has witnessed periods of acceleration and deceleration. GDP per capita oscillated around its trend of 0.8% growth per year during 1900-17 (Figure 1.3). After negative growth in 1918, a new growth regime started with an "up-break" (trend growth acceleration) and growth in GDP per capita that peaked in 1928. The sharp decline in activity in 1929 was followed by two years of recession. Recovery started in 1933 and culminated with a boom in the late 1950s, which came to an end in 1962. Activity growth fell once again and the gap became negative between 1964 and 1967. A new up-break occurred in 1967, with renewed acceleration in GDP from 1968 onwards. GDP exceeded its trend in 1974 and the acceleration phase continued until 1980, the year of a new "down-break" (trend growth deceleration). A sharp contraction in 1982-83 was followed by a recovery in the mid-1980s and another severe contraction in 1991-93. The most recent recovery started in 2004 with a marked improvement in the terms of trade. This last event highlighted possible links between output growth in Brazil and movements in commodity prices.

Figure 1.3. GDP per capita and trend GDP, 1900-2008
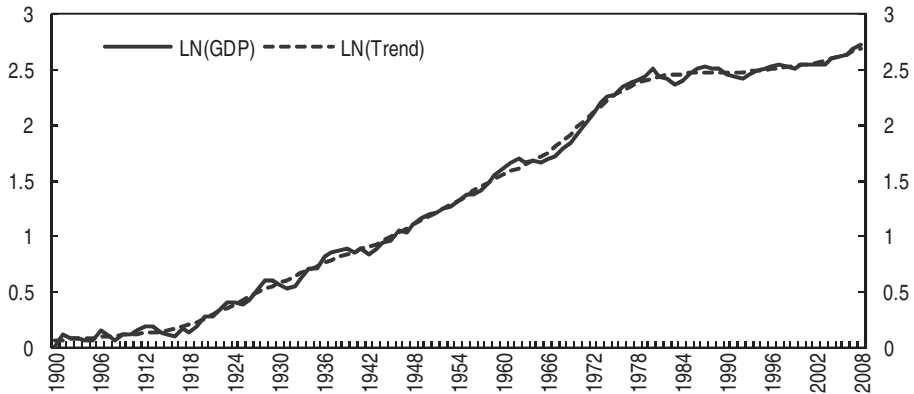
Trend, cycles and the terms of trade

Oral tradition has attributed the weak performance of South American countries relative to Asia to the volatility of commodity prices. Due to export price volatility, income sources are also volatile, which generates uncertainty and reduces investment. In turn, pro-cyclical international capital flows amplify income fluctuations and create "boom-bust" cycles.

Intuition agrees with the perception that natural resource booms cripple non-resource export sectors, create incentives for rent-seeking, inhibit other forms of productive activity and foster corruption.[5] Nonetheless, despite the important share of commodities in Brazil's exports, Cardoso and Holland (2009) find a small and statistically insignificant correlation between the price of commodities and economic growth after 1980. One can also reject the hypothesis that the price of commodities was a good explanation for growth in Brazil between 1900 and 2007. The correlation between the growth rate of GDP per capita and metal prices (or food and non-food commodity prices) is also low, negative and statistically insignificant.

Yet, what matters for Brazil are the terms of trade, which do not reflect swings in commodity prices one for one. In 2007, primary products and natural resources-based manufactured goods accounted for 54 and 37% of Brazil's exports and imports, respectively.[6] As a first approximation, there is

a positive and statistically significant correlation between Brazil's growth rate of GDP per capita and the terms of trade (0.24 between 1900 and 2007, and 0.40 between 1973 and 2007).

Has the effect of the terms of trade on growth changed over time? To answer this question, we use a linear state space model, which allows for the estimation of a vector autoregressive process (the transition equation) with coefficients that change over time. These coefficients are called unobservable variables (known as state variables) and are incorporated into, and estimated along with, the observable model (or the measurement equation).[7]

The first model describes a linear relationship between growth and the terms of trade. The measurement equation is:

$$g_t = \mu + \beta_t TOT + \varepsilon_t, \text{ where } \varepsilon_t \sim NID(0, \sigma_\varepsilon^2). \tag{5}$$

where g is the growth rate of GDP per capita, TOT is the log of terms of trade and β is the state variable.

The transition equation is:

$$\beta_{t+1} = \beta_t + u_t, \text{ where } u_t \sim NID(0, \sigma_u^2). \tag{6}$$

Estimation of the space model shows that the terms-of-trade effect is positive for the whole period and increases in magnitude from 1910 to 1940 (Figure 1.4). After 1940, the relationship continues to be positive, statistically significant and becomes relatively more stable.

