An improved measure of industry value added and factor shares: description of a new dataset of the U.S. and Brazilian manufacturing industries

Serge Shikher*

Department of Economics
Boston University

February 5, 2004

Preliminary Draft

1 Introduction

This paper describes a new dataset containing data on U.S. and Brazilian manufacturing industries. Our method of calculating industry value added and factor shares is different from the method used in the standard surveys of manufactures. We show how the standard sources of industry-level data overstate value added and capital share. We believe that our methodology results in more accurate measures of these variables.

Our dataset contains comparable information about U.S. and Brazilian manufacturing industries. It has data for 21 industries for the period 1986-95. The dataset includes such variables as industry value added, employment by type of labor, labor compensation by type of labor and type of compensation, capital stock by type of capital, proportion of foreign machinery in Brazilian industries, average rates of return to capital, and other variables. The dataset can be used for a variety of studies, including studies of technology, rates of return, skill bias, and others.

In the following sections, we describe the problems with existing measures of value added and factor shares, explain our methodology, and present the summary of our dataset. We also compare our data with existing datasets, and point out the differences resulting from different methodologies. We show that mismeasurement of capital share by standard datasets results in understating of the technology gaps between countries.

*Department of Economics, Boston University, 270 Bay State Road, Boston, MA 02215; shikher@bu.edu; http://people.bu.edu/shikher. Help from the staff of Lamont Library of Harvard University and Instituto Brasileiro de Geografia e Estatística was instrumental in creating our dataset.

2 Problems with existing industry-level value added and share measures

Manufacturing surveys, such as the Annual Survey of Manufactured (ASM) in the U.S., produce very high capital income, share, and rate of return. They typically report capital shares of over 0.5 for developed countries and over 0.7 for developing countries (see Figures 1 and 2). These numbers are very high, given that the capital share for the whole economy is around 0.3 for developed countries. In this section we explain the origin of this problem and offer a solution, implemented in out dataset. The capital share in our dataset is 0.27 in the United States and 0.47 in Brazil.

Value added produced by an entity, be it a firm, industry, or country, is defined as output minus all inputs, where inputs are the materials and services bought from outside the entity and used in the production of output. The value added is distributed to labor as wages and worker benefits and owners of capital as net income and depreciation.

Manufacturing surveys collect data on output and only some of the inputs. Many inputs are omitted. Inputs surveyed generally include raw materials, electricity used, fuels used, and industrial services bought. Other inputs, particularly those used in indirect support of production, such as communication and computer services bought, accounting services bought, legal services bought, advertising services bought, etc., are not surveyed and not subtracted from the output.[1] This overstates the reported value added.

There are other reasons why the reported value added is overstated. Manufacturing survey data is usually collected on establishment basis. Establishments can be production or auxiliary, and auxiliary establishments can be of direct or indirect support to production. Direct support includes environmental control, refrigeration maintenance, quality control, etc. while indirect support includes warehousing, sales, administrative, research and development, etc. The data for auxiliary establishments of direct support is collected in some surveys while the data for auxiliary establishments of indirect support is rarely collected. In some surveys, the data for these establishments is collected but not added to the industry in which the production establishment they serve operates.

Auxiliary establishments, particularly the establishments of indirect support, create little value added directly. On the other hand, many costs related to the process of production and marketing of the products are incurred in these auxiliary establishments. These can be payments to labor or to third parties for services provided. The total cost of producing a particular good or the cost of operating in a particular industry includes the costs incurred in auxiliary establishments. Omitting these costs understates the cost of doing business in an industry and overstates the value added of that industry.

Not accounting for inputs of indirect use and inputs bought by auxiliary establishments of indirect support overstates value added and understates labor income.[2] Since capital income

[1] These inputs are sometimes called the 'inputs of indirect use'.

[2] Another problem with some, but not all, surveys of manufactures is that they do not account for worker benefits. As we will see, worker benefits can be as much as 30% of total compensation. Not accounting for worker benefits will understate labor income and further overstate capital share.

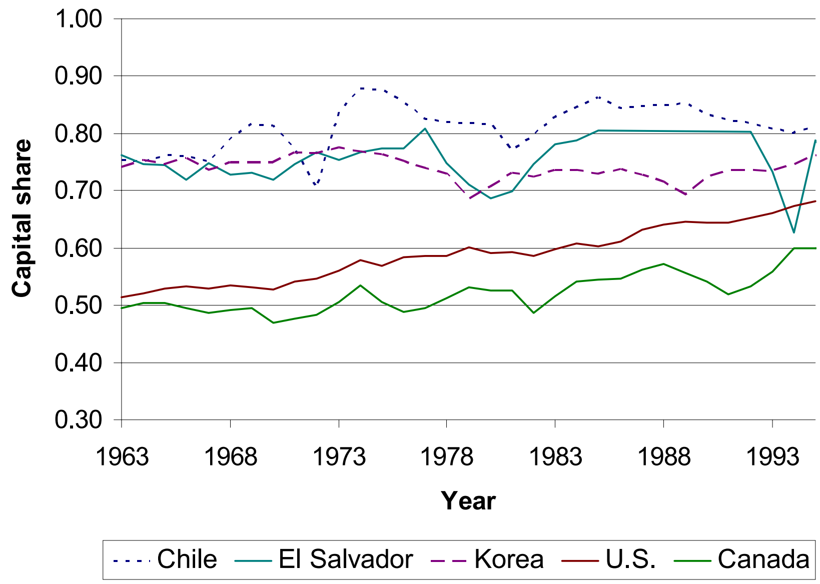

Figure 1: Capital shares for manufacturing sectors of five countries reported by the United Nations Industrial Statistics Database (UNIDO)

