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## Article

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Research in Globalization

## Provided in Cooperation with:

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*Suggested Citation:* do Sacomano Neto, Mário; Carmo, Marcelo; Ribeiro, Evandro Marcos Saidel; da Cruz, Wilton Vicente Gonçalves (2020) : Corporate ownership network in the automobile industry: Owners, shareholders and passive investment funds, Research in Globalization, ISSN 2590-051X, Elsevier, Amsterdam, Vol. 2, pp. 1-12,  
<https://doi.org/10.1016/j.resglo.2020.100016>

This Version is available at:

<https://hdl.handle.net/10419/330952>

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# Corporate ownership network in the automobile industry: Owners, shareholders and passive investment funds<sup>☆</sup>

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## ARTICLE INFO

### Article history:

Received 16 December 2019

Received in revised form 26 June 2020

Accepted 26 June 2020

Available online 2 July 2020

### Keywords:

Corporate control

Governance

Financialization

Network analysis

Automotive industry

## ABSTRACT

Who controls the corporate ownership network in the automotive industry: owners, shareholders or financial institutions? Recent studies have suggested that corporate control of automotive firms is increasingly associated with banks, investment funds and other players in the financial system. In particular, investment funds have reinforced significant changes in the ownership structure of the economy in the last few years. These changes imply a significant increase in financialization and the role of financial institutions in the dynamics and behavior of firms. Thus, this paper aims to: 1) analyze the corporate ownership networks of the largest automobiles companies; 2) assess the structure and relations in the corporate ownership network; 3) identify groups in the corporate ownership network; and 4) analyze the extent to which organizations depend on financial institutions. The corporate ownership network includes the 30 largest automakers worldwide connected with the largest holders supported by social network analysis (representing 348 nodes and 654 connections, among companies, banks, investment funds, and state). The findings of this study show how the corporate ownership network in the automotive industry is strongly intermediated by passive investment funds, such as BlackRock, Vanguard Group, Dimensional and State Street, which occupy a prominent structural position. These investment funds exhibit the highest scores of weight centrality, betweenness, and eigencentrality in the network. These funds have a prominent structural position and intermediate shares like blockholders on a different stock exchange. However, we observed a notable difference from Asian companies in American corporations. Asian companies match increases in productive and financial operations, accumulating and originating funds with a lower degree of financial exposure, while American companies exhibit greater dependence on finance activities. Beyond the corporate ownership network, we explore evidence from field theory, resource dependence theory, and the sociology of arbitrage to address the automotive companies' dependence on investment funds.

## 1. Introduction

Financialization is a multidimensional process that has an impact on society, economy, and business (Mader et al., 2020; Van der Zwan, 2014). Financialization involves both a new regime of capitalist accumulation and the rise and predominance of principles to maximize “shareholder value”. Lately, there has been a significant growth of influence from financial institutions on the economy as a whole (Davis & Greve, 1997; Davis &

Kim, 2015; Epstein, 2002; Fligstein, 1990; Palley, 2008). Basically, financialization includes the development of financial instruments, such as securitization, derivative contracts, exchange markets, financial assets and dividend payments to shareholders (Thomson & Dutta, 2015). Many studies have emphasized how shareholder value logic has replaced or influenced earlier managerialist governance models (Benton, 2016; Davis, 2008; Fligstein, 1990; Fligstein, 2001; Fligstein & Shin, 2007).

According to Fligstein (1990), financial control began to be incorporated into business strategies in the 1950s due to United States antitrust policies. This period was distinguished by low economic activity and unstable exchange rates, with regimes pressuring elites to increase capital mobility (Soener, 2015). This fact led to institutional changes to increase financial circulation. Since this period, corporate control of industrial firms has increasingly been associated with financial institutions and investors (Borghi et al., 2013; Davis, 2009; Erturk, 2015; Fligstein, 2001; Froud et al., 2006). These players have direct and indirect control on a company's ownership (Vitali et al., 2011). These players affect the governance

<sup>☆</sup> We appreciate the support from Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). We are enormously grateful to all colleagues at the Center for Culture, Organizations, and Politics and Humanities and Social Science Association (University of California, Berkeley) where this paper was previously discussed

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practices (Benton, 2016; Davis & Greve, 1997), the domain of resources (Pfeffer & Salancik, 2003), and the corporative strategies, (Fligstein, 2001; Fligstein & Brantley, 1992). As arbitrage, investment funds can influence the metrics and languages (Muniesa et al., 2007).

This phenomenon results in a series of questions and consequences for the economy, society and organizations. Financialization has increased inequality, reduced investments in real production and built up pressure on individuals and households (Thomson & Dutta, 2015). The growth rate of financial assets over world GDP is enormous (Thomson & Dutta, 2015). In 1980, they accounted for 120% of world GDP (or US\$ 12 trillion). In 1990, they were responsible for 263% of world GDP (or US\$ 56 trillion). In 2000, they represented 310% of global GDP (amounting to US\$ 119 trillion) and reached a ratio of 316% of world GDP in 2010, amounting to US\$ 219 trillion, for a world GDP of US\$ 80 trillion in 2013. That is, financial assets are three times larger than all of the production of goods and services worldwide. To have an idea of these numbers, the daily average value of financial market transactions was the US\$ 5.3 trillion in April 2013, while the average of goods and services in 2012 was US\$ 58.9 billion, ninety times less. Thus, “the value traded on financial markets in less than a week is more than what is sold in goods and services in an entire year” (Thomson and Dutta, 2015, p.11).

This financial dynamic entails significant changes in companies' strategies. For large corporations, financialization has an impact on: 1) the reallocation of productive and financial activities; 2) the concentration of capital through mergers and acquisitions; and 3) the creation of international production networks (Borghi et al., 2013). Consequently, financialization is a phenomenon that changes a number of production practices, priorities, and expectations because profit through capital investment is greater than through productive activities (Martin et al., 2008). Furthermore, these financial organizations (banks, pension funds, and institutional investors) have the influence to produce and/or recompose local orders and influence the strategic behavior of companies (Fligstein, 2001; Fligstein & Brantley, 1992).

Further, several studies have addressed the influence of financialization on the automobile industry (Borghi et al., 2013; Castellanos, 2013; Castellanos, 2014; Kädtler & Sperling, 2002). However, there has been a lack of studies examining corporate ownership and networks. Some studies, as stressed by Borghi et al. (2013) have shown some heterogeneous processes, with a notable difference between Asian and American automotive companies. The Japanese and South Korean companies match an increase in productive and financial operations, accumulating and originating funds with a lower degree of financial exposure, while American companies exhibit excessive dependence on finance activities (Borghi et al., 2013). The American companies are also characterized by high indebtedness with a high leverage ratio, denoting more fragile financial structures (Borghi et al., 2013).

