Balassa (1965) Comparative Advantage by Sector of Industry, Brazil 1986-2001

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This report describes the construction of a series of comparative advantage measures for Brazilian agriculture, mining and manufacturing sectors between 1986 and 2001. The series are available for *ISIC rev. 2* and several Brazilian sector classifications as files `compadv-isic2.csv`, `compadv-cnae.csv`, `compadv-niv100.csv`, `compadv-niv50.csv` and `compadv-subsibge.csv` at the URL `http://econ.ucsd.edu/muendler/brazil`.

The report is divided into three sections: (1) Construction of comparative advantage series, (2) Correlations between the comparative advantage series and trade-related variables and (3) File contents. An appendix details the sector definitions and mappings.

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1 Construction of Balassa (1965) Comparative Advantage Measures

1.1 Use

Balassa (1965) comparative-advantage indices measure revealed comparative advantage from international comparisons of exports data, and are blind to possible sources of advantage. Any explanation of comparative advantage is consistent with the Balassa (1965) measure.

1.2 Period covered

The series cover the period 1986 through 2001.

1.3 Data sources

Data on Brazilian and worldwide exports by industry are extracts from the data portal World Integrated Trade Solution (WITS), maintained by The World Bank in close collaboration with the United Nations Conference on Trade and Development (UNCTAD). The ultimate source of the exports data is the United Nation Statistical Division (UNSD) Commodity Trade (COMTRADE) Data Base that contains exports by commodity and partner country. Values are recorded in U.S. dollars. COMTRADE includes information for over 130 countries. The data are recorded according to several industry classifications, of which *ISIC revision 2* is used here.

1.4 Construction

Sector i's Balassa (1965) advantage in year t is

$$BADV_{i,t} \equiv \frac{X_{i,t}^{\text{Brazil}} / \sum_k X_{k,t}^{\text{Brazil}}}{X_{i,t}^{\text{World}} / \sum_k X_{k,t}^{\text{World}}}, \tag{1}$$

where $X_{i,t}$ are exports.

The exports source data are from WITS and at the *ISIC rev. 2* level.

1.5 Sector definitions

To make sector definitions compatible with Brazilian data sources, the *ISIC rev. 2* figures are mapped to the subsector IBGE classification (*subsibge* roughly comparable to the NAICS three-digit level), the Brazilian sector classification system *CNAE* (version 1995) as well as the Brazilian *Nível 50* and *Nível 100* definitions most commonly used for national accounting at the Brazilian statistical agency IBGE. The converters and correspondences can be found at `http://econ.ucsd.edu/muendler/brazil`.

Table 1: Balassa Comparative Advantage and Tariff Correlations

$BADV_{i,t}$	Sector FE		OLS	
	1986-98	1990-98	1986-98	1990-98
	(1)	(2)	(3)	(4)
Product Market Tariff	-1.271	.178	-1.587	-2.929
	(1.324)	(1.326)	(1.713)	(2.058)
Intm. Input Tariff	2.332	.402	-3.864	-14.130
	(1.331)*	(2.163)	(2.132)*	(3.409)***
Const.	1.265	1.777	4.833	4.293
	(.578)**	(.621)***	(.771)***	(.564)***
Obs.	390	270	390	270
R^2 (within for FE regressions)	.080	.026	.067	.142
p-value: Joint test for zero year indicators	.262	.850	.560	.391

Sources: Balassa comparative advantage based on UN Comtrade 1986-98, *ad-valorem* tariffs based on Kume, Piani, and Souza (2000), combined with input-output matrices (IBGE) for input tariffs. Controlling for year effects (joint χ^2 test). Balassa (1965) comparative advantage of sector i in year t is

$$BADV_{i,t} \equiv \frac{X_{i,t}^{\text{Brazil}} / \sum_k X_{k,t}^{\text{Brazil}}}{X_{i,t}^{\text{World}} / \sum_k X_{k,t}^{\text{World}}},$$

where $X_{i,t}$ are exports. Robust standard errors in parentheses: * significance at ten, ** five, *** one percent.

The Appendix provides an overview of sector definitions and comparative advantage measures at different levels of aggregation.

