Financialisation as structural change: measuring the financial content of *things*

Appendices

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A Appendix: Correspondence between OECD and BEA tables

The following correspondence is established between OECD and BEA IO tables in order to increase the degree of comparability between Brazil and United States results, see Table 1. The only sector that does not have a direct correspondent and also the reason why we deal with a 15-sector level of aggregation for the US and 14-sector for Brazil is Wholesale and Retail trade. They together form one unique industry in the OECD database while in the BEA database they are independent industries.

The OECD IO tables divide FIRE industries between financial intermediation, real estate activities and renting of machinery and equipment. Following a suggestion by one of the reviewers, we show in Table 2 that the shares of each one of these three components on GDP are highly correlated. This is true both in the US and Brazil, though correlations are stronger in the former. Hence, discussing results for financial institutions in terms of FIRE makes sense.

B Appendix: Data distortions and an alternative measure of financial content

In the United States and Brazil, the official Systems of National Accounts (SNA) treats financial intermediation, insurance, pension funds, and other activities such as administration of financial markets as financial activities. Assa (2016) provides a comprehensive narrative on the treatment of financial services in national accounting and the distortions created by financialisation in the US. He argues that the inclusion of services for which banks charge a fee as value-added has been responsible for inflating Gross Domestic Product (GDP).[1]

[1]Note that the 1993 SNA in the US recommended distributing Financial Intermediation Services Indirectly Measured (FISIM) to users, so that industries using finance will see their value added reduced, already in the official accounts.

OECD	BEA
Agriculture, hunting, forestry and fishing	Agriculture, forestry, fishing, etc
Mining and quarrying	Mining
Food products, beverages and tobacco	Manufacturing
Textiles, textile products, leather and footwear	Manufacturing
Wood and products of wood and cork	Manufacturing
Pulp, paper, paper products, etc	Manufacturing
Coke, refined petroleum products, etc	Manufacturing
Chemicals and chemical products	Manufacturing
Rubber and plastics products	Manufacturing
Other non-metallic mineral products	Manufacturing
Basic metals	Manufacturing
Fabricated metal products	Manufacturing
Machinery and equipment, nec	Manufacturing
Computer, Electronic and optical equipment	Manufacturing
Electrical machinery and apparatus, nec	Manufacturing
Motor vehicles, trailers and semi-trailers	Manufacturing
Other transport equipment	Manufacturing
Manufacturing nec; recycling	Manufacturing
Electricity, gas and water supply	Utilities
Construction	Construction
Wholesale and retail trade; repairs	-
Hotels and restaurants	Arts, accommodation, food etc
Transport and storage	Transportation and warehousing
Post and telecommunications	Information
Financial intermediation	FIRE
Real estate activities	FIRE
Renting of machinery and equipment	FIRE
Computer and related activities	PROF
R&D and other business activities	PROF
Public admin. and defence	GOV
Education	Educational services, health care, etc
Health and social work	Educational services, health care, etc
Other community, social and personal services	Other services, except government

Table 1: Correspondence criteria between OECD and BEA IO tables

The total output of a sector j is given by the sum of its valued-added and inputs used in production. Distortions in national accounts seem to be related to how financial value-added is measured. This brings some interesting implications. Divide the IO table between financial and non-financial sectors. Using Miyazawa (1976, p. 59-65) partition method, the matrix $\mathbf{A}$ can be decomposed as follows:

$$\mathbf{A} = \begin{bmatrix} \mathbf{A}_{RR} & \mathbf{A}_{RF} \\ \mathbf{A}_{FR} & \mathbf{A}_{FF} \end{bmatrix} \tag{B.1}$$

United States			
Sector	Finan. interm. & insur.	Real estate	Renting mach.
Finan. interm. & insur.	1	-	-
Real estate	0.7614	1	-
Renting mach.	0.9147	0.5376	1
Brazil			
Sector	Finan. interm. & insur.	Real estate	Renting mach.
Finan. interm. & insur.	1	-	-
Real estate	0.3421	1	-
Renting mach.	0.4295	0.6459	1

Table 2: Correlation between the individual components of FIRE on GDP

where $\mathbf{A}_{RR}$ is a $(n-1)\times(n-1)$ matrix of direct coefficients showing non-financial inputs used by non-financial industries; $\mathbf{A}_{RF}$ is a $(n-1)\times 1$ vector that captures non-financial inputs used by the financial sector; $\mathbf{A}_{FR}$ corresponds to a $1\times(n-1)$ vector showing direct financial content in the remaining industries, and $\mathbf{A}_{FF}$ shows financial requirements of the financial sector. It can be shown that the matrix of direct and indirect contents becomes:

$$\mathbf{L} = \begin{bmatrix} \mathbf{L}_{RR} & \mathbf{L}_{RF} \\ \mathbf{L}_{FR} & \mathbf{L}_{FF} \end{bmatrix} \tag{B.2}$$

with

$$\begin{aligned} \mathbf{L}_h &= \mathbf{L}_h\left(\left[\mathbf{I}-\mathbf{A}_{RR}\right]^{-1}, \mathbf{A}_{RF}, \mathbf{A}_{FR}, \left[\mathbf{I}-\mathbf{A}_{FF}\right]^{-1}\right) \\ \frac{\partial \mathbf{L}_h}{\partial(\mathbf{I}-\mathbf{A}_{RR})^{-1}} &> 0; \quad \frac{\partial \mathbf{L}_h}{\partial \mathbf{A}_{RF}} > 0; \quad \frac{\partial \mathbf{L}_h}{\partial \mathbf{A}_{FR}} > 0; \quad \frac{\partial \mathbf{L}_h}{\partial(\mathbf{I}-\mathbf{A}_{FF})^{-1}} > 0 \\ h &= \{RR, RF, FR, FF\} \end{aligned}$$