Some other studies have emphasized how financialization exerts an impact on corporate structures (Davis, 2008; Vitali et al., 2011; Davis & Greve, 1997; Mintz & Schwartz, 1985). This literature is interested in understanding the potential of financial institutions and investors to concentrate power inside corporations. Although some studies have explored forms of control in the automobile industry, there has been a lack of studies examining corporate ownership and the network structure (Davis, 2008), particularly to the automotive industry. Thus, understanding the structure and relations could reveal prominent positions of actors or groups (Wasserman & Faust, 1994) as holders. The corporate ownership network reflects the architecture of international ownership in some industries. Therefore, to understand the corporate ownership, network this study is underpinned by social network analysis (Borgatti et al., 2013; Scott, 2000; Wasserman & Faust, 1994). Based on these matrices and sociograms, networks can be designed using Gephi software (Bastian et al., 2009) and different network measures to reveal central, intermediary and prominent structural positions. These network properties, such as centrality and intermediation, are appropriate for addressing influence and power in the network and social structures (Borgatti et al., 2013; Newman, 2015; Wasserman & Faust, 1994).

Thus, this study reflects on the following questions. Who controls the corporate ownership network in the automotive industry: owners, shareholders or financial institutions? Who are the central intermediaries and groups? And how can shareholders influence automobile companies' strategies and structures? Thus, the paper aims to: 1) analyze the corporate ownership networks of the largest automobiles companies; 2) assess the structure and relations in the corporate ownership network; 3) identify groups in the corporate ownership network; and 4) analyze the extent to which organizations depend on financial institutions. Considering these matters, the paper focuses on some particular network measures, such as weight centrality, betweenness, eigencentrality, and modularity (Borgatti et al., 2013; Newman, 2015; Wasserman & Faust, 1994). The paper also explores how financial institutions, especially investment funds, can affect investments, choices, courses of action and strategies implemented by automotive companies (Fligstein, 2001; Fligstein & Brantley, 1992). American companies are more dependent upon finance markets. Beyond the corporate ownership network, we explore evidence from field theories (Fligstein & Mcadam, 2012) resource dependence theory (Pfeffer & Salancik, 2003), and the sociology of arbitrage (Muniesa et al., 2007) to address the dependence of this industry on financial institutions. Our findings show how the corporate ownership network in the automotive industry is strongly intermediated by passive investment funds, such as BlackRock, Vanguard Group, Dimensional and State Street. These investment funds exhibit the highest scores of weight centrality, betweenness, and eigencentrality in the network and have prominent structural positions and intermediate shares like blockholders on a different stock exchange. However, we observed a notable difference between Asian companies and the American corporations. The Asian companies match an increase in productive and financial operations, accumulating and originating funds with a lower degree of financial exposure, while the American companies exhibit excessive dependence upon finance activities.

The next section explores the theoretical assumptions concerning financialization, corporate control, and intermediaries. The subsequent section describes the methods, collection and data analysis. Finally, the last section presents the main results of the shareholder structures, corporate networks and companies' dependence on passive investment funds.

## 2. Financialization, corporate control and intermediaries

The question of power within organizations is a major topic in the financialization process because it influences the distribution of profits and control over resources. According to Bebchuk and Fried (2004), this power concerns decision made by and in favor of CEOs and large shareholders. CEOs' high earnings are unequivocal proof that high compensation paid to managers is tied to power within the organization.

In their study of pay and performance, Bebchuk and Fried (2004, pp. 21-30) discussed how stock dispersion impacts the internal power of large shareholders and senior executives. Their results showed that few major shareholders hold significant portions of shares under their control and have considerable decision-making power, while the majority of shareholders, dispersed into thousands of small investors, has little or no influence on the decision-making processes of companies. To address this subject, it is important to understand the conceptions of control and the influence of large financial groups and intermediaries.

### 2.1. Conceptions of control

Historically, Fligstein (1990) identified four stages of corporate control: 1) direct competitive control; 2) manufacturing control; 3) control via marketing and sales; and 4) financial control. Direct competitive control took place in the late nineteenth century, as there were no regulations at this time and no fields had formed. Direct competitive control directly affected competitors in the form of predatory practices, cartelization, and monopolization. The second concept of manufacturing control implied vertical and horizontal integration for the stability of production and prices. The focus on this concept of control involved manufacturing, costs and creating

oligopolies. The third concept of marketing and sales control became vigorous in large corporations after the Second World War. From this perspective, the idea was to find, create and maintain market dominance through increased sales of product differentiation or new products. The fourth and current concept of control is financial (Davis, 2009; Davis & Kim, 2015; Erturk, 2015; Fligstein, 1990; Froud et al., 2006; Lazonick, & O'Sullivan, M., 2000).

Fligstein (2001) argued that the recent process of financialization consists of a change in the corporate control conception, by which shareholders have pushed the agenda of maximizing the return from the growth of corporate stock value. This process marks the transition from the financial conception of control to the shareholder value conception, in which a company is not only used as an asset to be merged and acquired but is also used to value stock prices through dividend payments, repurchasing shares and stock exchange valuation (Fligstein, 2001, 149). This movement begins with managers failing to value firms only through mergers and acquisitions, which does not immediately allow for desirable returns and which maintains diversification and the current model of large vertical integration corporations. With the advent of shareholder value maximization, there was a tendency to disinvest in sectors that were considered unprofitable, to focus on the core business, and to raise the price of corporate stock in financial markets (Fligstein, 2001, 148).

Shareholder value is also a financial conception, but it fails to raise share prices (Fligstein, 2001). Davis and Thompson (1994) considered the development of the shareholder value conception as a type of social movement, consistent with the political-cultural approach. Otherwise, sociological approaches have considered the increasing dominance of banks and financial institutions over companies. Fligstein (2001) pointed out that the role of the state is also instrumental in creating this new financial reorganization, as was the case in the US with the antitrust relaxation policies and tax-cutting laws under Ronald Reagan (1981–1988), which produced conditions that led to the financial reorganization of firms (Fligstein, 2001, p.150).

The concept of financial control entails using financial tools that can measure performance according to profitability rates. These views of control reflect the actors' "world views" and, consequently, the solutions and justifications for problem solving (Fligstein, 1990). As pointed out by various researchers, firms are increasingly associated with the financial system (Davis, 2009; Davis & Kim, 2015; Erturk, 2015; Fligstein & Brantley, 1992; Froud et al., 2006; Lazonick, & O'Sullivan, M., 2000). Therefore, banks have become central players in the economic system. Thus, the first proposition is put forward:

**Proposition 1.** Corporate control of automotive companies is strongly associated with passive investment funds.

## 2.2. Large financial groups and intermediaries

The idea of bank control over large corporations is relatively old. The first movement occurred between 1895 and 1905 in the merger of large American corporations (Fligstein & Brantley, 1992). Recently, the literature on this topic has explored the influence of bank control on organizational behavior and how banks influence strategies and results. Therefore, questions arise regarding whether, in fact, banks affect strategic decisions and, if so, in what way. There are at least three levels of influence of banks: 1) direct control through actions; 2) bank hegemony due to their positions in the financial system; and 3) potential influence due to financial dependence (Fligstein & Brantley, 1992).

