

# Foreign Direct Investment by Sector of Industry, Brazil 1980-2000

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This report describes the construction of a series of foreign direct investment in Brazilian manufacturing between 1980 and 2000. The series is available as file `fdi.csv` at URL <http://econ.ucsd.edu/muendler/brazil>.

Care is warranted with this series of foreign direct investment (FDI). The variables can by no means serve as more than rough proxies to the actual FDI in Brazil between 1980 and 2000. There seem to be no alternative sources for FDI flows to Brazilian manufacturing sectors over the period 1980-2000 other than the Brazilian central bank's FDI series. The central bank's FDI figures are available at URL <http://www.bancocentral.gov.br/>. Both the methodology and the sector definitions changed in 1995. The changes adopted cast considerable doubt on the quality and consistency of FDI data up to 1995.

The report is divided in two sections: (1) Construction of FDI series, and (2) File Contents. An appendix details the sector definitions.

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# 1 Construction of FDI series

A series of rough estimates for foreign direct investment (FDI) may be helpful as a control in statistical analyses of the Brazilian manufacturing sector. The present dataset provides such rough estimates.

## 1.1 Use

Care is warranted with the present series of FDI. The data should not be used as figures that can stand for themselves. The likely degree of measurement error may render a consistent interpretation over time inadmissible.

However, statistical applications are conceivable where the inclusion of a badly measured variable may be preferable to its omission. Instances of concern may be analyses of technology adoption, responses to the trade regime, restructuring of assets, and the like. These analyses all share the feature that FDI may affect estimates, but is unlikely to play a central role. The present series seems to be sufficiently reliable to serve as a proxy to FDI.

## 1.2 Period Covered

The annual FDI series cover the period 1980 through 2000, with a break in data generation in 1995.

## 1.3 Data Source

The *Banco Central do Brasil* published annual figures of cumulated FDI between December 1980 and December 1994, and for June 1995. I will refer to such cumulated FDI figures as “FDI stocks” for simplicity.

In 1996, the central bank conducted a survey of FDI in the Brazilian manufacturing sector, and published “FDI stocks” for December 1995 that were based on new sector definitions. A comparison to the December 1994 figures, given typical FDI flows, suggests that “FDI stocks” had been overestimated prior to 1995. Since 1996, the central bank reports figures of FDI flows, based on the new sector definitions adopted since December 1995.

Neither the central bank’s sector definition prior to 1995 nor the sector definition since December 1995 are directly compatible with other standards for Brazil, such as *Nível 50* or *CNAE*.

## 1.4 Construction

### 1.4.1 Correcting for data breaks

The cumulated FDI figures (“FDI stocks”) for December 1995 are arguably the most precise. I have used the central bank’s subsequent reports of FDI flows from 1996 through 2000 to infer annual “FDI stocks” through 2000.

No FDI flows for 1995 are observed. This makes it difficult to compare the series before 1995 to the series after 1995. It is noteworthy, however, that aggregate FDI for the Brazilian manufacturing sector as a whole did not fluctuate strongly during the mid 1990s. While the central bank reported (implicit) FDI flows of US\$ 1.73 Mio and US\$ 1.65 Mio (current values) for 1993 and 1994, respectively, it reported a flow of US\$ 1.74 Mio (current value) for 1996. Under the assumption that aggregate FDI flows in 1995 equalled more or less the average of the years 1993, 1994 and 1996, an approximate FDI flow of US\$ 1.71 Mio can be inferred for 1995.

With this estimate at hand, we can compare the central bank’s FDI series before and after 1995. The estimate of FDI flows in 1995 together with the central bank’s survey results for “FDI stocks” in December 1994 yield an estimate of US\$ 21.7 Mio for cumulated FDI until December 1994. The central bank’s old series, however, reached a level of US\$ 29.0 Mio in December 1994, a considerably higher estimate.