The last two sub-matrices, $\mathbf{L}_{FR}$ and $\mathbf{L}_{FF}$, correspond to total (direct and indirect) financial requirements to produce one unit of output in the economy. Even though the disaggregation itself is quite tedious from the algebraic point of view, it comes with an important economic intuition. First, we have that total financial content is a positive function of total requirements of the financial sector itself, $(\mathbf{I}-\mathbf{A}_{FF})^{-1}$. Second, the interaction between finance and the remaining industries matters (see $\mathbf{A}_{FR}$ and $\mathbf{A}_{RF}$). Third, the interactions among industries net of finance, $(\mathbf{I}-\mathbf{A}_{RR})^{-1}$, also maintain a positive relationship with total financial content. Finally, the correspondence between each of those components has to be taken into account. This means that total financial content might increase even if direct content remains constant (or decreasing!) as long as there is an increase in the interaction between the other sectors.

From Eq. (B.1), and making use of Eq. (**??**), technical coefficients are such that:

$$\mathbf{A}_{RR} = \mathbf{Z}_{RR}\hat{\mathbf{x}}_R^{-1} \tag{B.3}$$
$$\mathbf{A}_{RF} = \mathbf{Z}_{RF}\mathbf{x}_F^{-1} \tag{B.4}$$
$$\mathbf{A}_{FR} = \mathbf{Z}_{FR}\hat{\mathbf{x}}_R^{-1} \tag{B.5}$$
$$\mathbf{A}_{FF} = \mathbf{Z}_{FF}\mathbf{x}_F^{-1} \tag{B.6}$$

where $\mathbf{Z}_{RR}$ is a $(n-1)\times(n-1)$ matrix that captures direct magnitudes of inter-industry flows outside the financial sector; $\mathbf{Z}_{RF}$ corresponds to a $(n-1)\times 1$ vector for non-financial inputs used by the financial sector; $\mathbf{Z}_{FR}$ is a $1\times(n-1)$ vector that stands for inter-industry flows going from the financial sector to the remaining sectors of the economy; $\mathbf{Z}_{FF}$ shows financial inputs used by the financial sector itself; $\mathbf{x}_R$ is a $1\times(n-1)$ vector of non-financial total output such that $\hat{\mathbf{x}}_R$ stands as the respective $(n-1)\times(n-1)$ diagonal matrix; and finally, $\mathbf{x}_F$ corresponds to financial total output. Furthermore:

$$\mathbf{x}_R = \mathbf{i}^T\mathbf{Z}_{RR} + \mathbf{Z}_{FR} + \mathbf{V}_R \tag{B.7}$$
$$\mathbf{x}_F = \mathbf{Z}_{RF}^T\mathbf{i} + \mathbf{Z}_{FF} + \mathbf{V}_F \tag{B.8}$$

such that $\mathbf{V}_R$ is a $1\times(n-1)$ vector that captures value-added of non-financial activities and $\mathbf{V}_F$ corresponds to financial value added. Finally, $\mathbf{i}$ corresponds to a $(n-1)\times 1$ vector of 1's.

Suppose the previous critique is correct and $\mathbf{V}_F$ has been overvalued in the SNA. This means that true $\mathbf{V}_F$ and $\mathbf{x}_F$ are lower. Hence, technical coefficients $\mathbf{A}_{RF}$ and $\mathbf{A}_{FF}$ are potentially biased downwards. This is clear if we substitute Eqs. (B.8) in (B.4) and (B.6), and compute the partial derivative on $\mathbf{V}_F$:

$$\frac{\partial\mathbf{A}_{RF}}{\partial\mathbf{V}_F} = -\mathbf{Z}_{RF}[(\mathbf{Z}_{RF}^T\mathbf{i} + \mathbf{Z}_{FF} + \mathbf{V}_F)^{-1}]^2 < 0 \tag{B.9}$$
$$\frac{\partial\mathbf{A}_{FF}}{\partial\mathbf{V}_F} = -\mathbf{Z}_F[(\mathbf{Z}_{RF}^T\mathbf{i} + \mathbf{Z}_{FF} + \mathbf{V}_F)^{-1}]^2 < 0 \tag{B.10}$$

If distortions are increasing in time, financial value-added is expected to exhibit a positive trend bias which in turn implies that direct and indirect financial content would have a negative trend bias. Our strategy consists in redistributing financial value-added so that it enters the IO table exclusively as inputs. In this way, we are artificially setting financial value-added to zero while we are able to maintain the consistence of IO tables. Whenever we find an increase in financial content, we can say more confidently that something significant is going on, deep in the structure of the economy, which requires careful analysis. The three crucial variables to change are $\mathbf{Z}_{FR}$, $\mathbf{Z}_{FF}$, and $\mathbf{V}_F$, that are now given by:

$$\tilde{\mathbf{Z}}_{FR} = \mathbf{Z}_{FR} + \mathbf{Z}_{FR}\hat{\mathbf{s}}$$
$$\tilde{\mathbf{Z}}_{FF} = \mathbf{Z}_{FF} + \mathbf{Z}_{FF}s_{ii}$$
$$\tilde{\mathbf{V}}_F = 0$$

where $\hat{\mathbf{s}} = \{s_{ij}\}$ is a $(n-1)\times(n-1)$ diagonal matrix with $s_{ii} = \mathbf{V}_F/\sum_{j=1}^{n} z_{Fj}$, i.e. the ratio between FIRE's value-added and the sum of all financial inputs before redistribution. We expect this second modified set-up to deliver greater financial content coefficients. It corresponds to an extreme scenario that has a complementary role in our analysis showing if, in the limit, distortions in $\mathbf{V}_F$ have more influence in levels or trends.