One of the aspects that led to the emergence of the liberalized and deregulated finance regime was the "entry into the picture of relatively new, but particularly powerful, agents of money capital or concentrated money-capital, which were pension funds and investment funds, which gave rise to the notion of 'institutional investors'" (Farnetti, 1999, p.183). These funds have become the most decisive private institutions in the context of globalized finance, according to Farnetti (1999), Davis (2008) and Fichtner et al. (2017). Today, other categories of institutional investors

have been added to pension funds, such as insurance companies and collective investment funds, which have greatly increased capital in search of liquid investments (Farnetti, 1999). Complementarily, Carmo, Sacomano Neto, and Donadone (2019) demonstrated that the largest shareholders of automobile companies are large financial groups.

These groups also invest heavily in manufacturing companies, withdrawing billions of dollars every year in dividends. The Vanguard Group, State Street Corp., and BlackRock, among others, are the largest shareholders of Ford and GM and also have stakes in Toyota, Volkswagen, and Hyundai. Fig. 1 shows the growth of passive index funds in equities investments. As Fichtner et al. (2017) emphasized, index mutual funds remained the larger category until 2007. After this period, exchange traded funds (ETFs) took the lead. In total, these passive funds had at least US\$ 4 trillion in assets under management, thus exceeding the assets under management of the entire hedge fund industry (Fichtner et al., 2017). Thus, investors have shifted capital from expensive, actively managed mutual funds to cheap funds, such as exchange traded funds.

The largest of these organizations is BlackRock, Inc., with assets under management of US\$ 5,975,818,000 in 2018 (NASDAQ, 2018). Based in New York City, this group invested in 4837 different stocks in 2017. Its main investments were in the following sectors: technology (21.94%); health (12.92%) and industry (11.02%); it concentrated two-thirds of its investments in these four sectors, as appears to be the diversification pattern of these large groups (Willis Towers Watson, 2019). Fig. 1 shows the increase in assets under management by equity passive index funds.

In second place in the ranking of the largest financial groups is Vanguard Group, Inc., headquartered in Valley Forge, Pennsylvania; this financial group had assets under management of US\$ 4,866,611,000 in 2018 (NASDAQ, 2018). In 2017, it invested in 4025 different stocks and in various different branches of the economy. Technology (21.29%) and financial services (21.23%) were the largest sectors in which this giant targeted its businesses. Health (12.15%), industry (11.63%) and energy (5.62%) were also part of its portfolio. Vanguard Group is the largest shareholder of Apple, Microsoft, Amazon, Alphabet, JPMorgan, and Exxon Mobil, among others (Willis Towers Watson, 2019).

Another giant investor is State Street Corp. Headquartered in Boston, Massachusetts, the group had assets under management of US\$ 2,511,297,000 in 2018, ranking third among the major financial groups (NASDAQ, 2018). State Street Corp invested 3616 shares, divided mainly into technology (20.55%), financial services (20.24%), industries (12.83%) and health (12.82%), altogether reaching two-thirds of all investments in these four major sectors of the economy (Willis Towers Watson, 2019).

Added to these large groups are dozens of others that monopolize most of US private capital and much of world capital, and their influence reaches thousands of manufacturing companies, which under increasing reliance on massive capital to invest have been radically changing their governance, market strategies, and business models.

Thus, the growth of corporations became dependent not only on productive activities but also on financial resources from the institutional investor. Moreover, large automotive companies invested in the financial market to raise money or invest resources and liquid assets (Borghi et al., 2013).

These relationships in groups of financial actors certainly generate gains and relational resources, as pointed out by various studies (Dyer & Singh, 1998; Hervas-Oliver & Albors-Garrigos, 2009; Lavie, 2006). Therefore, a point of reflection is what the structure of the network looks like. Banks certainly occupy positions of centrality and probably intermediation (betweenness) in the network structure (Borgatti & Li, 2009). There is still the possibility of forming groups and networks of heavily connected banks with a high degree of intermediation (Kilduff & Tsai, 2003). Thus, the second proposition is put forward:

**Proposition 2.** Passive investment funds perform a high level of centrality and intermediation (betweenness) in the corporate ownership networks.

These structural prominences tend to stabilize the field in favor of those with greater dominance and influence. According to Fligstein and McAdam



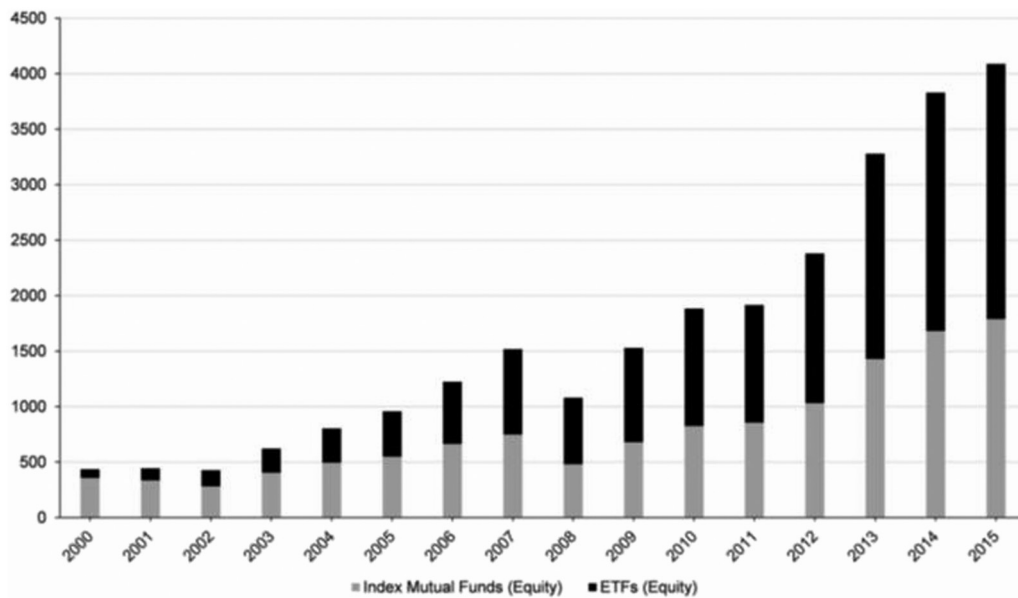


Fig. 1. Assets under management by equity-passive index funds, 2000–2015.

(2012), the fields entail forming coalitions since they understand that there is a role for skilled actors in persuading others to cooperate. Beyond the corporate ownership network and field theory, we explore evidence from resource dependence and the sociology of arbitrage to address the automotive companies' dependence on passive investment funds.

### 3. Methods and data

From the methodological point of view, the research is exploratory, based on documental and content analysis, and it involves qualitative and quantitative data (Collins & Hussey, 2005). Typical techniques for exploratory research are case studies, observation, and historical analysis, which can provide quantitative and qualitative data (Collins & Hussey, 2005).

All of the data from a shareholding structure were collected from Orbis Database, 4Traders, Nasdaq, OICA, Bloomberg and official reports from companies. Our sample comprises the 30 largest automakers (ranked by production in 2016) and their largest holders, mainly companies, banks, passive investment funds, mutual and pension funds and government (Orbis Database). From these 30 automakers, 401 nodes and 700 edges were identified. Due to a lack of information, the PSA, Anhui and Faw information was collected from 4Traders.