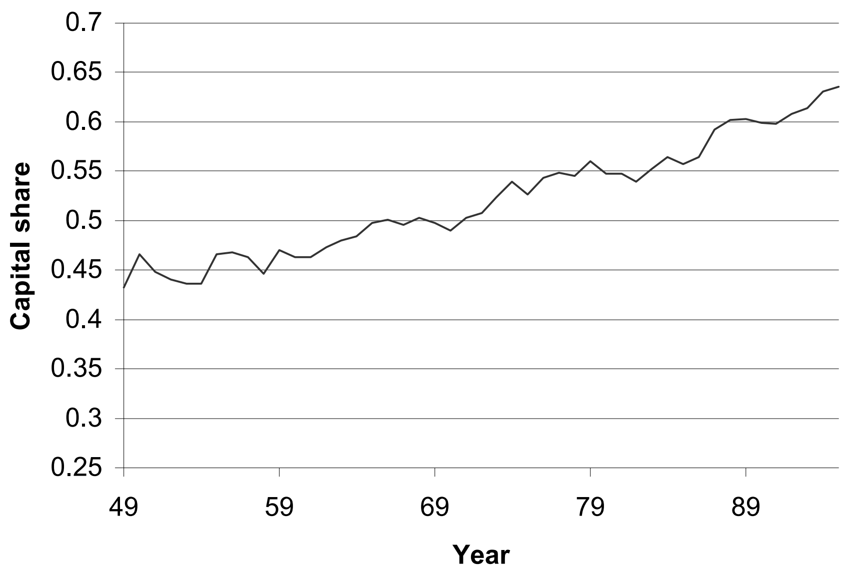

Figure 2: Capital share for the U.S. manufacturing sector reported by the Annual Survey of Manufactures (ASM)

is calculated in manufacturing surveys as value added minus labor income, the capital income is overstated.

3 An alternative accounting procedure for value added

In general, value added can be calculated by using either the subtraction or the addition method. In the subtraction method, all inputs are subtracted from the output to arrive at the value added. In the addition method, incomes of all the factors of production are added together to arrive at the value added. Both methods should produce equivalent results.

Both methods are used in calculating country value added but only the subtraction method is used in calculating industry value added. Correctly calculating value added in manufacturing using the subtraction method is extremely data-intensive and practically infeasible because it requires information about all inputs purchased by an establishment. We propose to calculate industry value added using the addition method.

In order to calculate value added using the addition method we need to know the incomes of labor and owners of capital. The income of labor is the total labor cost which includes wages, salaries, and the supplemental labor costs. Calculating the income of the owners of capital is where we must exercise particular care.

In order to make sure that all auxiliary establishments are accounted for and to facilitate the calculation of the income of owners of capital we propose to calculate value added on the firm level instead of the establishment level. In fact, since net income is only available at the firm level or higher we have to use firm-level data.

Depreciation reported in accounting statements of firms is based on accounting rules and is calculated for the stock of assets which may be different from the stock of capital in economic sense. We choose to ignore the accounting depreciation altogether and calculate depreciation using economic rates of depreciation and economic stocks of capital.

The net income reported by corporations in their income statements is not the same as the net income which is the component of the value added. To arrive to the economic net income, the accounting net income must first be adjusted from the sales basis to the production basis. Accounting net income is equal to revenues minus costs related to goods sold in the current period. Economic net income, on the other hand, is revenues minus costs related to goods produced in the current period. We perform the necessary adjustments using changes of inventories. Note that period expenses, such as selling and administrative expenses, do not have to be adjusted.

Some items that are considered revenues and expenses for a firm for accounting purposes are not part of economic value added. In particular, interest revenue, interest expense, gains and losses on investments are not considered part of value added. Generally, items classified in income statements under nonoperating income and expenses are not considered part of value added.

4 Data sources and methodology

We have compiled data for 21 manufacturing industries of the United States and Brazil for years 1986-95. Our data comes from many different sources. We list these sources in Section 4.1. Our industry classification is described in Section 4.2. In Section 4.3 we describe how we deal with monetary units. Sections 4.4 and 4.5 describe how we measure industry-level physical and human capitals.

4.1 Data sources

Brazilian data is mostly from the Pesquisa Industrial Anual (PIA) which is the annual survey of manufacturing industries conducted by the Instituto Brasileiro de Geografia e Estatística (IBGE) which is the Brazilian statistical agency. During the period of 1986-95 PIA was conducted on both firm and establishment basis.

To form the capital stock we used the 1975 IBGE survey of fixed assets as the starting point and the investment data from 1976-85 PIAs and Economic Censuses to arrive to the end-of-the-year 1985 capital stock using the perpetual inventory method. Brazilian educational attainment data is from the Relação Anual de Informações Sociais (RAIS) which is the database containing administrative records of all employees in Brasil. RAIS is administered by the Ministério do Trabalho e Emprego (Ministry of Labor).

U.S. data is from the Quarterly Financial Survey (QFR), Annual Survey of Manufactures (ASM), U.S. Census of Manufactures, Enterprise Statistics Survey, and the Census of Wholesale Trade, all conducted by the U.S. Census Bureau. Capital stock and investment data are from the Fixed Assets Tables, which are part of the Fixed Reproducible Tangible Wealth in the United States Survey done by the Bureau of Economic Analysis (1995, 1997). U.S. educational attainment data is from the Current Population Survey (CPS), which is a joint project of the Bureau of Labor Statistics (BLS) and the Census Bureau.

4.2 Industries

The data was collected for 21 manufacturing industries which represent approximately 2-2.5 digit SIC level. The list of industries is in Table 1. There were two principal considerations which governed our industry classification. First and foremost, the industries had to be the same for both countries. Even within each country, different surveys are often conducted using different classifications of industries.[3] Therefore, our industry classification had to be at least at the level of aggregation of the survey with the highest level of aggregation.

The second consideration is that aggregating firm level data into very narrowly defined industries does not make much sense since firms often engage in several activities. For example, very few firms stay within a single 4-digit SIC industry. Our industry classification is based in large measure on the classification used in QFR which collects firm level data. The industry classification of that survey, which is done on the level of 2.5-digit SIC, was designed so that most firms stayed within one industry.

[3] As is the case with QFR and ASM in the U.S. for example.