Figure 1.4. The effect of the terms of trade on the growth rate of GDP per capita, 1910-2008
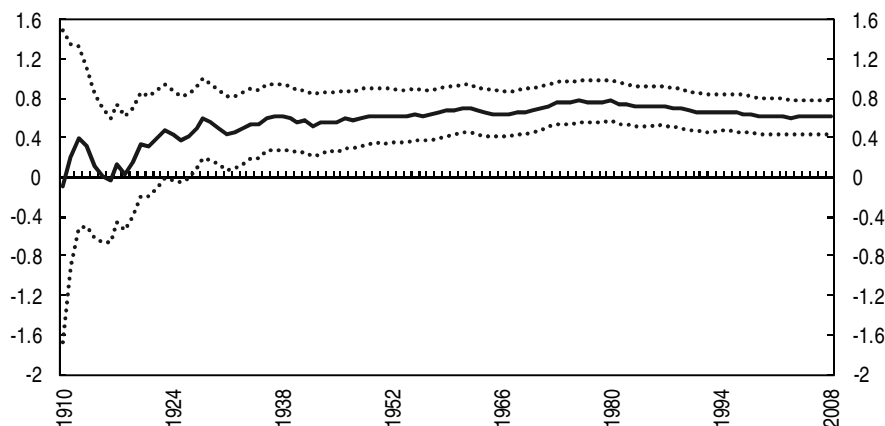
Source: Authors' estimations.

The next step is to introduce proportional changes in physical and human capital in the estimation of the relationship between the growth rate of output per worker and the terms of trade. The data cover the period 1950-2008 and is the same used in the growth accounting exercise reported above. The measurement equation is now:

$$\gamma_t = \eta + \lambda_t TOT + \alpha_1 dK_t + \alpha_2 dH_t + \xi_t, \text{ where } \xi_t \sim NID(0, \sigma_\xi^2) \ (7)$$

where γ is the growth rate of output per worker, dK is the proportional change in physical capital and dH is the proportional change in human capital.

The transition equation is:

$$\lambda_{t+1} = \lambda_t + \nu_t, \text{ where } \nu_t \sim NID(0, \sigma_\nu^2). \tag{8}$$

Estimation of Equation (8) shows that the relationship between the growth rate of output per worker and the terms of trade remains positive and statistically significant, despite the introduction of control variables (Figure 1.5). For comparison, we also looked at the estimation results for the relationship between the growth rate of GDP per worker and the terms of trade without the control variables. The difference in the results shows that the introduction of control variables reduces the effect of the terms of trade

on output growth. The reason is that only part of the estimated effect takes place through productivity changes.

Figure 1.5. The effect of the terms of trade on the rate of growth of GDP per worker (with control variables), 1950-2008
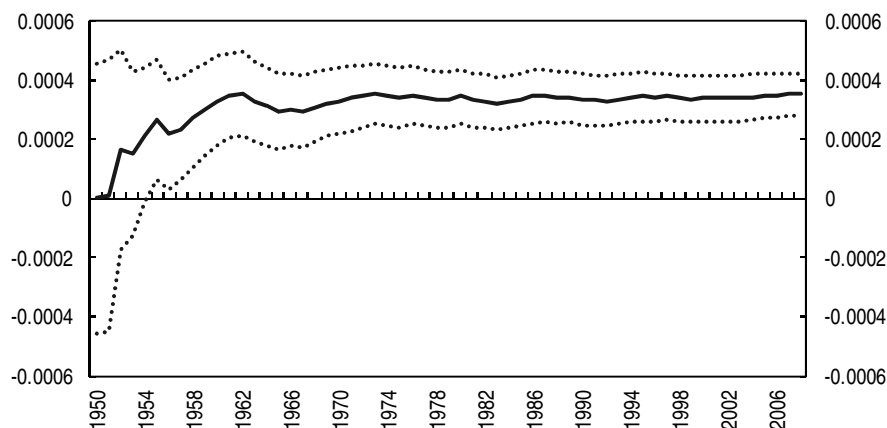
Output gap and terms of trade

If the terms of trade affect growth through a volatility channel, there must be a positive correlation between the terms of trade and the gap of output in relation to its trend. This correlation is indeed positive and statistically significant. Using the same methodology as above, the effect of the terms of trade on the output gap remains positive during the 20th century. The linear state space model used here defines the measurement equation as:

$$gap_t = \delta + \pi_t TOT_t + \zeta_t, \text{ where } \zeta_t \sim NID(0, \sigma_\zeta^2) \qquad (9)$$

where *gap* is the percentage difference between GDP per capita and trend GDP per capita. The Hodrick-Prescott filter was used to compute the trend GDP per capita series.