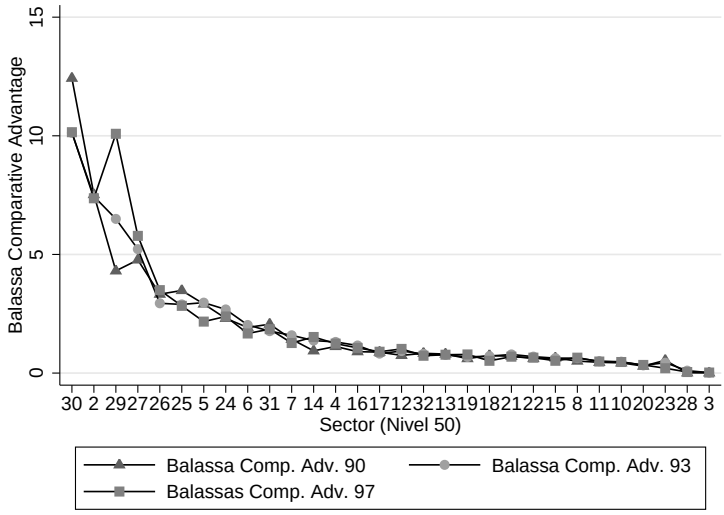
2 Correlations Between the Comparative Advantage Series and Trade-related Variables

Brazil's comparative advantage pattern is relatively stable over the period 1986-2001.

Table 1 reports results from various linear regressions of the Balassa (1965) measure in equation (1) on sector indicators, year indicators, and product-market and intermediate input tariffs.[1] For Brazil, the Balassa (1965) measure of comparative advantage is not statistically significantly related to tariffs. Year indicators are neither individually nor jointly different from zero at common significance levels.

Sector-fixed components take on most explanatory power. Figure 1 ranks manufacturing industries by their sector-fixed component to illustrate the regression results. With the exception of processed sugar (sector 29), Brazil's comparative advantage remains largely unchanged between 1990 and 1997.

[1] *Ad valorem* tariffs by sector and year are from Kume, Piani, and Souza (2000). To arrive at intermediate input tariff measures by sector and year, these tariff series are combined with economy-wide input-output matrices from IBGE. The vector of sector-level input tariff indices is $\tau_{i,t}^{in} = w_{i,t}' \tau_{i,t}^{out}$ in year t, where $w_{i,t}$ is the matrix of sector-specific shares of inputs.



Sources: UN Comtrade 1986-98. Sectors at *Nível 50* ranked by Balassa comparative advantage FE (for sector definitions see Table 2). Estimates of Balassa comparative advantage fixed effects (FE) from sector-fixed effects regression on output tariffs, input tariffs and year indicators (Table 1 column 2, p. 3).

Figure 1: **Balassa Comparative Advantage**

3 File Contents

The following files `compadv-isic2.csv`, `compadv-cnae.csv`, `compadv-niv100.csv`, `compadv-niv50.csv` and `compadv-subsibge.csv` contain the Balassa (1965) Comparative Advantage series for the sector classifications *ISIC rev. 2*, *CNAE* (version 1995), *Nível 100*, *Nível 50*, and subsector IBGE (*subsibge*). All series span the period from 1986 until 2001.

compadv-isic2.csv (1,552 obs.)

	Variable	Description
1.	`isic2`	*ISIC rev. 2*
2.	`year`	Calendar year
3.	`wrld_exp`	Exports World ($ '000)
4.	`wrld_tot`	Total Exports World ($ '000)
5.	`braz_exp`	Exports Brazil ($ '000)
6.	`braz_tot`	Total Exports Brazil ($ '000)
7.	`balcadv`	Balassa (1965) comp. advantage
8.	`balarank`	Quintile rank Balassa advantage

compadv-cnae.csv (4,848 obs.)

	Variable	Description
1.	`cnae`	*CNAE* (version 1995)
2.	`year`	Calendar year
3.	`wrld_exp`	Exports World ($ '000)
4.	`wrld_tot`	Total Exports World ($ '000)
5.	`braz_exp`	Exports Brazil ($ '000)
6.	`braz_tot`	Total Exports Brazil ($ '000)
7.	`balcadv`	Balassa (1965) comp. advantage
8.	`balarank`	Quintile rank Balassa advantage

compadv-niv100.csv (1,040 obs.)

	Variable	Description
1.	`niv100`	*Nível 100*
2.	`year`	Calendar year
3.	`wrld_exp`	Exports World ($ '000)
4.	`wrld_tot`	Total Exports World ($ '000)
5.	`braz_exp`	Exports Brazil ($ '000)
6.	`braz_tot`	Total Exports Brazil ($ '000)
7.	`balcadv`	Balassa (1965) comp. advantage
8.	`balarank`	Quintile rank Balassa advantage

compadv-niv50.csv (496 obs.)

	Variable	Description
1.	`niv50`	*Nível 50*
2.	`year`	Calendar year
3.	`wrld_exp`	Exports World ($ '000)
4.	`wrld_tot`	Total Exports World ($ '000)
5.	`braz_exp`	Exports Brazil ($ '000)
6.	`braz_tot`	Total Exports Brazil ($ '000)
7.	`balcadv`	Balassa (1965) comp. advantage
8.	`balarank`	Quintile rank Balassa advantage

compadv-subsibge.csv (224 obs.)