#	**Name**	**SIC**
1.	Food and kindred products except coffee and sugar	20
2.	Coffee$^{(*)}$	N/A
3.	Sugar$^{(*)}$	N/A
4.	Textile mill products	22
5.	Apparel and leather	23, 31
6.	Lumber and wood	24
7.	Furniture and fixtures	25
8.	Paper and allied products	26
9.	Printing and publishing$^{(**)}$	27
10.	Industrial chemicals and synthetics	281, 282, 286
11.	Pharmaceuticals	283
12.	Residual of chemicals	284, 285, 287, 289
13.	Petroleum and coal products$^{(**)}$	29
14.	Rubber and rubber products	30
15.	Non-metallic mineral products	32
16.	Metallurgy and metal products	33, 34
17.	Non-electrical machinery	35
18.	Electrical and electronic machinery	36
19.	Motor vehicles and equipment	371
20.	Other transportation equipment	372, 373, 374, 375, 376, 379
21.	Other industries	38, 39

$^{(*)}$ Data exists only for Brazil. Excluded from analysis.
$^{(**)}$ Possible outlier industry.

Table 1: List of industries used in our dataset with corresponding SIC industries

Two industries were found to be possible outliers and were excluded from some of the analysis done in this paper. They were the 'Petroleum and Coal Products' and 'Printing and Publishing' industries.[4]

4.3 Monetary units

All data expressed in monetary units was converted into constant 8/1/94 units of local currencies using the appropriate price indices. Brazilian Real was then converted into U.S. dollars using the market exchange rate for 8/1/94 published by the Banco Central do Brasil (BCB).

[4]These industries are often found to be outliers in industry-level studies.

Type of asset	Depr. rate	Source
Building and structures	0.03	HW
New domestic machinery and equipment	0.12	HW
New foreign machinery and equipment	0.12	HW
Used machinery and equipment	0.12	HW
Data processing equipment	0.30	HW and BEA
Office equipment (incl. furniture)	0.21	Calculated from BEA
New means of transport	0.28	BEA, HW, Jorgenson
Used means of transport	0.28	BEA, HW, Jorgenson

HW: (Hulten and Wykoff, 1981; Hulten and Wykoff, 1996).

BEA: (U.S. Bureau of Economic Analysis, 1995; U.S. Bureau of Economic Analysis, 1997).

Jorgenson: (Jorgenson, 1996).

Table 2: Depreciation rates by category of capital good

4.4 Physical capital

Capital stock, divided into 5 categories of capital goods, was calculated using the perpetual inventory method. The categories were buildings and structures, machinery and equipment, data processing equipment, office equipment (including furniture), and means of transport. In addition, Brazilian machinery and equipment was divided into new domestic machinery and equipment, new foreign machinery and equipment, and used machinery and equipment. Brazilian means of transport were also divided into new means of transport and used means of transport.

Each category had its own depreciation rate (see Table 2). We used depreciation rates from Hulten and Wykoff (1981), Hulten and Wykoff (1996), BEA (1995), BEA (1997), and Jorgenson (1996). The perpetual inventory method is described in Hulten and Wykoff (1981) and Fraumeni (1997). The latter paper summarizes various studies of depreciation.

4.5 Human capital

We estimate human capital H by the level of educational attainment of workers: $H = e^{\phi(S)}$, where S is the years of schooling. Our treatment of human capital is the same as Hall and Jones's (1999) who use the survey paper of Psacharopoulos (1994) of return-to-schooling estimates for different countries. Following Hall and Jones (1999), we take $\phi(S)$ to be piecewise linear with 0.134 marginal wage increase for each of the first 4 years of education, 0.101 marginal wage increase for each of the years 5-8, and 0.068 marginal wages increase for each of the years beyond 8.

The only cross-country data that we were able to obtain is for the educational attainment of all manufacturing workers combined. Therefore, we estimate cross-country differences of human capital from differences of educational attainment as well as observed industry wages.

We assume that industry wage is proportional to the level of human capital in that industry:

$$w_{ic} = w_c H_{ic},$$

where w_{ic} is the wage in industry i and country c, w_c is the wage per unit of human capital in country c manufacturing sector ('base wage', which is equal across industries), and H_{ic} is the level of human capital in industry i and country c. Then the average manufacturing wage in country c is

$$\overline{w}_c = \frac{\sum_i w_{ic} L_{ic}}{L_c} = \frac{\sum_i w_c H_{ic} L_{ic}}{L_c} = w_c \frac{\sum_i H_{ic} L_{ic}}{L_c} = w_c \overline{H}_c,$$

where L_{ic} is employment in industry i, L_c is manufacturing employment in country c, and $\overline{H}_c$ is the human capital in the manufacturing sector of country c. From the above equations we have $w_c = \overline{w}_c / \overline{H}_c$ and

$$H_{ic} = \frac{w_{ic}}{w_c} = \frac{w_{ic} \overline{H}_c}{\overline{w}_c} = \frac{w_{ic}}{\overline{w}_c} e^{\phi(S_c)},$$

where S_c is the years of schooling obtained by workers in the manufacturing sector of country c.

5 Description of the data

Our data is summarized in Table 3. Manufacturing sectors are large in both countries and represent a significant proportion of the labor force (about 14.7% in the U.S. and 7.2% in Brazil). Value added per worker, capital stock per worker, and total compensation per worker are all several times higher in the U.S. than in Brazil.

We note that worker benefits constitute a significant proportion of total compensation in both countries. These benefits are proportionally higher in Brazil than in the United States. We can see that this is because the proportion of legally requires benefits is more than 3 times higher in Brazil than in the U.S. The voluntary benefits are actually smaller in Brazil. This supports our view that accounting for worker benefits is important when calculating total labor compensation.

The capital share is about 0.27 in the U.S. manufacturing and 0.47 in Brazilian manufacturing. The U.S. capital share is close to the generally accepted value of capital share for the whole U.S. economy, 0.3. The next three sections describe industry value added as well as capital- and labor-related variable in more detail. Section 6 compares our data with data reported by UNIDO.