The transition equation is:

$$\pi_{t+1} = \pi_t + \vartheta_t, \text{ where } \vartheta_t \sim NID(0, \sigma_\vartheta^2) \qquad (10)$$

Estimation of Equation (10) shows a positive and significant effect of the terms of trade on the output gap (Figure 1.6). The estimated coefficient oscillates markedly from 1910 to the 1940s and becomes more stable thereafter.

Figure 1.6. The effect of the terms of trade on the output gap, 1910-2008
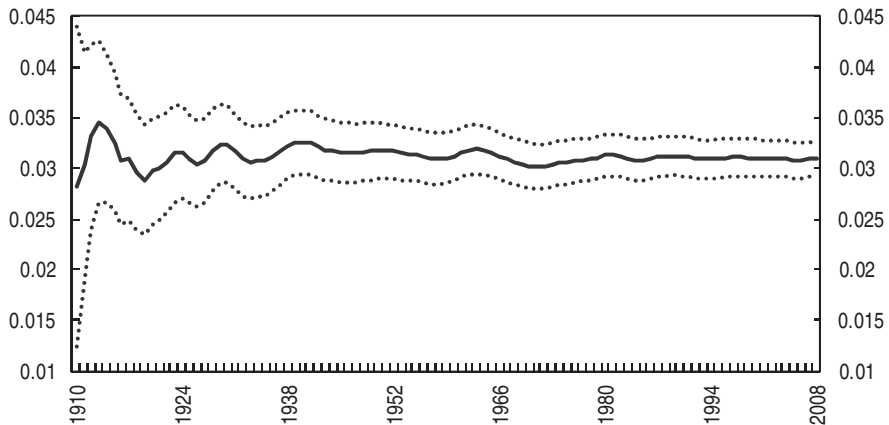
Source: Authors' estimations.

For illustration, there is a clear correlation between the boom of 2004-08 and the concomitant improvement in the terms of trade (Figure 1.7). The effect of the terms of trade is nevertheless less obvious in previous booms over the post-World War II period. Inflationary finance and import-substituting industrialisation are behind the output acceleration of the Kubistchek presidency (mid-1950s to early 1960s), which left the economy ill equipped to face the political crisis of 1963-64. Exceptionally favourable international liquidity contributed markedly to the "economic miracle" between 1968 and 1980.

Figure 1.7. Output gap and the terms of trade, 1973-2008
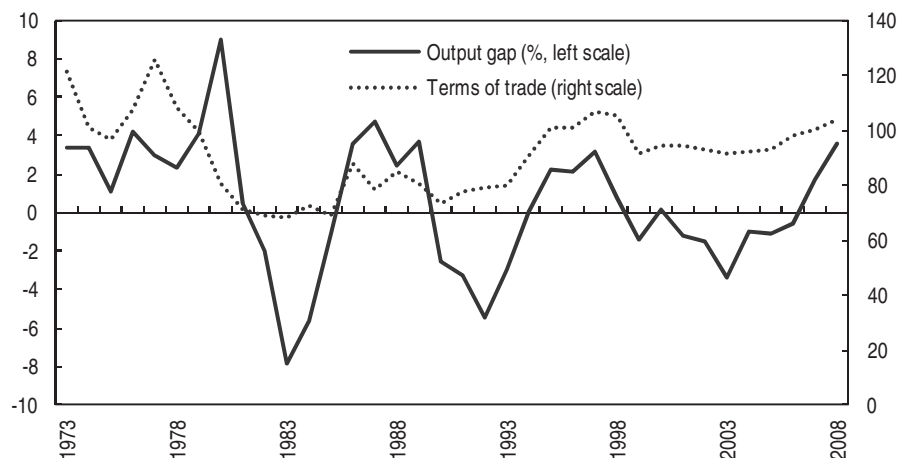
Source: IPEA (IPEADATA) and Oxford Latin American Economic History Database and Funcex.