All of the data from a shareholding structure were categorized by each automaker (30 companies). For each shareholder, the following were included 1) name; 2) shareholders of the corresponding automaker; 3) type of company to which the shareholder belongs (banks, investment funds, mutual and pension funds and government); 4) the approximate dollar value of these shares; and 5) a normalized value of participation in dollars for subsequent use in the network construction. Descriptive data include information about shareholder structures and the corporate ownership structures.

The network's nodes and edges were developed from the ownership structure and their respective participation in each of the assemblers. The weight of the tie was measured from the approximated participation of each shareholder (LOG of the correspondent dollar value). Microsoft Excel and Gephi were used to organize, construct, manipulate and visualize the network. Gephi software is an open-source network analysis written in Java (Bastian et al., 2009). This software allows users to interact with the representation, as well as manipulate structures, shapes, and colors to reveal hidden patterns. Networks between companies and banks help to visualize the structure and relationships, as well as the positions of the actors in corporate control. Gephi software can measure the structural properties

and relationships in a given network (Wasserman & Faust, 1994), such as centrality, structural equivalence, structural autonomy, density, and cohesion.

In this paper, more attention will be paid to centrality, betweenness and group metrics. In centrality, an actor centralizes the relationship with other actors in the network. These networks properties, such as centrality and intermediation, are appropriate for addressing influence and power in the network and social structures (Borgatti et al., 2013; Newman, 2015; Wasserman & Faust, 1994). Thus, more central actors have access to resources, power, and information (Wasserman & Faust, 1994). For example, the centrality of a bank or investment fund can be related to access to scarce resources and information. Centrality can also help to visualize how groups with denser relations can generate technology transfer, resources, and knowledge between actors. To calculate the group, Gephi software is based in a multiscale modular structure proposed by Lambiotte et al. (2009) and on the community metrics proposed by Blondel et al. (2008).

Network analysis can also analyze the actors, relationships or the network structure as a whole (Wasserman & Faust, 1994). These positions reflect the social capital of actors, defined as the totality of resources (financial capital and also information, etc.) activated through the extension, more or less mobilized, of relationships in the network. This capital involves access to banks and financial resources (or their positions in the network).

This study focuses on weight centrality, betweenness, eigencentrality, and modularity (Borgatti et al., 2013). These network measures help to explain influence, power, and groups. Centrality measures the most important or central vertices in a network (Newman, 2015). Betweenness measures the extent to which a node is located on paths between other nodes (Newman, 2015). Eigencentrality measures each node's scores and compares them with scores from its neighbors (Newman, 2015). To a certain extent, eigencentrality measures how some nodes are connected to other important nodes.

Modularity indicates the best partition of the groups in a particular network (Clauset et al., 2004; Newman, 2006). Modularity helps to identify the emergence of densely connected groups, with sparser connections with other groups. Thus, network properties can identify the central, intermediary, important actors and prominent actors and groups. Prominent structural positions support actors and groups in accessing resources, power, and information (Borgatti et al., 2013; Newman, 2015; Scott, 2000).

The degree of an actor is the number of links that it has to other actors. We denote with  $k_i$  the degree of the  $i^{\text{th}}$  actor in the network (Barabási, 2016). An important property of a network is its average degree  $\langle k \rangle$ , which for a directed network is

$$\langle k \rangle = \frac{1}{N} \sum_{i=1}^N k_i = \frac{L}{N} \quad (1)$$

Here,  $L$  is the total number of links, and  $N$  is the total number of actors (vertices). A network is often represented by its adjacency matrix. The adjacency matrix of a directed network of  $N$  vertices has  $N$  rows and  $N$  columns, its elements being:

$$A_{ij} = 1 \text{ if there is a link pointing from vertex } j \text{ to vertex } i; \quad (2.a)$$

$$A_{ij} = 0 \text{ if vertices } i \text{ and } j \text{ are not connected to each other.} \quad (2.b)$$

In our study, we consider a weighted network, where each link  $(i, j)$  has a unique weight  $w_{ij}$ . The elements of the adjacency matrix carry the weight of the link as  $A_{ij} = w_{ij}$ . The weighted degree of an actor  $i$  is given by

$$k_i^w = \sum_{j=1}^N w_{ij} \quad (3)$$

Betweenness centrality ( $C_{Bi}$ ) quantifies the number of times that vertex  $i$  acts as a bridge along the shortest path between two other vertices, and it can be described by

$$C_{Bi} = \sum_{j \neq i \neq k} \frac{\sigma_{jk}(i)}{\sigma_{jk}} \quad (4)$$

where  $\sigma_{jk}$  is the total number of shortest paths from vertex  $j$  to vertex  $k$ , and  $\sigma_{jk}(i)$  is the number of those paths that pass through vertex  $i$ .

The clustering coefficient captures the degree to which the neighbors of a given vertex link to each other. For vertex  $i$  with degree  $k_i$ , the local clustering coefficient is defined as

$$C_i = \frac{2L_i}{k_i(k_i - 1)} \quad (5)$$

where  $L_i$  represents the number of links between the  $k_i$  neighbors of vertex  $i$ .

Some other metrics are useful for describing the whole network. The Average Weighted Degree is an average of Eq. (3) over all of the vertices in the network. The clustering coefficient for the whole network is the average of Eq. (5) over all of the vertices in the network. The density of the network is the total numbers of links ( $L$ ) over the maximum number of possible links ( $L_{max}$ ), for directed graphs  $L_{max} = N(N - 1)$ ; for directed graphs with self-connections allowed,  $L_{max} = N^2$ .

The study is also underpinned by content analysis (Bardin, 2006; Collins & Hussey, 2005; Gibbs, 2008). A vast body of information requires an in-depth document analysis to confirm names, relations, histories, and contextual and historical aspects. The descriptive data analysis explored in this document reveals important information about shareholder structures and the corporate ownership structure.

**Table 1**  
Ownership Structure (source: Orbis).

Orbis classification	Sample Companies (%)	Automakers
Independent Ownership	40%(12)	Toyota, Daimler, GM, Honda, BMW, Hyundai, Renault, Subaru, Mazda, Suzuki, Isuzu
Has no identified shareholder with over 25% ownership		
No Majority Ownership	23%(7)	Ford, Fiat, Nissan, Mitsubishi, Changan, Geely, Chery
Has no identified shareholder with over 50% ownership, but at least one with over 25%		
Indirect majority Ownership	6%(2)	Baic, BYD
Has an identified shareholder with over 50% total ownership or calculated total ownership		
Directed Majority Ownership	23%(7)	VW, SAIC, PSA, Dongfeng, Great Wall, Faw, Mahindra
Has an identified shareholder with over 50% ownership or is a branch/foreign companies		
Unknown Ownership	6%(2)	Saipa, Anhui JAC
no mentioned ownership		

## 4. Results

This section explores the main results of the shareholder structures of the largest automobiles companies worldwide. Subsequently, the paper presents the structures, relations, and groups in the corporate ownership network.