5.1 Value added

Figures 3 and 4 show the evolution of value added in the U.S. and Brazilian manufacturing industries. In the U.S., the manufacturing value added per worker has clearly grown between

	United States	**Brazil**
Employment$^{(*)}$	18.5 mil.	4.7 mil.
Employment$^{(**)}$	16.9 mil.	4.3 mil.
Largest industries by employment	Metallurgy, Non-electrical machinery, Electrical and electronic machinery, Food, Printing and publishing, Transportation equipment	Food and kindred products except coffee and sugar, Apparel and leather, Metallurgy, Chemicals and petrochemicals, Textile mill products
Total compensation per employee	$39,625	$11,884
Salaries as % of total compensation	79.94%	67.14%
Legally required benefits as % of total compensation	8.04%	25.57%
Voluntary benefits as % of total compensation	12.02%	7.29%
Capital per employee	$66,826	$37,461
Value added per employee	$55,797	$28,341
Capital share$^{(*)}$	0.27	0.47
Capital share$^{(**)}$	0.23	0.50
Average (real) rate of return on the stock of capital	21%	31%

$^{(*)}$ Includes outlier industries
$^{(**)}$ Excludes outlier industries

Table 3: Overview of manufacturing sectors of the United States and Brazil

1986 and 1995. In Brazil, on the other hand, there was little growth during these 10 years. Both countries have experienced a recession in the early 1990s but the decline seems more severe in Brazil. In addition, Brazil has experiences a monetary crisis in 1995 with the associated decline in the manufacturing value added.

Figure 5 shows the average value addeds per worker for each industry. We can see that in both countries Chemical, Machinery, and Metal industries have high value addeds per worker. Textile and Wood industries have low value addeds per worker. The value added per worker is higher in the U.S. than in Brazil in every industry.

5.2 Physical capital, capital shares, and rates of return

Figure 6 shows the average capital stock per worker for each industry. Industrial Chemicals, Pharmaceuticals, Other Chemicals, and Paper and Allied Products industries have very high stocks of physical capital per worker. Apparel, Furniture and Fixtures, and Lumber and Woods Products industries have the lowest stocks of physical capital. U.S. has more physical capital than Brazil in all industries.

Figure 7 shows average capital shares for each industry. Chemicals, Metals, Electrical and Electronic Machinery have high capital shares. Apparel and Furniture have low capital shares. We can also see that Brazil has higher capital shares in all industries.

Brazilian industries employ both domestic and foreign machinery. We have collected data on the proportion of foreign machinery used in each industry. The average (for the period) proportions are shown in Figure 8. Motor Vehicles, Textile Mill Products, and Paper Products industries have the highest proportions of foreign machinery, around 13% of total machinery. Other Chemicals and Food industries have the lowest proportions, 1 and 2% of total machinery, respectively.

Figure 9 shows the average real rates of return to physical capital in each industry. Brazil has higher rates of return than the U.S. in all industries. Metallurgy, Motor Vehicles, and Furniture are the industries in which the rates of return in the two countries are most similar. Electrical and Electronic Machinery, Pharmaceuticals, and Apparel industries command the highest premiums in Brazil.

Figure 10 shows the evolution of the average rates of return in U.S. and Brazilian manufacturing during 1986-95. The rate of return in the U.S. manufacturing has steadily increased over the period, from less than 17% to over 24%.[5] The rate of return in Brazilian manufacturing has been much more volatile than the U.S. rate. It has peaked in 1987 and 1993, and was battered by economic crises in 1990 and 1995. Generally, it seems to have declined over the period. The average rate of return in Brazilian manufacturing had been higher than the U.S. rate, except in 1995 when the U.S. rate of return was higher. The 1995, however, was a peak year in the U.S. and a recession year in Brazil.

[5] Dumenil and Levy (1990) claim that the rates of return in U.S. manufacturing had displayed a downward trend since the 1960s until 1980.

Source:	**Our data**		**Unido**	
Country:	U.S.	Brazil	U.S.	Brazil$^{(*)}$
Employment	18.5 mil.	4.7 mil.	17.2 mil.	4.2 mil.
Total compensation per employee	$39,625	$11,884	$29,854	$8,355
Value added per employee	$55,797	$28,341	$85,305	$42,104
Capital share	0.27	0.47	0.65	0.80

$^{(*)}$ Some data for Brazil was missing and was interpolated

Table 4: Comprison of our and UNIDO data

5.3 Employment, human capital, and worker compensation

Figure 11 shows total employment by industry in the two countries. Metals, Machinery and Food industries had the highest employment in the United States. Food, Apparel, and Metals industries had the highest employment in Brazil.

Figure 12 shows the educational attainment of workers in total manufacturing. Workers are classified into 9 categories, according to the highest educational level achieved. The distribution of educational attainment in Brazil is clearly to the left (less educated) of the U.S. distribution. Most Brazilian manufacturing workers have 4 to 7 years of education. At the same time, very few U.S. workers have less than complete secondary education. About 17% of manufacturing workers in the U.S. have university education. The corresponding number in Brazil is about 4%.

Figure 13 shows the average human capital in each industry.[6] Machinery (including Motor Vehicles) and Chemical industries have the highest levels of human capital. Textile, Apparel, Wood, and Furniture industries have lower levels of human capital. U.S. has higher levels of human capital in all industries.

Total compensation in each industry is shown in Table 14. Motor Vehicles, Industrial Chemicals, and Pharmaceuticals generally have higher compensation in both countries. Apparel has the lowest compensation in both countries.

6 Comparison with the UNIDO data

Table 4 compares our data to the data reported by UNIDO.[7] We can see that the employment reported by UNIDO is somewhat smaller than ours, most likely because UNIDO data omits (at least some) non-production establishments. As we predicted, our total compensation per employee is higher than UNIDO's because (i) we account for all worker benefits and (ii)

[6] Industry-level human capital is calculated from both education and compensation data, as previously described.

[7] The UNIDO's data is essentially the data reported by governments in their surveys of manufactures, since the UNIDO itself does not engage in data collection. UNIDO, however, does make an effort to make data comparable between countries, which is why we use their data here, rather than the data directly from ASM and PIA.