	Variable	Description
1.	`subsibge`	Subsector IBGE
2.	`year`	Calendar year
3.	`wrld_exp`	Exports World ($ '000)
4.	`wrld_tot`	Total Exports World ($ '000)
5.	`braz_exp`	Exports Brazil ($ '000)
6.	`braz_tot`	Total Exports Brazil ($ '000)
7.	`balcadv`	Balassa (1965) comp. advantage
8.	`balarank`	Quintile rank Balassa advantage

Appendix: Sector Classifications

To assess the sensitivity of Balassa (1965) comparative advantage measures to the level of sectoral aggregation, it is convenient to rank sectors by comparative-advantage quintile. Tables 2 and 3 compare the quintile rankings across the Brazilian sector classifications *subsibge* (roughly comparable to the NAICS three-digit level), *CNAE* (version 1995) and *Nível 50*.

Table 2: Subsector ibge and *Nível 50* Comparison

Subsector ibge	Comp. Adv.		Quintile	
Nível 50	1990	97	90	97
1 **Mining and quarrying**	**.976**	**.846**	**3**	**3**
2 Mining of minerals	7.526	7.366	5	5
3 Extraction of petroleum and gas, mining of coal	.011	.024	1	1
2 **Manufacture of non-metallic mineral products**	**.994**	**1.047**	**3**	**3**
4 Manufacture of nonmetallic mineral products	1.122	1.242	3	3
3 **Manufacture of metallic products**	**1.696**	**1.498**	**4**	**4**
5 Manufacture of iron and steel products	2.912	2.170	4	4
6 Manufacture of nonferrous metal products	1.923	1.669	4	4
7 Manufacture of metal products n.e.c.	1.426	1.267	4	3
4 **Manufacture of machinery, equipment and instruments**	**.461**	**.575**	**1**	**1**
8 Manufacture of machinery and commercial equipment	.507	.650	1	2
5 **Manufacture of electrical and telecomm. equipment**	**.523**	**.611**	**1**	**2**
10 Manufacture of electrical equipment and components	.432	.467	1	1
11 Manufacture of electronic and communication equipment	.453	.487	1	1
6 **Manufacture of transport equipment**	**1.044**	**.967**	**4**	**3**
12 Manufacture of automobiles, trucks and buses	.746	1.020	2	3
13 Manufacture of vehicle parts and transportation eqpmt.	.802	.775	3	2
7 **Manufacture of wood products and furniture**	**.871**	**1.251**	**3**	**4**
14 Manufacture of wood products and furniture	.939	1.522	3	4
8 **Manufacture of paper and paperboard, and publishing**	**.632**	**.517**	**2**	**1**
15 Manufacture of paper and pulp, and publishing	.635	.519	2	2
9 **Manufacture of rubber, leather and products n.e.c.**	**.624**	**.807**	**2**	**2**
16 Manufacture of rubber products	.903	1.062	3	3
32 Manufacture of miscellaneous other products n.e.c.	.834	.731	3	2
10 **Manufacture of chemical and pharmaceutical products**	**.662**	**.613**	**2**	**2**
17 Manufacture of non-petrochemical chemicals	.883	.900	3	3
18 Manufacture of petrochemical products and petroleum	.741	.518	2	1
19 Manufacture of miscellaneous chemical products	.610	.786	2	3
20 Manufacture of pharmaceutical products and detergents	.294	.344	1	1
21 Manufacture of plastics products	.708	.691	2	2
11 **Manufacture of apparel and textiles**	**.621**	**.452**	**1**	**1**
22 Manufacture of textiles	.616	.650	2	2
23 Manufacture of apparel and apparel accessories	.539	.205	1	1
12 **Manufacture of footwear**	**3.051**	**2.562**	**5**	**5**
24 Manufacture of footwear and leather and fur products	2.306	2.386	4	4
13 **Manufacture of food, beverages, and ethyl alcohol**	**3.224**	**3.443**	**5**	**5**
25 Processing of coffee	3.481	2.833	5	5
26 Processing of plant products	3.326	3.496	5	5
27 Processing of meat, including slaughter	4.769	5.783	5	5
28 Processing of dairy products	.012	.045	1	1
29 Processing of sugar	4.309	10.085	5	5
30 Processing and refining of food fats and oils	12.427	10.151	5	5
31 Manufacture of other food products and beverages	2.062	1.852	4	4
25 **Agriculture, hunting, forestry and fishing**	**1.419**	**2.025**	**4**	**4**
1 Agriculture, fishing, hunting and forestry	1.643	2.468	4	4

Source: UN Comtrade 1990. Balassa (1965) comparative advantage of sector i in year t: $BADV_{i,t} \equiv (X_{i,t}^{\text{Brazil}} / \sum_k X_{k,t}^{\text{Brazil}}) / (X_{i,t}^{\text{World}} / \sum_k X_{k,t}^{\text{World}})$, where $X_{i,t}$ are exports (5th quintile: strongest adv.).

