

- (1) The distribution of PageRank centrality—positional power—is asymmetric between sectors and that implies an asymmetric distribution of sectoral wages
- (2) Sectoral centrality is relevant to explain distributive conflict dynamics.

# Workers' positional power: an input-output relations study.

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## Introduction

This paper analyzes the structure of inter-sectoral relations of Argentina’s economy, via network analysis tools. The research question focuses on the notion of positionality and how it can explain the power relations between capital and labor. Economic sectors hold a specific position in the production network, which give rise to a particular structure whose topological characteristics express the positional dimension of union bargaining power. The complex network theory concept that captures different aspects of a node’s position is centrality. Then we can operationalize the concept of structural power using these measures.

## Objectives

1. To operationalize the concept of workers’ positional/structural power through the analysis of the properties of the production network in Argentina.
2. To explore its link with the sectoral wages distribution.

## Data and methodology

Workers position will be determined by the network position held by the economic sector to which the firm where they work belongs. This information is provided by the Input-Output Table (IOT), obtained from the OECD database, which contains data for 45 sectors, according to the ISIC Rev.4. The data is annual, for the period 1998-2018 and for the Argentine case.

We propose the Weighted PageRank Index (WPR) (Brin and Page 1998; Zhang, Wang, and Yan 2022) to approximate the structural power of workers. Formally:

$$\mathbf{wrank}_i = \alpha \sum_{j \in V} (\theta \frac{w_{ij}}{s_j^{out}} + (1 - \theta) \frac{a_{ij}}{d_j^{out}}) \mathbf{wrank}_j + \frac{(1 - \alpha) u_i}{\sum_{i \in V} u_i}$$

where  $\theta \in [0, 1]$ ;  $d_j^{out}$ ,  $s_j^{out}$  and  $wrank_j$  are the out-degree, the out-strength and the WPR of node  $j$ , respectively; and  $u_i$  takes the non-uniform relative importance of the nodes into account. We include the share of each sector in formal employment in Argentina as relevant node-information to calculate its centrality.

WPR is a global centrality measure that takes into account:

1. the neighbors position in the production network,
2. the number and weight of the incoming edges,
3. some node-specific quantifiable information attached to sector  $i$ , and
4. a tuning parameter ( $\theta$ ) adjusting the relative importance of weights in the definition.

Figures 1 and 2 show the heat maps constructed from input-output tables. The rows in 1 identify major suppliers, while the columns in 2 identify major buyers.