	Our data	**UNIDO**
TFP gap	0.46	0.26

Table 5: TFP gap ($\log(A_{US}/A_{BR})$) between U.S. and Brazilian manufacturing sectors, calculated using our and UNIDO's capital shares

we include all non-production establishments which tend to have higher compensation than production establishments.

Also as we predicted, UNIDO's reported value added per worker is significantly higher than ours because (i) UNIDO's data omits non-production establishments where many of the inputs are consumed and (ii) UNIDO's data does not account for many of the inputs, as we previously discussed. The combination of bigger value added and smaller total compensation results in UNIDO's capital share being higher than ours. Table 4 shows that UNIDO's capital shares are about twice as high as ours.

6.1 Effect of the capital share on the TFP measure

The value added is higher in UNIDO's data than in our data, but it is higher in both countries. Therefore, the ratio of U.S. to Brazilian value added is very similar in both datasets. As a consequence, the much larger capital shares in the UNIDO data lead to much lower measure of the TFP gap. Table 5 reports that the TFP gap between U.S. and Brazilian manufacturing sectors is 0.46 in our data, but only 0.26 in the UNIDO's data. We conclude that the industry-level relative TFP measures, calculated using the UNIDO (or any survey of manufactures) data, may not be appropriate for economic analysis.

7 Conclusion

In this paper we explain why the existing measures of industry value added and factor shares may not be accurate. We describe an alternative measurement procedure for these variables. This procedure was implemented in a dataset containing information about U.S. and Brazilian manufacturing industries.

We show that industry value added reported by standard surveys of manufactures overstates value added by about 40%, understates labor compensation by about 30-35%, and overstates capital share by a factor of two. As the result, the measured TFP gap between the U.S. and Brazilian manufacturing industries is significantly understated.

Our dataset contains comparable information about many aspects of U.S. and Brazilian manufacturing. It includes data on the labor force and labor compensation by type of labor and type of compensation, investment and capital stock by type of capital, rate of return to capital, human capital, and other variables. The dataset can be used to study technology, investment, rates of return, labor compensation, and other topics.