Efforts to maintain high growth after 1978, when the terms of trade declined, are also visible in Figure 1.7. As a result, with its large current account deficits, the economy was not well prepared to face a scarcity of capital when the external crisis hit in 1981-82. By contrast, large international reserves at the end of 2008 allowed the economy to weather the effects of a global crisis-driven scarcity of credit and a decline in the terms of trade.

1918–66: Import-substituting industrialisation

During World War I, a lack of competition from imported goods created an incentive for domestic producers to invest in industrialisation. In the 1920s, two large companies were founded with government incentives: *Siderúrgica Belgo-Mineira* and *Companhia de Cimento Portland*. Based on their experience and the profits made throughout the war, small workshops were transformed into factories that produced machinery and equipment. According to the 1920 census, out of a working population of nearly 9 million people, 6.2 million (70%) were employed in agriculture, 1.2 million (14%) in the industrial sector and 1.5 million (16%) in services. While the proportion of people employed in the industrial sector had doubled in relation to the 1872 census, many "factories" were no more than small workshops. The majority of the few "real" factories were dedicated to producing low-quality textiles and garments.

Brazil came to enjoy a monopoly in the coffee market in the first half of the 20th century. During the 1920s, the government artificially maintained coffee prices by buying the national production through the use of external loans. The crash of 1929 dried up the sources of foreign financing and forced both the central government and the State of São Paulo to abandon the scheme. Between 1928 and 1930, the price of coffee dropped by almost 40% and caused export revenues and GDP to fall as well. In 1931, the National Coffee Council began buying and destroying stocks.

It is estimated that Brazil's GDP per capita fell by 3.4% in 1930 and by another 4.6% in 1931, and yet the economy was growing again in 1932 and had already overtaken its 1929 output level in 1933. Despite the fact that the recession was serious, it only lasted two years. The price-fixing policy for coffee, by guaranteeing the income of the plantation owners, allowed for an expansion of manufacturing.[8] However, the impact on the government budget was severe, with a suspension of the servicing of external debt between 1931 and 1932, followed by an adjustment plan in 1934, which culminated in a default declared by President Vargas in 1937.

The crisis of 1929 reinforced import-substituting industrialisation, which raised productivity. Kuznets (1953) was among the first economists to argue that labour migration from agriculture to manufacturing enhances growth because manufacturing is more productive. Krugman (1987) also argues that this movement provides learning-by-doing spillovers.

After the 1940s, coffee began to lose its supremacy among exports. Currently, Brazil's main commodity exports are iron ores, soy beans, oils and oilcake. However, Brazil's exports today are highly diversified, as is reflected in a very low export concentration index of 9.1, which is typical of OECD countries (OECD, 2008).

From the Kubistchek years to the military coup

In the 1950s, the Kubistchek administration used inflation to finance "50 years of growth in five", with the setting-up of the automobile industry and the construction of a new capital city, Brasília. As discussed above, an improvement in the terms of trade was not the root cause of the boom that lasted until 1962. Inflationary finance was the government's response to its growing budget deficits. The beginning of an inflationary process takes people by surprise. Budget revenue falls as inflation becomes endemic and the population learns to hold money for as short a period of time as possible. However, before people learn to anticipate purchases or to deposit money in interest-bearing bank accounts, the government has time to collect revenue from the inflation tax. This is how President Kubistchek could finance the government's investment programme - by borrowing directly from *Banco*

do Brasil - during a period when Brazil did not have a central bank and government bonds were almost non-existent.

There is a close association between the output gap and money creation (Figure 1.8). The correlation between the output gap and the percentage variation of the monetary base between 1948 and 1964 is 0.32. This correlation disappeared after the mid-1960s with the creation of a central bank and the introduction of indexed government bonds. Even during the mega-inflation years, the government was unable to finance itself through increased seignorage, which remained at around 2% of GDP during the 1970s until mid-1990s.[9]