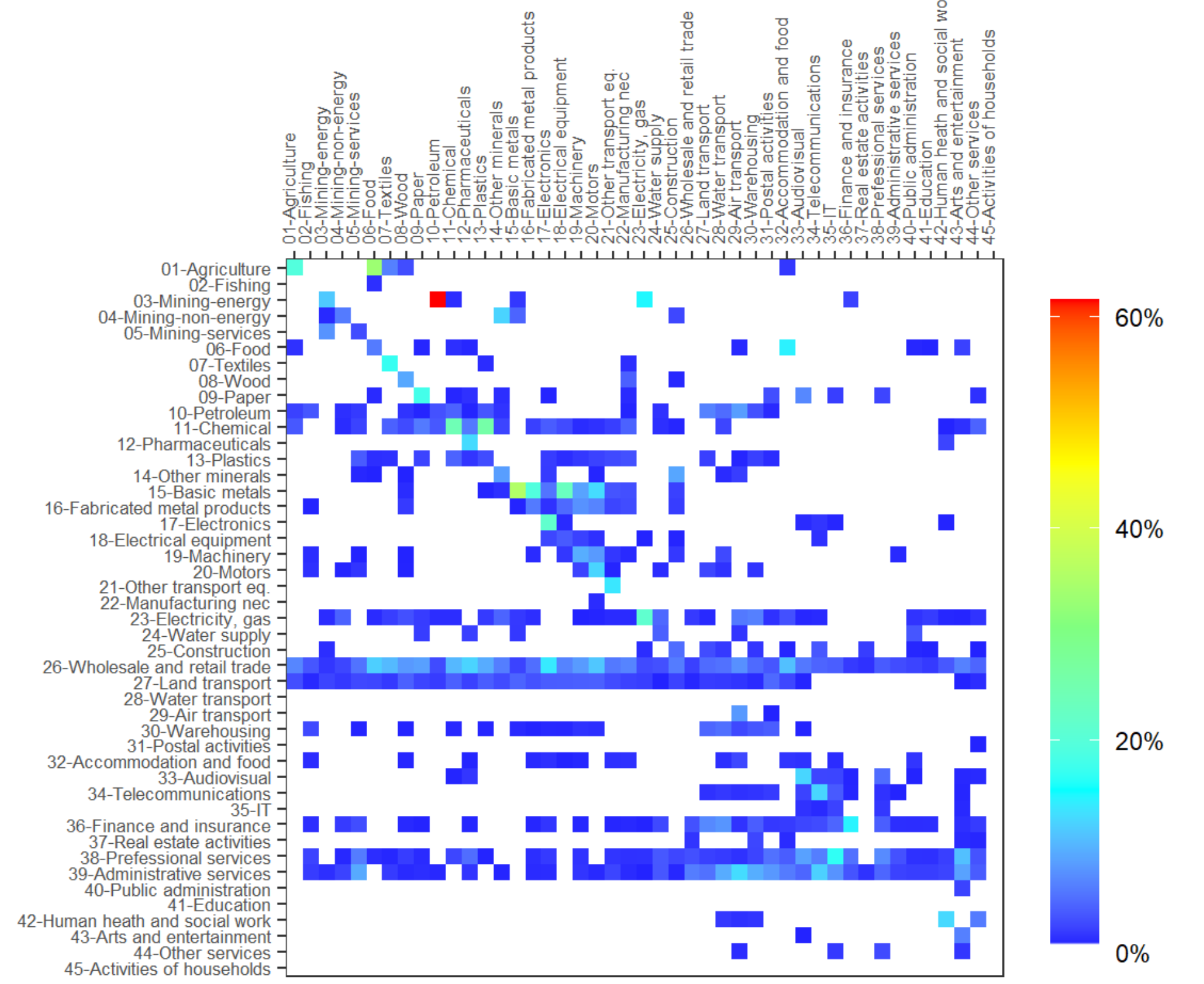


Figure 1: Material Cost Shares (Important Suppliers), Argentina 2018

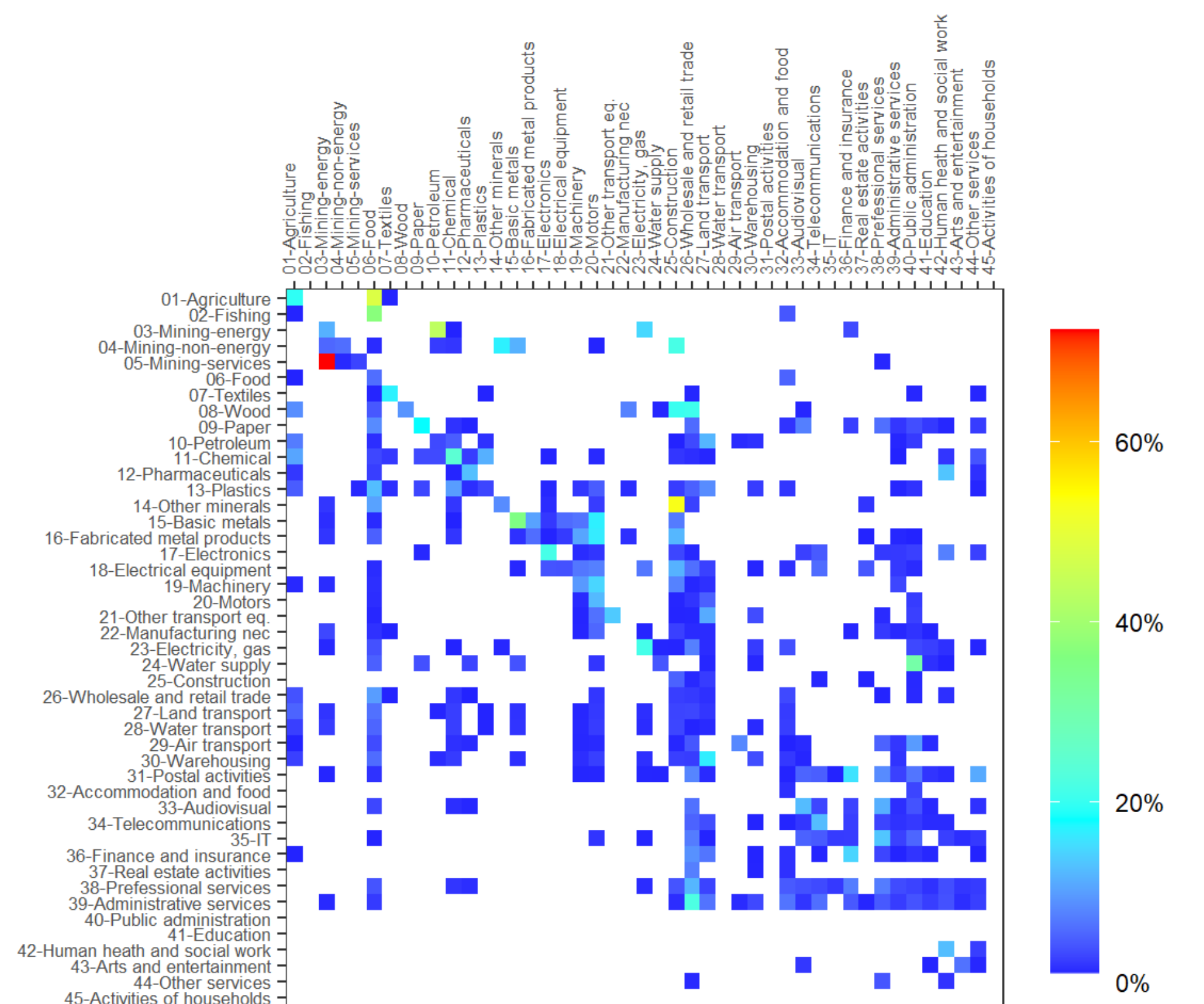


Figure 2: Output Cost Shares (Important Buyers)-2018, Argentina 2018

## Results

The ranking is led by the food industry, retail and wholesale trade, and the agricultural sector (Figure 3). Although it is an heterogeneous group, the three sectors are associated with global valorization processes, which is reflected in the fact that they are export-oriented industries.

We explore the link between the WPR and sectoral wages. Wage results of union intervention vary according to the more or less strategic position that each sector occupies in the economic structure and the consequent disruptive potential of union action.

Following Clauset, Shalizi, and Newman (2009) method, we tested whether sectoral wage and WPR follow a power law, another distribution characterized by heavy-tails or neither. The results indicate that there is

not enough evidence to reject the null hypothesis that the sample comes from a power-law distribution.