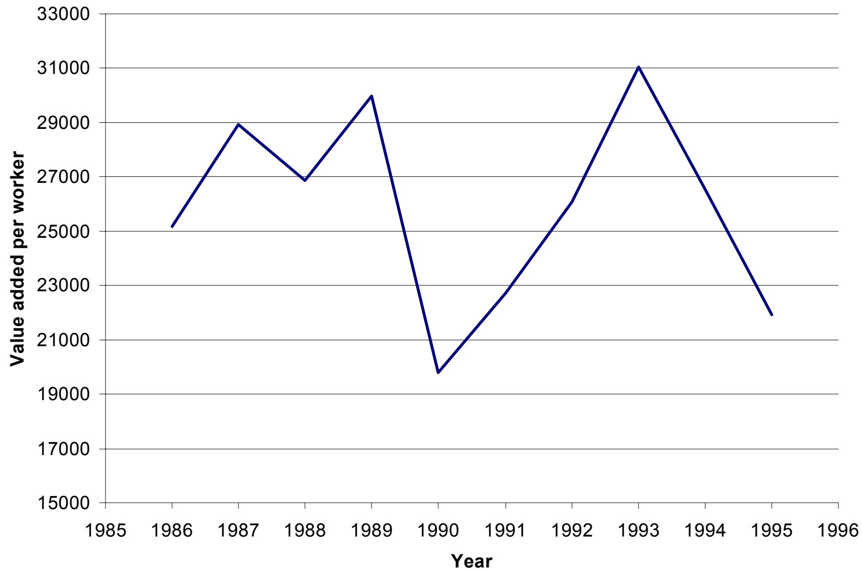

Figure 3: Value added per worker in Brazilian manufacturing, 1986-95

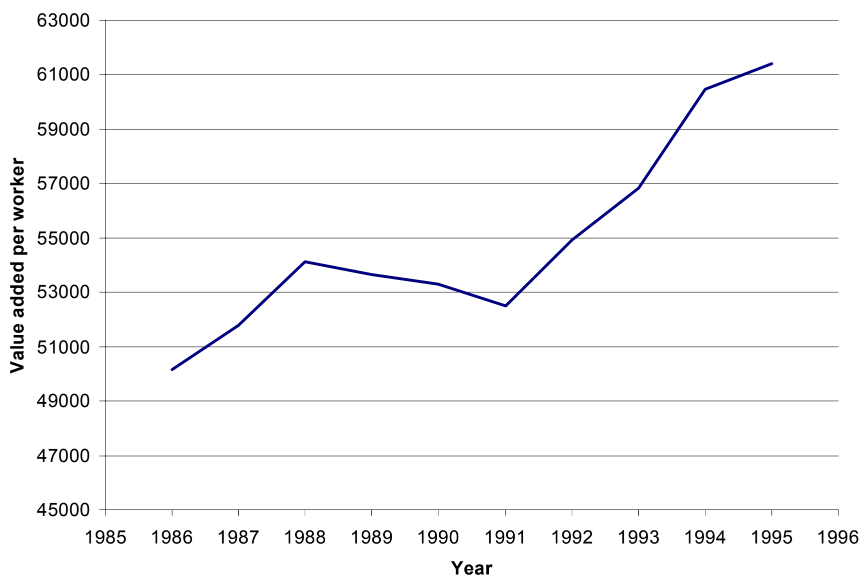

Figure 4: Value added per worker in U.S. manufacturing, 1986-95

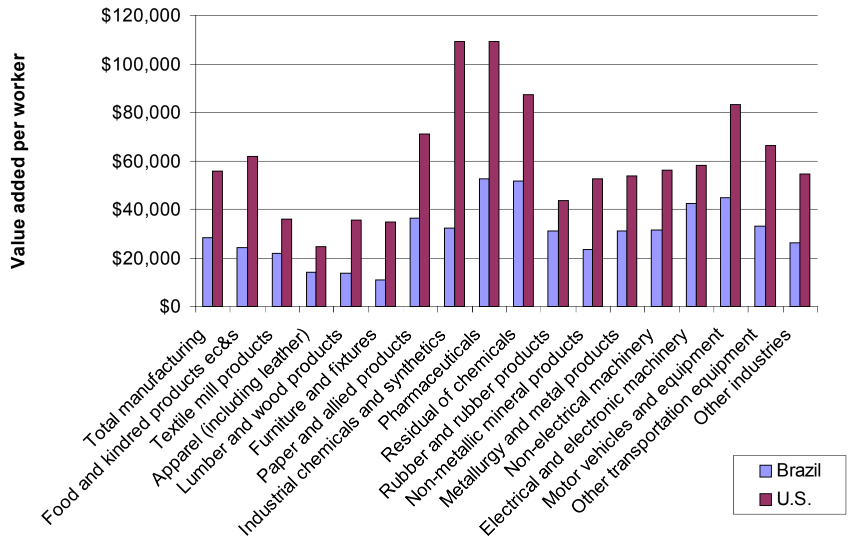

Figure 5: Value added per worker by industry

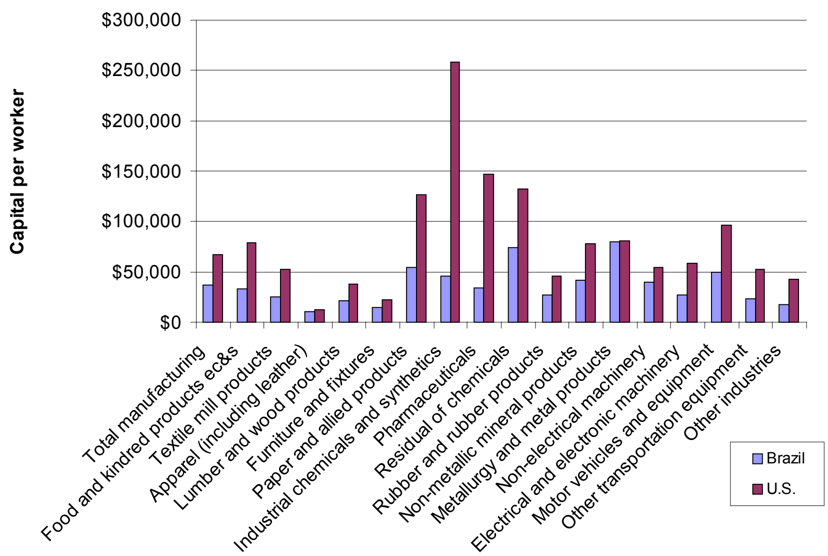

Figure 6: Capital per worker by industry

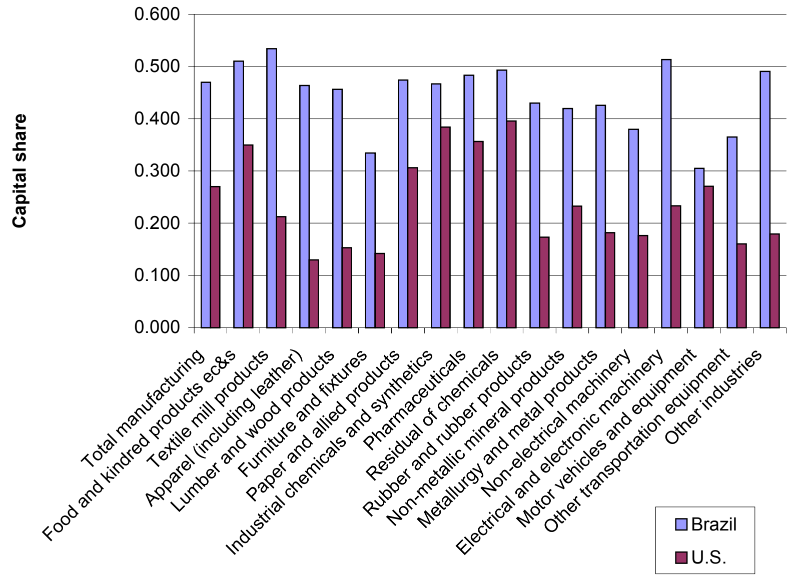

Figure 7: Capital share by industry

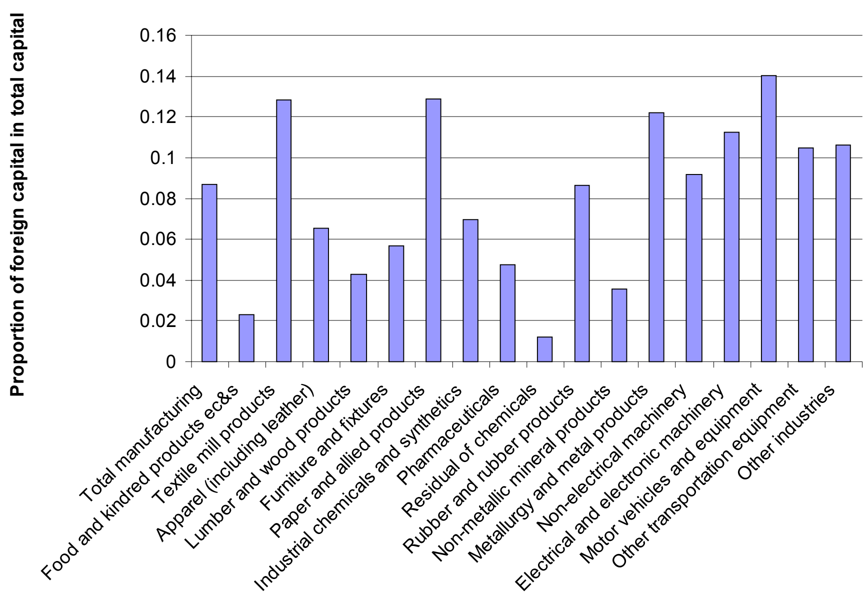