To correct the sector-specific “FDI stocks” prior to 1995 down, I have first reduced all reported “FDI stocks” in 1994 by a factor of  $21.7/29.0 \approx .75$ . Under the assumption that the central bank’s methodology before 1995 reflected relative changes in “FDI stocks” properly, I have replaced “FDI stocks” in all years before 1994 by

$$stk_t^{corr} = \frac{stk_{t+1}^{corr}}{1 + \left(\frac{flw_{t+1}}{stk_t}\right)^{old}} = \left(\frac{stk_t}{stk_{t+1}}\right)^{old} stk_{t+1}^{corr}, \quad (1)$$

starting in 1993. Here,  $stk_t$  denotes cumulated FDI until December of year  $t$ , and  $flw_t$  is FDI flow during year  $t$ . Corrected flows were inferred accordingly.

The file `fdi.csv` contains the results of this procedure. The series for individual sectors are reasonably smooth around 1995, given observed volatility before and after 1995.

#### 1.4.2 Applying consistent sector definitions

To make sector definitions consistent across the periods 1980-1995 and 1995-2000, and to make them compatible with other data sources, the sectors are aggregated to *nível 50* where possible. The Brazilian national accounting system uses this classification system since 1990. In many instances, the central bank either lumped sectors in 1980-1995 or in 1995-2000 together in a more aggregate manner so that consistency can only be achieved by aggregating up beyond *nível 50*. As a result, the level of detail only ranges around the *SIC* one-digit level in many instances. Appendix B provides an overview of sector definitions.

## 2 File Contents

The file `fdi.csv` contains the annual series of foreign foreign direct investment by manufacturing sector. The series spans the period from 1980 until 2000.

### `fdi.csv` (13 obs.)

	Variable	Description
1.	<code>niv50</code>	Sector Definition (base: <i>Nível 50</i> ) <sup>a</sup>
2.	<code>niv50det</code>	Sector Definition, <i>Nível 50</i> details <sup>b</sup>
3.	<code>v95</code>	Sector Description of Central Bank, 1980-1995
4.	<code>v00</code>	Sector Description of Central Bank, 1995-2000
5.	<code>stk1980</code>	FDI stock Dec. 1980 (current Mio US\$)
6.	<code>flw1981</code>	FDI flow 1981 (current Mio US\$)
7.	<code>stk1981</code>	FDI stock Dec. 1981 (current Mio US\$)
	...	
44.	<code>flw2000</code>	FDI flow 2000 (current Mio US\$)
45.	<code>stk2000</code>	FDI stock Dec. 2000 (current Mio US\$)

<sup>a</sup>Observations are: 12 aggregated manufacturing sectors that make *nível 50* consistent with the central bank data, and an observation for industry totals. See appendices A and B

<sup>b</sup>Entries are: Details for the mapping of 27 manufacturing sectors to consistent aggregates. See appendices A and B

## Appendix: Sectors of Industry

The definition of sectors of industry according to *nível 80* would roughly correspond to a three-digit *SIC* level in the US. The Brazilian national accounting system uses this classification system since 1990. The first two digits of *nível 80* (usually called *atividade 80*, *atividade 100*, or *nível 50*) are identical to the first two digits of *nível 100*, a commonly used classification system for firm or plant level data.

### A English Descriptions of Sectors at *Nível 80*

A list of *IBGE*'s English descriptions of sectors at *nível 80* follows below. The according more aggregate classification due to Mesquita Moreira (2000) is reported alongside. The abbreviations stand for

- *bi*: processed intermediate goods (*bens intermediários*),
- *bine*: non-processed intermediate goods (*bens intermediários não elaborados*),
- *bk*: capital goods (*bens de capital*),
- *bket*: vehicles for commercial use (*bens de capital: equipamentos de transporte*),
- *bc*: non-durable consumer goods (*bens de consumo*), and
- *bcd*: durable consumer goods (*bens de consumo duráveis*).