### 4.1. Shareholder structure

According to data collected from the Orbis Database, approximately 40% of the sample (30 companies) has *independent ownership* (no identified shareholder with more than 25% ownership); 23% of the sample has *no majority ownership* (no identified shareholder with more than 50% ownership but at least one with more than 25%); 6% of the sample has *indirect majority ownership* (identified shareholder with more than 50% total ownership or calculated total ownership); 23% of the sample has *directed majority ownership* (identified shareholder with more than 50% ownership or is a branch/foreign company), and 6% of the sample has *unknown ownership* (no mentioned ownership), as shown in Table 1. Although most automakers are classified as “*independent ownership*” (no identified shareholder with more than 25% ownership), many of them are strongly dependent on banks, passive investment funds and financial institutions.

Companies with “*no majority ownership*” (no identified shareholder with more than 50% ownership but at least one with more than 25%) have one holder with more influence on the shareholder structure. Companies with *indirect majority ownership* (identified shareholder with more than 50% total ownership or calculated total ownership) are rarer. The ownership structure of companies with *directed majority ownership* (identified shareholder with more than 50% ownership or is a branch/foreign companies) has even more influence from branch/foreign companies. In the sample, there are some companies denominated as “*unknown ownership*” (no mentioned ownership), such as Saipa and Anhui JAC. No information was found about shareholder structures for these companies. Table 2 illustrates the ownership structure by the company and the total shares held by companies and financial institutions.

The last column shows the sum and percentages of shares held by mutual and pension funds, banks and financial companies. In particular, passive investment funds are increasing their shares in many companies in the US and abroad. For example, the Vanguard Group is one of General Motors' largest shareholders, with 6.31% of total ownership. As shown in Table 2, General Motors (GM) has one of the highest percentages of shares held by financial institutions: 73% mainly from private investment funds. Honda has a high level of shares held by financial institutions but with more influence from Japanese banks, such as the Japan Trustee Services Bank. Other companies with high percentages of shares held by financial institutions are Ford, Renault, Suzuki, Daimler, and Isuzu, as shown in Table 2. All of the Chinese companies present high percentages of shares held by financial institutions from China and a high level of state influence.

Although the Ford family owns most of Ford's shares, the board of executives comprises many financial institutions and directors with financial trajectories. Furthermore, the Vanguard Group and BlackRock are expressive shareholders in Ford, with 7.21% and 5.83%, respectively. This

**Table 2**

Ownership structure by company (source: Orbis Database).

	Production 2016	Number of Shareholders	Shares by held Mutual and pension funds (%) 1	Shares held by Banks (%) 2	Shares held by Financial Companies (%) 3	Total shares held from financial institutions (= 1 + 2 + 3)	Shares held from companies (%)	Other Shareholders (%)
TOYOTA	10.213.486	70	11,9	23,6	0,15	35,65	11,57	52,78
VOLKSWAGEN	10.126.281	17	1,3	0	17	18,3	70,79	10,91
HYUNDAI	7.889.538	38	25,97	3,33	0,57	29,87	21,58	48,55
G.M.	7.793.066	107	40,16	21,81	11,2	73,17	3,92	22,91
FORD	6.429.485	98	36,2	15,57	2,82	54,59	5,08	40,33
NISSAN	5.556.241	40	17,31	6,53	0,15	23,99	47,72	28,29
HONDA	4.999.266	66	35,12	32,02	3,05	70,19	4,99	24,82
FIAT	4.681.457	63	18,12	8,39	2,06	28,57	45,57	25,86
RENAULT	3.373.278	61	19,91	7,13	15,17	42,21	20,6	37,19
PSA	3.152.787	2	29,13	0	0	29,13	16,12	54,75
SUZUKI	2.945.295	54	22,09	31,76	5,15	59	22,67	18,33
SAIC	2.566.793	26	7,48	0,15	5,95	13,58	72,29	14,13
DAIMLER AG	2.526.450	65	18,62	14,36	8,04	41,02	8,75	50,23
B.M.W.	2.359.756	49	4,9	12,69	2,28	19,87	38,84	41,29
CHANGAN	1.715.871	45	15,59	1,9	45,75	63,24	0,82	35,94
MAZDA	1.586.013	51	31,27	9,24	0,55	41,06	5,75	53,19
BAIC	1.391.643	9	0,92	0,66	0	1,58	68,6	29,82
DONGFENG	1.315.490	26	3,08	8,57	5,49	17,14	69,13	13,73
GEELY	1.266.456	46	10,64	8,09	0	18,73	81,27	0
GREAT WALL	1.094.360	32	43,02	6,41	50,57	100,00	0	0
MITSUBISHI	1.091.500	31	10,76	6,56	0	17,32	52,03	30,65
TATA	1.084.678	78	22,41	23,58	0,86	46,85	43,75	9,4
FUJI SUBARU	1.024.604	59	26,56	22,42	4,87	53,85	20,99	25,16
CHERY	695.617	10	6,59	0	33,87	40,46	42,2	17,34
ANHUI JAC	651.291	0	3,48	0	0	3,48	23,4	73,12
IRAN	636.000	8	3,37	0	21,08	24,45	44,57	30,98
KHODRO								
ISUZU	614.798	59	22,13	37,29	12,33	71,75	27,74	0,51
MAHINDRA	604.466	33	3,54	2,64	4,92	11,1	71,95	16,95
FAW	557.174	26	6,32	0,39	0,24	6,95	56,03	37,02
BYD	510.572	3	90,76	0	0	80,76	19,24	0

percentage of shares provides power to influence important investments. Observing the data, it is quite interesting to verify how some companies are more dependent on shares from different holders. The results show that there are many companies with shares held by other companies, such as Volkswagen, Nissan, Fiat, SAIC, BAIC, Dongfeng, Mitsubishi, Tata, Iran, Mahindra, and Faw. Many of these companies are subsidiaries from the group. More in-depth studies of the relationships between the shareholder structures and the subsidiaries are required.

Financialization is not a homogenous process. While Ford and GM are associated with investment funds, the Chinese (Saic, Baic, Dongfeng, Geely, Great Wall, Chery, Jac, Faw and BYD) and Indian companies (Tata and Mahindra) are associated with public banks. In Japan, many companies have private banks as shareholders, such as the Japan Trustee Services Bank. These differences in corporate control over the industry draw attention to the relations among corporate strategies, financialization, and the national systems.

#### 4.2. Corporate network: structure, relations, and groups

Table 3 shows the network statistics and properties. The corporate ownership network shown in Fig. 2 shows the nodes and connections. The network shows low density and some groups (five components). The network density is 0.011, and the modularity is 0.571.

**Table 3**

Network statistics and properties.

Network properties	Network statistic
Medium degree	1879
Average Weighted Degree	17,39
Density	0,011
Cluster Coefficient	0.103
Modularity	0,571
Connected Components	5

The medium degree and the average weighted degree reinforce the low density. The clustering coefficient is 0.103, and the modularity is 0.571. The algorithm indicates 5 groups (connected components), indicating that the network is not highly and densely connected, but it presents some groups (measured by the modularity and community algorithm).