Figure 8: Proportion of foreign machinery in total capital in Brazil

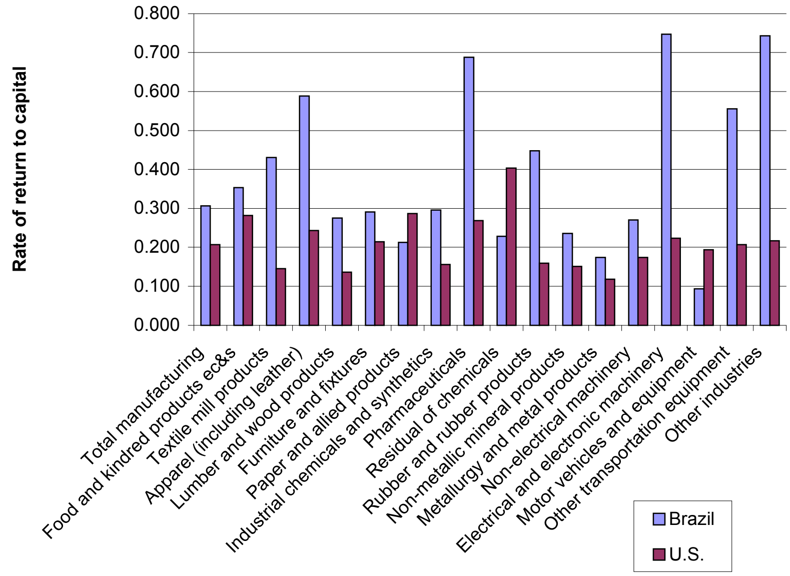

Figure 9: Average rate of return to capital by industry

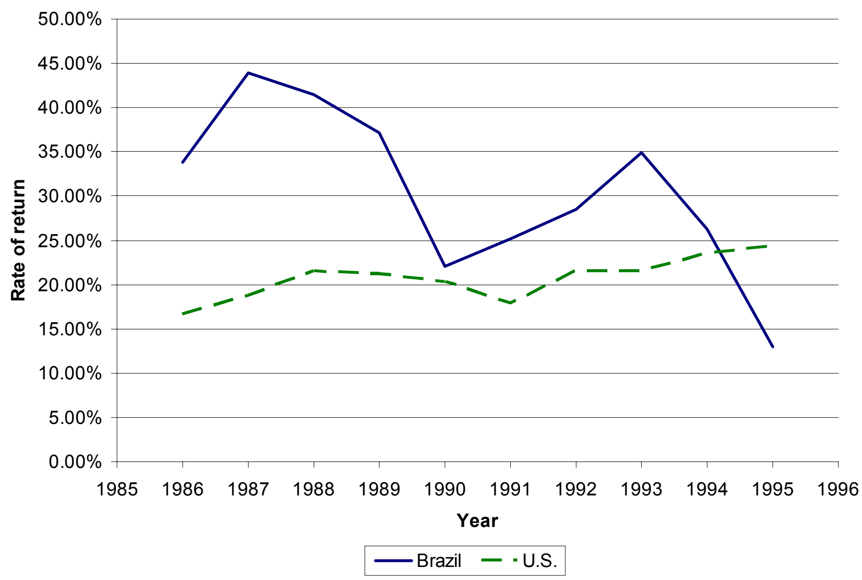

Figure 10: Average rates of return to physical capital in U.S. and Brazilian manufacturing, 1986-95

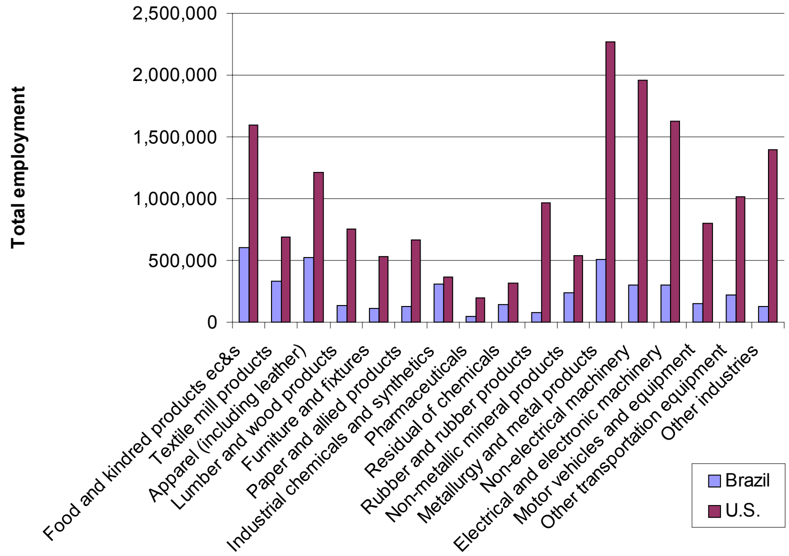

Figure 11: Employment by industry

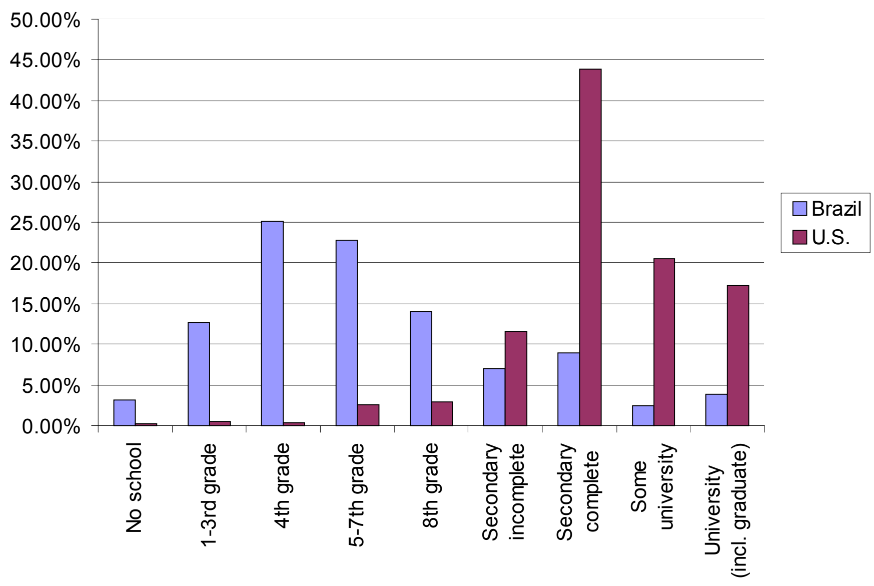

Figure 12: Educational attainment by workers employed in U.S. and Brazilian manufacturing industries