Table 3: Subsector ibge and cnae Comparison

Subsector ibge	Comp. Adv.		Quintile	
cnae (2-digit) level	1990	97	90	97
1 **Mining and quarrying**	**.976**	**.846**	**3**	**3**
10 Coal Mining	.015	.027	1	1
11 Petroleum and Gas Extraction	.0005	.002	1	1
13 Metallic Mineral Mining	11.316	11.023	5	5
14 Nonmetallic Mineral Mining	.853	.801	3	3
2 **Manufacture of non-metallic mineral products**	**.994**	**1.047**	**3**	**3**
26 Nonmetallic Mineral Product Manufacturing	.950	1.124	4	4
3 **Manufacture of metallic products**	**1.696**	**1.498**	**4**	**4**
27 Metals Production and Basic Processing	2.362	1.941	5	4
28 Metal Product Manufacturing (excluding machinery)	1.445	1.264	5	4
4 **Manufacture of machinery, equipment and instruments**	**.461**	**.575**	**1**	**1**
29 Machinery and Equipment Manufacturing	.540	.652	2	3
30 Office Machinery and Data Processing Equipment Manuf.	.142	.114	1	1
33 Medical, Therapeutic and Optical Equipment Manufact.	.273	.225	1	2
5 **Manufacture of electrical and telecomm. equipment**	**.523**	**.611**	**1**	**2**
31 Electrical Machinery, Equipment and Supplies Manuf.	.466	.481	2	2
32 Electronic Component and Comm. Apparatus Manufacturing	.318	.205	2	1
6 **Manufacture of transport equipment**	**1.044**	**.967**	**4**	**3**
34 Motor Vehicle Manufacturing	.674	.997	3	3
35 Other Transportation Equipment Manufacturing	.995	.884	4	3
7 **Manufacture of wood products and furniture**	**.871**	**1.251**	**3**	**4**
20 Wood Products Manufacturing	.931	1.672	4	4
36 Furniture and Miscellaneous Manufacturing	.436	.611	2	2
8 **Manufacture of paper and paperboard, and publishing**	**.632**	**.517**	**2**	**1**
21 Pulp, Paper and Paper Products Manufacturing	1.261	1.400	4	4
22 Publishing, Printing and Reproduction of Recording	.262	.173	1	1
9 **Manufacture of rubber, leather and products n.e.c.**	**.624**	**.807**	**2**	**2**
16 Tobacco Product Manufacturing	.805	4.208	3	5
25 Rubber and Plastics Product Manufacturing	.944	1.079	4	4
37 Recycling	.231	.433	1	2
10 **Manufacture of chemical and pharmaceutical products**	**.662**	**.613**	**2**	**2**
23 Coal Products Manufacturing and Petroleum Refining	.718	.352	3	2
24 Chemical Products Manufacturing	.652	.697	3	3
11 **Manufacture of apparel and textiles**	**.621**	**.452**	**1**	**1**
17 Textile Products Manufacturing	.715	.651	3	3
18 Apparel Manufacturing	.556	.221	2	1
12 **Manufacture of footwear**	**3.051**	**2.562**	**5**	**5**
19 Leather Processing and Leather Products Manufacturing	2.523	2.646	5	5
13 **Manufacture of food, beverages, and ethyl alcohol**	3.224	3.443	5	5
15 Food and Beverage Manufacturing	3.213	3.428	5	5
25 **Agriculture, hunting, forestry and fishing**	**1.419**	**2.025**	**4**	**4**
1 Crop and Plant Growing and Animal Farming	2.004	3.023	5	5
2 Forestry and Logging	1.185	2.258	4	5
5 Fishing	.453	.251	2	2

Source: UN Comtrade 1990. Balassa (1965) comparative advantage of sector i in year t: $BADV_{i,t} \equiv (X_{i,t}^{\text{Brazil}} / \sum_k X_{k,t}^{\text{Brazil}}) / (X_{i,t}^{\text{World}} / \sum_k X_{k,t}^{\text{World}})$, where $X_{i,t}$ are exports (5th quintile: strongest adv.).

References

Balassa, Bela (1965): "Trade Liberalization and Revealed Comparative Advantage," *Manchester School of Economic and Social Studies*, 33, 99–123

Kume, Honório, Piani, Guida, and Souza, Carlos Frederico Bráz de (2000): "A Política Brasileira de Importação no Período 1987-98: Descrição e Avaliação," IPEA (Instituto de Pesquisa Econômica Aplicada), Rio de Janeiro