This network structure draws attention to the level of centrality and betweenness of some companies and financial institutions (investment funds, banks, financial companies). Each color of the network represents a different category and percentages of the sample (1. blue = automotive companies [28.16%]; 2. red = mutual and pension funds [25.29%]; 3. green = banks [14.66%]; 4. yellow = financial companies [10.32%]; 5. light blue = insurance companies [6.32%]; 6. pink = public authorities, state and government [5.75%]; 7. orange = individuals or families [4.31%] and 8. purple = private equity firms [3.45%]). The corporate ownership network has many financial institutions in the nucleus. In addition, financial institutions (especially passive investment funds) have a high level of centrality and betweenness. Evidence shows that this network can be classified as a modular and hierarchical network, but this classification requires future studies. Nevertheless, modular and hierarchical networks tend to reinforce the prominent positions.

##### 4.2.1. Corporate ownership network: centrality and betweenness

The results show that the most central financial institutions in the corporate ownership network are passive investment funds: Vanguard, BlackRock, Norway, and Fidelity. All of them are investment funds, but Norway is a public investment fund. This position of centrality is indicated by the weighted degree (Table 4). Similarly, these three investment funds and some banks are the most intermediary in the sample (Table 3), as indicated by the betweenness centrality.

The Vanguard Group has the highest level of weighted degree. The Vanguard Group has the highest level of betweenness, centrality, and eigencentrality. The results show that the Vanguard Group has shares in 24 automakers and BlackRock and Norway hold shares in 21 automakers



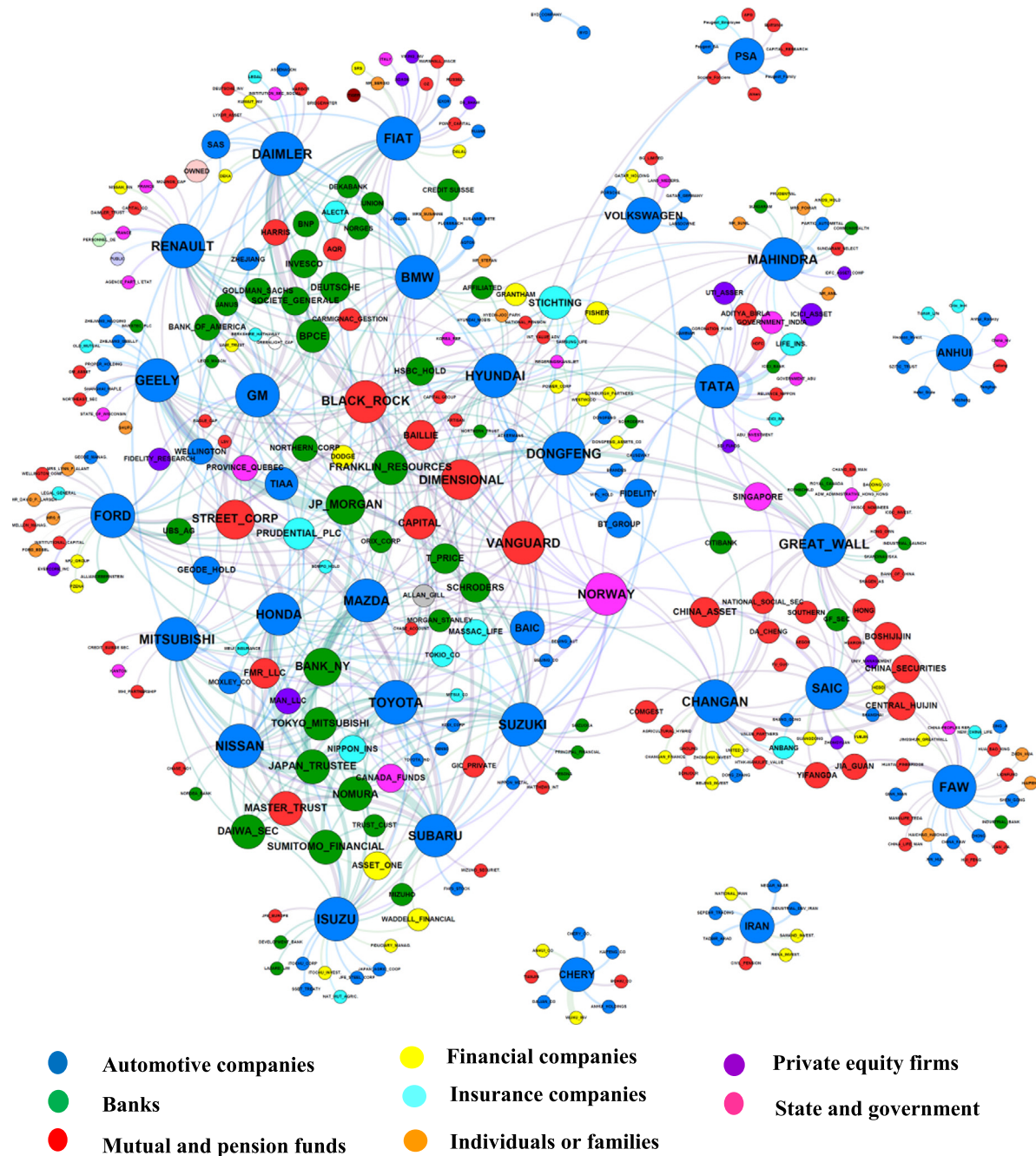


Fig. 2. Corporate ownership network.

each. This outcome explains why these investment banks have the highest levels of weighted degree, betweenness centrality and eigencentrality. Dimensionally, JP Morgan, Street Corp. and the Bank of New York exhibit relatively high levels of centrality and intermediation, indicated by the weighted degree and betweenness centrality. JPMorgan and the Bank of New York are the first traditional banks in the sample.

The Vanguard Group is one of the world's largest investment management companies. Today, it has more than 20 million investors in approximately 170 countries and operates approximately US\$ 5.1 trillion in global assets under management. The Government Pension Fund of Norway is owned by the Government of Norway. The Government Pension Fund Global, also known as the Oil Fund, was established in 1990 to invest surplus revenues in the Norwegian petroleum sector (The Economist, 2017). Therefore, it centralizes and intermediates shares in different companies, as shown.

#### 4.2.2. Groups and modularity

Communities and modular algorithms were used to measure the group structures (Blondel et al., 2008; Lambiotte et al., 2009). The algorithm comprises the groups with different colors, as shown in Fig. 2. The colors represent groups defined from the “modularity class” algorithm in Gephi software. This algorithm was proposed by Lambiotte et al. (2009) and Blondel et al. (2008), and it indicates the best partition of the groups in a particular network.

The results show that corporate shareholding by groups is strongly influenced (or partially explained) by geographical, historical and/or ethical ties (Japan-Japan, China-China, India-India, etc.). However, there are some exceptions, such as Fiat, which is part of the American group, and Hyundai and Dongfeng, which represent a new group. Geely is part of the European Group. All of the other groups are strongly influenced by geographical, historical and/or ethical ties. Some groups are more central (orange, green and



**Table 4**

Network measures for financial institutions.