Figure 1.8. Output gap and money creation, 1948-1964

In per cent
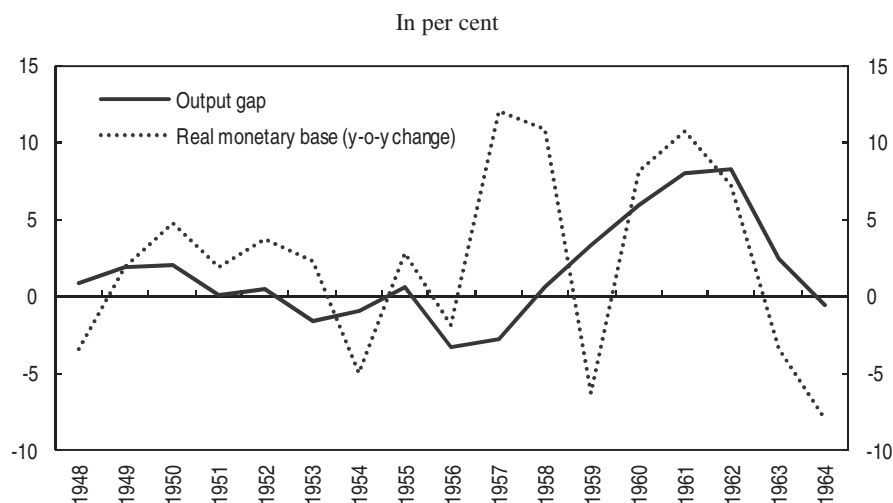
Source: IPEA (IPEADATA) and authors' calculations.

However, it was not capital flight that interrupted the escalation of inflationary financing in the beginning of the 1960s; it was the military coup and the new government's policies. After introducing a programme that is discussed below, the military leaders then invented painless inflation. They created salary pegging, indexation and mini-devaluations of the exchange rate.

From anti-export bias to export subsidies

The strong anti-export bias of import-substituting industrialisation, in vogue until the mid-1960s, derived to a large extent from a real exchange

rate overvaluation. Foreign exchange controls were introduced in 1947. Throughout the period from 1947 to 1953, the domestic currency became increasingly overvalued. A system of licensing kept demand for imports under control. At the beginning of 1953, Law 1807 created an incipient market for foreign exchange in which the inflows and outflows of capital and its earnings were allowed, as well as the buying and selling of foreign exchange for tourism. Later that year, a multiple exchange rate system was created, which replaced direct quantitative controls by auctions for foreign exchange. In 1957, the exchange control system underwent further changes. *Ad valorem* tariffs were introduced and the exchange rate categories were reduced from five to two. Political crises dominated the years from 1962 to 1964 and the official exchange rate lagged substantially behind inflation, thus creating a disincentive to export.

After 1964, the military government acted to boost economic growth and promote export diversification by undertaking a series of measures. It abolished state-level export taxes, simplified administrative procedures for exporters and introduced a programme of tax incentives and subsidised credits for exporters. Fiscal subsidies for exports introduced after 1964 included exemptions from the tax on industrialised products (November 1964) and the income tax on profits from exports (June 1965), drawback of taxes on imported raw materials and components used in exported goods (November 1966) and value added tax (VAT) exemption for manufactured product exports (Constitution of 1967).

Changes introduced after 1964, such as a more stable real exchange rate and export subsidies, may have contributed to export diversification. The share of manufactured exports increased from less than 30% of exports in 1974 to more than 50% in 1981.[10] Export diversification and the growth of exports of manufactured goods may have contributed to the increased productivity and the up-break in output growth of 1967. This hypothesis is reinforced by Pablo Fajnzylber (2005), who studied Brazilian exporting firms at the beginning of the 21st century and showed that exporting firms are more competitive and productive than non-exporting firms.[11]

1967–79: The economic miracle

After the military coup of 1964, the government introduced the *Programa de Ação Econômica do Governo* (PAEG), which promoted important structural reforms, such as a deep fiscal adjustment with a reduction of budget deficits based on expenditure cuts and a tax reform, including the introduction of a VAT; and a reform of financial markets, including the creation of a central bank. Veloso, Villela and Giambiagi (2008) contend that the growth acceleration episode associated

with the Brazilian economic "miracle" was due to a large extent to the delayed effect of the reforms associated with PAEG. Everything was fine until the oil shock of 1974. Between 1973 and 1976, GDP continued to grow rapidly in line with higher potential output. However, aggregate demand began to sag towards the end of the 1970s, and the limits imposed by the second oil shock began to be felt. The government adapted to the shock and avoided a recession, letting inflation rise and financing the current account deficit with external debt.

There is a close association between Brazil's output gap and the real US interest rate (Figure 1.9). The correlation is -0.62. Economic growth persists as long as foreign loans sustain the current account deficit. A new oil shock in 1979 and higher foreign interest rates came at a bad time. GDP growth peaked in 1980 well above potential. The 1981 crisis put an end to a period of spectacular growth, which turned negative in 1982, as the economy entered a recession. The oil shock, acting as a production tax paid to non-residents, also took a toll on the economy's potential growth.