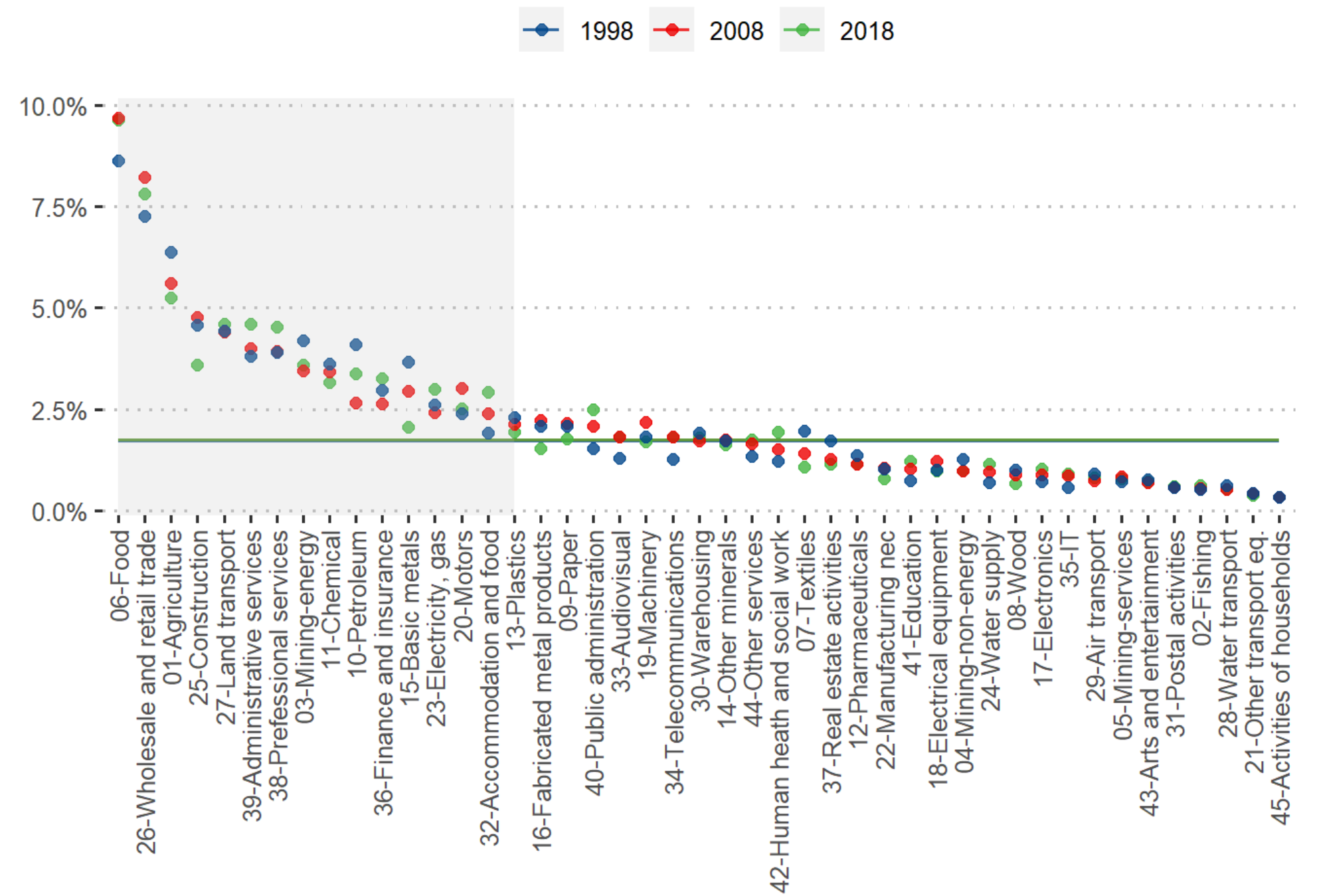


Figure 3: Workers structural power, operationalized through WPR. Argentina, 1998, 2008 y 2018

Greater structural power does not necessarily mean higher wages, because: (1) structural power captures only a piece of the overall bargaining power; and (2) the relationship between bargaining and wages is stochastic: high bargaining power means a high probability of success in the wage dispute and not directly higher wage.

Therefore, we regressed the logarithms of the two variables, based on Barrera Insua and Noguera (2021) analytical framework. So, we estimate the exponent of the relationship  $\mathbf{w} \sim WPR^\alpha$  by regressing  $\log(\mathbf{w}) = c + \alpha \log(WPR)$ , wehere  $\mathbf{w}$  is the sectoral wage. We found a statistically significant relationship with an exponent being on average around 1.9.

Dependent variable: mean sectoral wage (log)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log(PageRank)	1.873	1.806	1.876	1.821	1.802	1.871	1.766
p-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Controls	No	A1	A2	B	C	D	B,C,D
Fixed effects	Sí	Sí	Sí	Sí	Sí	Sí	Sí
N	945	945	945	945	945	945	945
R2	0.5882	0.5688	0.5409	0.5544	0.6201	0.5481	0.7164
adj. R2	0.5878	0.5979	0.5349	0.553	0.6189	0.5471	0.7146

Notes: p-values in brackets. Controls A=1-Total strength, 2-in/out strength. B=Sectoral profit rate, companies payment capacity. C= Unionization rate, conflict. D=Minimum wage.

## Concluding remarks

**Main results** can be summarized in: (1) the distribution of positional power is asymmetric between sectors and that implies an asymmetric distribution of sectoral wages; (2) positional power is relevant to explain distributive conflict dynamics.

The **main contribution** is twofold: (1) we propose an alternative way to measure the workers bargaining power, by operationalizing it through complex networks approach; (2) we provide empirical evidence (at the national level) about the relationship between the workers structural power and the sectoral wage distribution.

## References

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