<i>Nív.80</i>	<i>Nív.50</i>	<i>Mor. 2000</i>	English Description of Sector
201	2	.	Iron ore mining
202	2	.	Mining of other metals
301	3	.	Oil and gas production
302	3	.	Coal and other mining
401	4	<i>bine</i>	Non-metallic mineral products
501	5	<i>bi</i>	Basic metallic products
502	5	<i>bi</i>	Rolled steel

<i>Nív.80</i>	<i>Nív.50</i>	<i>Mor. 2000</i>	English Description of Sector
601	6	<i>bi</i>	Non-ferrous metallic products
701	7	<i>bine</i>	Other metallic products
801	8	<i>bk</i>	Manufacturing and maintenance of machinery and equipment
802	8	<i>bk</i>	Tractors and embankment machinery
901	9	.	Printing and publishing
1001	10	<i>bcd</i>	Electrical equipment
1101	11	<i>bcd</i>	Electronic equipment
1201	12	<i>bket</i>	Automobiles, trucks, and buses
1301	13	<i>bcd</i>	Other vehicles and parts
1401	14	<i>bcd</i>	Wood and furniture
1501	15	<i>bine</i>	Paper, pulp, and cardboard
1601	16	<i>bi</i>	Rubber products
1701	17	<i>bi</i>	Non-petrochemical chemical elements
1702	17	<i>bi</i>	Alcohol
1801	18	<i>bi</i>	Motor gasoline
1802	18	<i>bi</i>	Fuel oil
1803	18	<i>bi</i>	Other refinery products
1804	18	<i>bi</i>	Basic petrochemical products
1805	18	<i>bi</i>	Resins and fibers
1806	18	<i>bi</i>	Alcoholic fuel
1901	19	<i>bi</i>	Chemical fertilizers
1902	19	<i>bi</i>	Paints, varnishes, and lacquers
1903	19	<i>bi</i>	Other chemical products
2001	20	<i>bc</i>	Pharmaceutical and perfumery products
2101	21	<i>bi</i>	Plastics
2201	22	<i>bi</i>	Natural textile fibers
2202	22	<i>bi</i>	Natural textiles
2203	22	<i>bi</i>	Artificial textile fibers
2204	22	<i>bi</i>	Artificial textiles
2205	22	<i>bc</i>	Other textile products
2301	23	<i>bc</i>	Apparel
2401	24	<i>bine</i>	Leather products and footwear
2501	25	<i>bc</i>	Coffee products
2601	26	<i>bc</i>	Processed rice
2602	26	<i>bine</i>	Wheat flour
2603	26	<i>bc</i>	Other processed edible products

<i>Nív.80</i>	<i>Nív.50</i>	<i>Mor. 2000</i>	English Description of Sector
2701	27	<i>bc</i>	Meat
2702	27	<i>bc</i>	Poultry
2801	28	<i>bc</i>	Processed milk
2802	28	<i>bc</i>	Other dairy products
2901	29	<i>bc</i>	Sugar
3001	30	<i>bine</i>	Raw vegetable oil
3002	30	<i>bi</i>	Processed vegetable oil
3101	31	<i>bi</i>	Animal food and other food products
3102	31	<i>bc</i>	Beverages
3201	32		Miscellaneous

## B Mapping of Sectors at *Nível 50* to Consistent Aggregates

The following table summarizes how sector definitions in the central bank's FDI data were transformed to *Nível 50*.

Aggregate	<i>Nív.50</i>	Description of Sector
4	4	Non-metallic mineral products
12	12	Automobiles, trucks, and buses
13	13	Other vehicles and parts
15	15	Paper, pulp, and cardboard
22	22	Other textile products
z1	5,6	Metal products
z2	7,8	Metal and mechanical products
z3	10,11	Electrical and electronic eqpm.
z4	19,20	Chemicals and pharmaceuticals
z5	23,24	Apparel and leather products
z6	25,26,27,28,29,30,31	Processed food products
z9	9,14,16,17,18,21,32	Other sectors <sup>a</sup>

<sup>a</sup>Sectors not separable due to inconsistent aggregation across periods 1980-1995 and 1995-2000.



## References

MESQUITA MOREIRA, MAURÍCIO (2000): “Indústria e Comércio Exterior,” *Conjuntura Econômica*, 54(7), 25–34