Figure 1.9. Brazil's output gap and the US real interest rate, 1968-1985
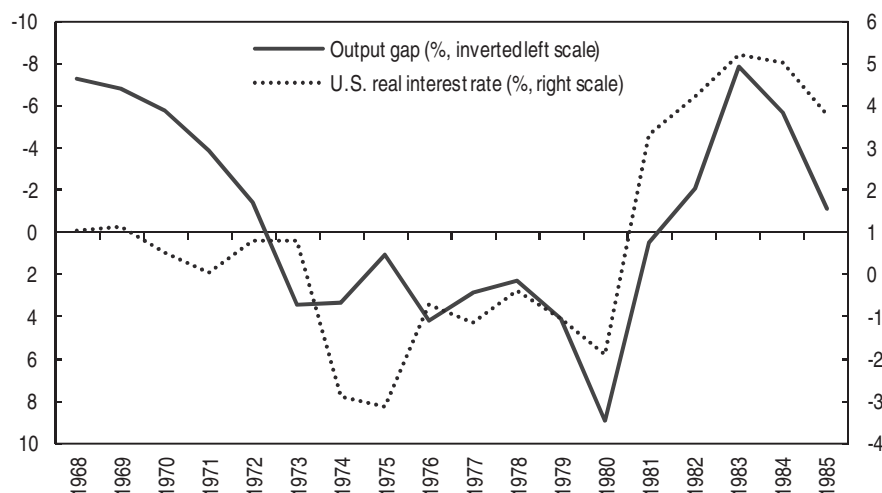
Source: IPEA (IPEADATA) and US Bureau of Labour Statistics.

1980–2008: From the "lost decade" to a new era

An important reason for the low growth rates of the last hundred years is economic volatility, largely due to external financial shocks. Each period of growth (not induced by an improvement in the terms of trade) has been followed by an external crisis that wipes out some of the previous gains.

Phases of abundant external capital have coincided with spending booms. When capital becomes scarce, growth collapses. With potential growth in the 1980s reduced by the increase in oil prices, periods of growth, such as in 1985 and 1986, drove actual GDP above potential. In the absence of external financing, the heterodox macroeconomic stabilisation plans were doomed to failure.

During the 1980s, the country's external debt overhang remained unsolvable, despite the 1987 moratorium; it was only to be resolved in 1993. Domestically, the Brazilian government tried to finance fiscal imbalances through inflation - not that inflation produced any significant revenue. Brazilians had already learned about capital flight. However, inflation did allow budget imbalances to be hidden through a process in which the increase in prices converted nominal expenditure (which could not be financed by nominal tax revenue) into real expenditure (which is compatible with real tax revenues).[12]

The very high inflation of the 1980s may well be a reason for the down-break of trend growth that was observed after 1980. Jones and Olken (2008) show that down-breaks are associated with substantial increases in inflation. Of the 39 down-breaks in their sample, 33 show increases in inflation.

During the 1980s, Brazil's government hid the problem of external debt, which had been inherited from previous administrations, as well as the maladjustments that it provoked, under the soft carpet of mega-inflation. However, as inflation rose, the government became increasingly unpopular. On the one hand, salaries failed to keep up with rising prices; on the other, the inflation transferred middle-class savings to the upper class, which had better access to diversified information and investment opportunities.

The problems that had been accumulating since 1980 took a significant toll on growth. After frustrated attempts to control inflation through price freezes and heterodox plans, the government declared the 1987 moratorium. President Collor then tried even more radical measures by freezing bank deposits and thereby made the 1990-92 recession even more traumatic. Indeed, inflation remained so uncomfortable that, in the second half of the 1990s, the government indexed the public debt to interest rates, which were indexed to the exchange rate. From the middle of 1994 onwards, President Cardoso used the exchange rate as an anchor to keep inflation under control. With abundant foreign capital, it was possible to finance the current account deficits, which reached 3% of GDP on average during the eight years of his administration. Government spending increased year after year.

However, GDP began to grow again after 1993 at close to potential, which was then lower than before due to a lack of investments in infrastructure. GDP fell in 2003, although an increase of about 5% in 2004 left it close to potential once again. Utilisation of installed manufacturing capacity peaked in the middle of 2004. The central bank remembered that the last politician to speak of the flexibility of full capacity, with an expansion of hours and overtime, was Alan Garcia, the populist Peruvian president and sponsor of Peru's inflation explosion of 1985-90. Monetary policy was tightened and GDP fell in 2005.

A new era?