	Company description	Weighted degree	Betweenness centrality	Eigen centrality
VANGUARD	Investment fund	203,1	0,180	1000
BLACK_ROCK	Investment fund	225,9	0,096	0,943
NORWAY	Public Investment fund	175,1	0,146	0,894
DIMENSIONAL	Investment fund	129,1	0,051	0,708
JP_MORGAN	Bank	193,8	0,037	0,667
STREET_CORP	Investment fund	174,1	0,022	0,686
BANK_NY	Bank	130,6	0,011	0,583
JAPAN_TRUSTEE	Bank	195,5	0,001	0,433
MASTER_TRUST	Investment fund	105,1	0,001	0,433
SUMITOMO_FINANCIAL	Bank	91,1	0,001	0,433
NOMURA	Bank	67,7	0,001	0,433
FRANKLIN_RESOURCES	Bank	67,6	0,010	0,340
DAIWA_SEC	Bank	65,0	0,001	0,433
TOKYO_MITSUBISHI	Bank	79,1	0,001	0,386
BPCE	Bank	63,8	0,007	0,327
CAPITAL	Investment fund	61,3	0,012	0,322
TIAA	Corporation	57,2	0,004	0,361
STICHTING	Insurance Company	54,5	0,008	0,299
PRUDENTIAL_PLC	Insurance Company	46,5	0,003	0,283
DEUTSCHE	Bank	42,2	0,003	0,244
SCHRODERS	Bank	41,4	0,004	0,223
FMR_LLC	Investment fund	39,4	0,001	0,263
BAILLIE	Investment fund	39,3	0,007	0,206
CHINA_ASSET	Public Investment fund	38,9	0,040	0,128
T_PRICE	Bank	38,6	0,002	0,241
CENTRAL_HUIJIN	Public Investment fund	50,0	0,019	0,088
NIPPON_INS	Insurance Company	34,8	0,000	0,232
SAS	Bank	34,7	0,002	0,178
ASSET_ONE	Financial Institution	34,6	0,000	0,206
CHINA_SECURITIES	Public Investment fund	33,8	0,019	0,088
SOCIETE_GENERALE	Bank	33,5	0,001	0,199

pink), others more intermediary (yellow and red), and still other groups more distant (blue) (Fig. 3).

The orange group (20,11%) is the largest (CeCentral Block), comprising Toyota, Mazda, Subaru, Mitsubishi, Isuzu, Honda, Nissan and Suzuki, which are mainly Japanese companies. There are also two other central groups. These groups mainly comprise: 1) Ford, GM and Fiat (pink); and 2) BMW, Daimler, Renault and Geely (green), with 17,82% and 11,78% of the sample, respectively. Hyundai and Dongfeng (yellow) comprise the yellow group with substantial centrality, but it is a smaller group, with 3,74% of the sample. The algorithm suggests two distant blocks, one comprising Tata and Mahindra, which are both Indian Companies (brown), and the other distant groups are composed by Great Wall, Faw, Changan and SAIC, which are all Chinese Companies (blue), with 8,62% and 17,82% of the sample, respectively.

The banks and passive investment funds are at the center of the networks. Vanguard (the most central and intermediary investment fund) is inside the orange group. Both the prominent block and the intermediary's blocks are completely associated with banks and investment funds. These blocks are strongly affected by the power of these actors from financial systems. It is interesting to observe the dark green block with one South Korean company and one Chinese company. These companies have a high degree of betweenness and are closely associated with banks and passive investment funds.

#### 4.3. Who controls the automotive industry? The dependence on passive investment funds

Both descriptive and network analysis data show a high influence of financial institutions, mainly passive investment funds, as a holder in American, European and Japanese companies. Our findings are in accordance with previous studies of financialization in this particular industry (Borghi et al., 2013; Lung, 2004; Kädtler & Sperling, 2002). The Asian companies have a strong shareholder structure based on the accumulation of internal funds and influence from the state. Therefore, they have a smaller degree of financial exposure from private investment funds (Borghi et al.,

2013). The network measures confirm previous studies of financialization in this particular industry. Beyond the corporate ownership network, we explore evidence from field theories (Fligstein & Mcadam, 2012) resource dependence theory (Pfeffer & Salancik, 2003) and the sociology of arbitrage (Beunza & Garud, 2007; MacKenzie, 2003; Muniesa et al., 2007) to address the dependence of this industry on passive investment funds.

##### 4.3.1. Financialization and fields

One interesting conclusion from the sociology of markets concerns the heterogeneity of the forms of control over this industry. Financialization is not a homogeneous process. Even inside one industry, multiple forms of control are possible, as emphasized by the variety of the capitalism literature (Hall & Soskice, 2001; Morgan & Kristensen, 2006), multiple logics (Thornton & Ocasio, 2008) and multiple fields perspectives (Gestel & Hillebrand, 2011; Klutetz & Fligstein, 2016). This question addresses possible explanations for how the shareholder value orientation will be diffused in this particular industry. Although it is an economic movement and a world trend, each country preserves its own characteristics of economic development, institutional arrangements and state intervention in the economy – elements that provide the outlines of each nation-state. In short, every aspect of the financialization and corporate control of the automakers that we analyze depends heavily on the historical context. These models of capitalism have been socially and politically constructed over time. One plausible explanation introduced by Fligstein (2001) helps to explain this heterogeneous process. The central argument from field theory is that managers and owners seek stable structures of interaction with major competitors (Fligstein, 2001). Once this structure becomes legal and profitable, companies establish fields that tend to produce or reproduce these structures (Fligstein, 2001).

The automakers are influenced by the institutional and historical processes in the market. Bresser-Pereira (2011) listed at least five models of capitalism, separating models between developed and developing countries. He found the “liberal-democratic model” of the Anglo-Saxon countries, the “social model” or European model, and the “Japanese model”, called “endogenous social integration”. In developing countries, he