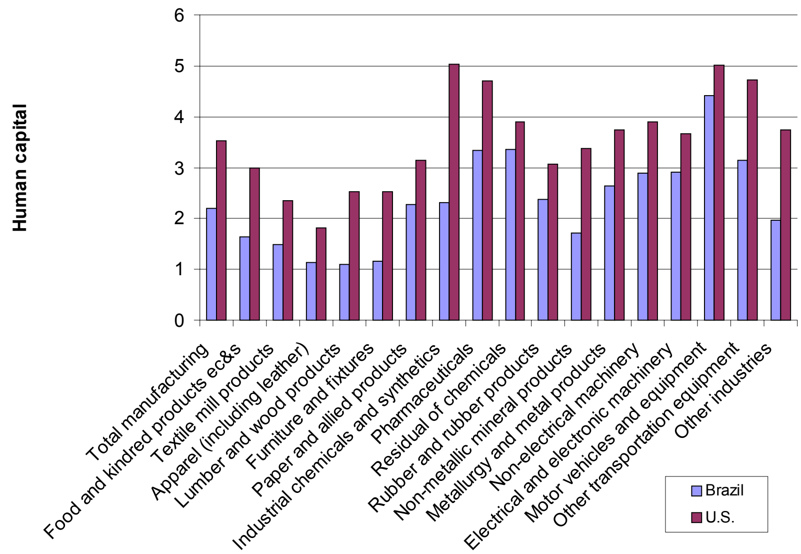

Figure 13: Human capital by industry

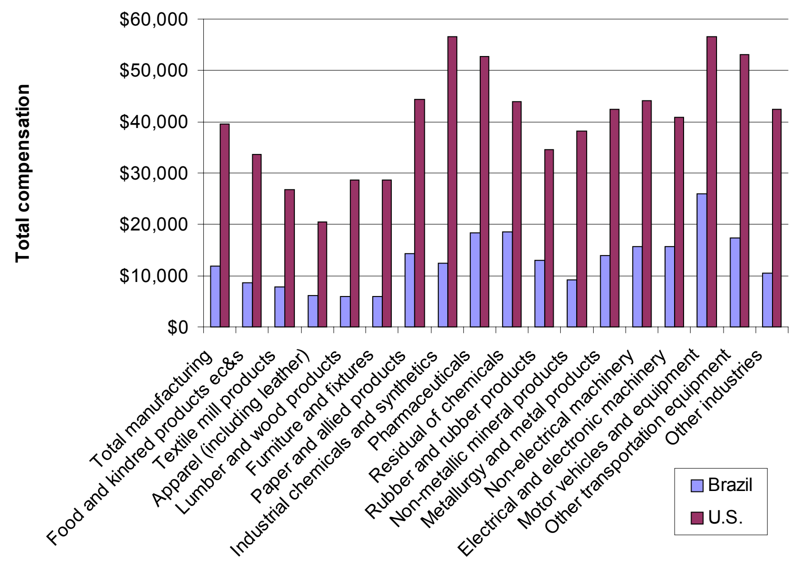

Figure 14: Total compensation by industry

References

Banco Central Do Brasil (1994). Taxas de câmbio, http://www.bcb.gov.br.

Dumenil, G. and Levy, D. (1990). Post depression trends in the economic rate of return for U.S. manufacturing, *The Review of Economics and Statistics* **72**(3): 406–413.

Fraumeni, B. M. (1997). The measurement of depreciation in the U.S. National Income and Product accounts, *Survey of Current Business* pp. 7–23.

Hall, R. E. and Jones, C. I. (1999). Why do some countries produce so much more output per worker than others?, *The Quarterly Journal of Economics* .

Hulten, C. R. and Wykoff, F. C. (1981). The estimation of economic depreciation using vintage asset prices: An application of the Box-Cox power transformation, *Journal of Econometrics* **15**(3): 367–96.

Hulten, C. R. and Wykoff, F. C. (1996). Issues in the measurement of economic depreciation: Introductory remarks, *Economic-Inquiry; 34(1), January 1996, pages 10-23.* .

Instituto Brasileiro de Geografia e Estatistica (IBGE) (1975, 1980, 1985). *Censo Industrial*.

Instituto Brasileiro de Geografia e Estatistica (IBGE) (1986-95). *Pesquisa Industrial Anual (PIA)*.

Jorgenson, D. W. (1996). Empirical studies of depreciation, *Economic-Inquiry; 34(1), January, pages 24-42.* .

Ministerio Do Trabalho e Emprego (1986-95). *Relacao Anual de Informacoes Sociais (RAIS)*.

Psacharopoulos, G. (1994). Returns to investment in education: A global update, *World Development* **22**(9): 1325–43.

U.S. Bureau of Economic Analysis (1995). Fixed reproducible tangible wealth in the United States, 1925-94, http://www.bea.gov.

U.S. Bureau of Economic Analysis (1997). Fixed reproducible tangible wealth in the United States: Revised estimates for 1993-95 and summary estimates for 1925-96, *Survey of Current Business* .

U.S. Bureau of Labor Statistics and U.S. Census Bureau (1986-95). *Current Population Survey*.

U.S. Census Bureau (1986-95a). *Annual Survey of Manufactures*.

U.S. Census Bureau (1986-95b). *Quarterly Financial Survey*.

U.S. Census Bureau (1987, 1992a). *Census of Manufactures*.

U.S. Census Bureau (1987, 1992b). *Census of Wholesale Trade.*

U.S. Census Bureau (1992c). *Enterprise Statistics Survey.*