Between 2002 and 2008, Brazil benefited from global growth, particularly in China and its demand for commodities. Between mid-2002 and mid-2005, the price of Brazil's semi-manufactured exports rose by 43%, and the price of its basic products by 59%. The benefits brought about by this positive terms-of-trade shock were evident. An exchange rate appreciation allowed for a reduction in external indebtedness and the increase in export prices encouraged investment in the production of raw materials. Such prosperity came under threat in the second half of 2008 as a result of the global crisis.

However, this time the Brazilian economy responded to the international crisis differently. Until 2002, net public sector indebtedness would surge each time the exchange-rate depreciated - as a result of the effect of a depreciation on the value of the external debt in domestic currency and the national debt, which was in part indexed to the exchange rate. This time around, the stock of domestic debt indexed to the exchange rate had been unwound and the government had accumulated international reserves during the boom years thanks to the improvement in the terms of trade.

It is also true that the 2008-09 crisis was different. Until then, an exchange-rate devaluation resulting from an external shock would have an inflationary impact and lead to an increase in the public debt-to-GDP ratio. The central bank would be forced to increase the interest rate in order to control the inflationary effect of the currency depreciation. In turn, this measure would contribute to a new rise in public indebtedness. To maintain confidence in the solvency of the public sector, the government would have to increase the primary budget surplus. Both monetary and fiscal policy reactions would aggravate the impact of the external shock on activity. Nevertheless, the devaluation of the *real* in 2008-09 did not lead to an increase in public indebtedness during the crisis. High international reserves served to soften part of the devaluation shock. This brought losses for

companies that speculated in exchange-rate derivatives, but there was no capital flight. The central bank was also able to reduce interest rates.

Even so, the damage caused by the external turbulence to the Brazilian economy was evident in October 2008. Companies put in place collective vacation schemes and postponed investments. During the first six months of the crisis, from October 2008 to March 2009, manufacturing output declined by more than 10% (14% in the first quarter of 2009). However, a gradual recovery started in the second half of the year, with positive growth in manufacturing output compared with the level of December 2008. Although affected by the crisis, Brazil was one of the countries that could react effectively to it because it had less financial vulnerability and could rely on appropriate regulation and supervision of its financial market.

Conclusions

This paper applied the Bai and Perron methodology to the growth rate of GDP per capita in Brazil between 1900 and 2008 and identified four periods (1900-17, 1918-66, 1967-79 and 1980-2008) on the basis of structural breaks in the series. Growth accounting analyses for these periods attributed the growth acceleration that took place after 1968 to an increase in productivity, possibly due to lagged effects of the structural reforms introduced in 1965-68 and to increased investment in infrastructure. A down-break in 1981 was marked by a fall in both productivity growth and capital accumulation. A decrease in productivity growth over the third regime could be explained in part by lower infrastructure investment and by high inflation until mid-1994. Finally, the country moved from severe macroeconomic volatility until mid-1994 to prosperity in more recent years.

Using linear state space models, the paper also found a positive and significant terms-of-trade effect on economic growth, and volatility around potential output. We argue that policies to raise growth through higher government expenditure in the presence of deteriorating terms of trade (as in the late 1970s) ended in disaster when external finance dried up.

An Ideal Husband, Oscar Wilde's play, tells a story of unrealistic expectations. Lady Chiltern, a woman of strict principles, idolises her husband, a rising star in politics. Their life is filled with nectar and ambrosia, until the appearance of Mrs. Cheveley. She comes with a letter - one that proves Sir Chiltern's fortunes were made on the back of privileged information during the construction of the Suez Canal. In exchange for this letter, she seeks support for the construction of a new canal in Argentina. Having previously denounced the Argentine project as a fraud, Sir Chiltern is faced with a dilemma. Should he alter his stance or allow the contents of

the letter to come to light? In either case his spotless reputation would suffer and his marriage would come to an end. Although loathe to disabuse his wife of her unrealistic expectations, no amount of money can buy back one's past.

The same principle holds for governments. Every administration is hostage to the actions undertaken by the previous one, and Brazil's history is littered with mistakes that were made when trying to correct previous errors. The Kubistchek administration used inflationary finance to deal with fiscal disequilibria and low tax revenue. The military governments adopted generalised indexation to live with inflation and offered subsidised loans through the National Development Bank to deal with a scarcity of long-term credit in a volatile economy. Policy makers' responses to the global crisis of 2008-09 have been different; yet, Brazil's fiscal strategy remains questionable. The government has relied on a steadily rising tax burden to finance steadily rising spending. In 2008, tax collection amounted to 36% of GDP, nearly 14 percentage points higher than during 1991-93.

Brazil's fiscal deterioration appears mild by recent international standards. The primary budget surplus declined to just 1% of GDP during the 12 months through to October 2009, down from 4.3% of GDP a year earlier, and the overall budget deficit increased to 4.6% of GDP from 1.3% of GDP a year earlier. Counter-cyclical policies, however, have to be temporary. This is the case of recent tax cuts, but the rise in spending sounds a note of caution. Federal expenditures have risen in areas, such as public sector wages and employment, which seem hard to unwind quickly, if necessary, and fiscal policy is unlikely to be tightened ahead of elections in 2010. There is also reason for concern about the potential quasi-fiscal costs associated with the current aggressive expansion of credit by public banks.

Two longer-term fiscal challenges require attention. *Firstly*, the composition of spending has deteriorated because social security outlays have increased steadily over the years, while public-sector investment has remained extremely low at just 1% of GDP. *Secondly*, the strategy to raise the tax burden to finance ever-increasing expenditure does not seem sustainable and Brazil's complex tax system is a hurdle to doing business in the country. Out of 183 countries, Brazil ranks 167 in terms of the amount of taxes and mandatory contributions on labour that are paid by business as a percentage of commercial profits (69% in Brazil, against 41% for the median of countries surveyed by the World Bank in its *Doing Business* publication). When it comes to the number of hours needed to prepare, file and pay the corporate income tax, VAT and social security contributions, Brazil ranks last (at 10 standard deviations from the sample median).

From the point of view of stimulating Brazil's growth potential, important fiscal reforms will need to be made and infrastructure investment will need to be raised to sustain higher productivity. A hypothesis worth investigating in future work is whether high and complex taxation is a reason for Brazil's poor GDP growth performance relative to other emerging countries.

Notes

1. See, for instance, Acemoglu (2001).

2. Brazilian novelist, poet, play and short-story writer (1939-1908), widely regarded as the greatest celebrity of Brazilian literature.

3. See, for instance, de Mello (2008).

4. Data used in Gomes, Pessoa and Veloso (2003) is available on the site: www.victorgomes.com.br.

5. Humphreys, Sachs and Stiglitz (2007) argue that natural resources are different from other sources of wealth because they do not need to be produced. Their case for a negative impact of natural resources on growth also includes arguments, such as the "Dutch disease", insufficient investment in education and weak unaccountable government. One can also hypothesise that unearned riches are a curse because governments get fat on revenue from primary activities and do not have to tackle the far more difficult task of creating a framework of laws and institutions that generate sustained growth and stable tax revenues (Sal-i-Martin and Subramanian, 2003). A massive inflow of natural resource revenues produces perverse political effects, such as corruption and clientelism. Manzano and Rigobon (2007) find that the curse operates through a debt overhang and their finding supports the perverse voracity effect of natural resources on economic performance. However, development is subject to the wise, or foolish, decisions on which society embarks. Different results can come from the same situations because unexpected factors are inherent to progress, such as chance or psychological variables. Thus, the empirical evidence on the curse of natural resources remains elusive.

6. Loyaza *et al*. (2005) find that negative terms-of-trade shocks have the effect of slowing down the growth rate of Latin America and Caribbean economies, and Astorga (2009), intrigued by the negative association between trade openness and growth in his estimation of the determinants of long-term growth in the six largest economies of Latin America over the period 1900-2004, tests if high openness in the context of specialisation in primary products can be harmful to growth. Adjusting

the openness variable by changes in export composition over the century, he finds that export diversification has mixed results: in some regressions, it is not significant and its inclusion does not affect the strength of the openness coefficient; in others, he finds some evidence that the degree of export diversification influences the growth impact of openness.

7. For details, see Harvey (1989), Hamilton (1994, Chapter 13; 1994b), and especially the excellent analysis by Koopman, Shephard and Doornik (1999).

8. See Cardoso (1981).

9. See Cardoso (1998).

10. Since the 1980s, the share of manufactured exports in total exports has oscillated between 50% and 60%, depending on the level of commodity prices.

11. Fajnzylber (2005) studied 1 636 firms across 13 Brazilian States and 9 industrial sectors. Exporting firms sell 2.7 times more per worker and have 94% more capital and 50% higher total factor productivity than non-exporting firms. The share of workers with secondary education is 30% higher and wages are 90% higher in exporting firms than in non-exporting firms.

12. See Cardoso (1998).

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