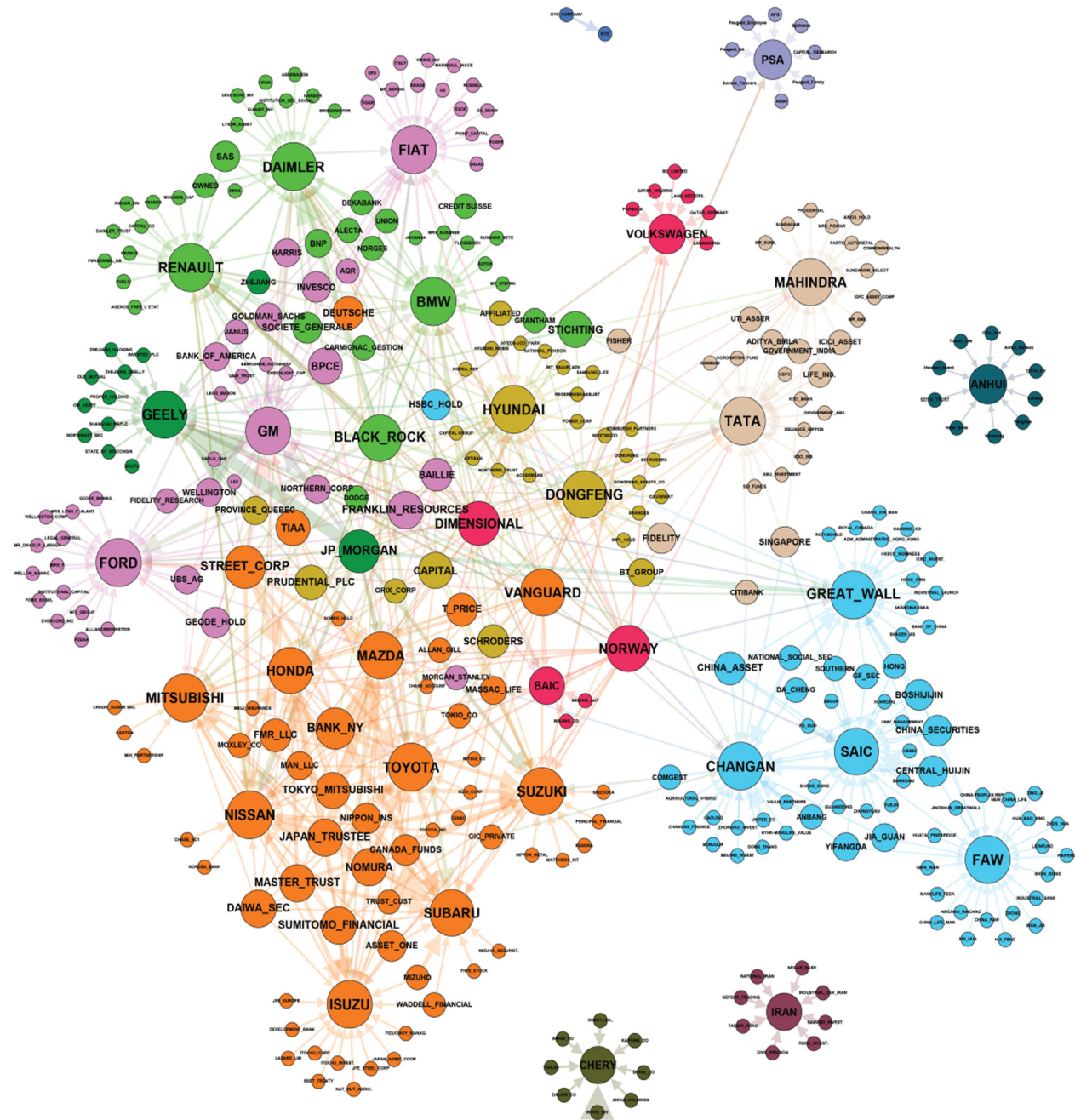


Fig. 3. Groups and modularity class. (For interpretation of the references to color in this figure, the reader is referred to the web version of this article.)

emphasized the “Asian development model”, represented by China, India and other countries with fast and dynamic growth, and countries with low growth and per capita income, such as Brazil, Mexico, South Africa and Turkey, classified as belonging to an alleged “liberal-dependent model”. Hall and Soskice (2001) discussed the varieties of capitalism, dividing European countries into “liberal market economies” and “coordinated market economies”; and Boyer (2004), with his theory of regulation, distinguished four forms of advanced capitalism: “market” in the United States, “mesocorporativist” in Japan, “public/integration” in France and “social-democrat” in the Scandinavian countries.

These varieties of capitalism explain the variation in financialization among automotive companies. Using Esping-Andersen's (1990) classification of types of development, we see three distinct models: the “liberal model” substantiated in the United States; the “corporatist model” grounded in Germany; and the “social-democratic”, which would drive in the Scandinavian countries. The difference would be in the poles of

liberalism and social democracy, in which there would be different conceptions of the type of capitalism that each national state builds. For this approach, there would be a welfare state in Europe, for example, and a liberal state in the US. For Bresser-Pereira (2011), this difference is a result of the greater or lesser presence and influence of socialist or social-democratic parties in each country. In the United States, there is a weak presence or even a complete lack of socialist influence in society as a whole.

#### 4.3.2. Corporate networks

The results also emphasize that financialization causes deep changes in the corporate network, especially the influence of passive investment funds (Davis, 2008; Fichtner et al., 2017). Passive investment funds increased their market share significantly after the financial crisis in 2008. Therefore, such current networks between these large institutional investors and passive investment funds differ from the networks established previously, as demonstrated by Davis (2008). Previously, the US economy was largely

centered on a small number of banks in New York. Only three banks formed a powerful money cartel, subjecting all firms to their domain. The First National Bank, for example, held stakes in at least 49 boards of directors by 1914, and the National City Bank attended 48 boards of directors. Furthermore, JP Morgan participated in 72 directories in 47 of the largest companies in the country in the same period (Davis, 2008, p.13). However, with the laws restricting interlocking boards, mutual funds (especially exchange traded funds) have grown and surpassed banks and are now becoming the leading financial institutions of all time (Fichtner et al., 2017). The ETFs are dominated by three asset management firms: BlackRock, Vanguard and State Street (Fichtner et al., 2017).

In recent years, investment funds (especially passive funds) have acquired significant shareholdings in thousands of publicly listed corporations both in the United States and abroad (Davis, 2008). According to Fichtner et al., 2017, Vanguard, BlackRock and State Street (the “Big Three”) together are the largest shareholders with 40% of all US listed companies and 88% of the companies listed on the S&P 500 index. This fact reflects the level of concentration of ownership not only for the automotive industry but also for many other industries, as pointed out by Davis (2008) and Fichtner et al., 2017. This huge increase in passive investment funds occurred mainly after the financial crisis in 2008 because they are less expensive than active investment funds.

Table 4 shows that Vanguard, BlackRock and State Street hold significant amounts of shares in many of automotive companies, confirming the results presented by Fichtner et al. (2017) regarding the hidden power of investment funds. Therefore, Proposition 1 – “Corporate control of automotive companies is increasingly associated with banks and investment funds” – is partially confirmed. Although these passive investment funds are shareholders in many companies, some of them are more dependent on this type of investor, such as General Motors and Ford. Furthermore, the automotive industry has also the Norway fund and Dimensional funds as huge investors.

As the results show from social network analysis, investment funds have the highest scores of centrality, betweenness, and eigencentrality (Table 4). Passive investment funds intermediate shares on different stock exchanges from the largest to the smallest automotive companies. As pointed out by Davis (2008), these funds exhibit high levels of structural prominence. This structural position can provide several benefits for investment funds. For example, the centrality of investment funds (such as BlackRock and the Vanguard Group) can be related to access to scarce resources and information. These positions reflect some capital that can help them to achieve other types of resources, such as financial, information, technological, reputational, etc.

The structural prominence of investment funds has interesting impacts, particularly for industries. In the previous period, the strategy to finance automakers consisted of bank indebtedness, rendering the debt/equity ratio more favorable to banks than to market issues (Davis, 2008). However, there are investors who are moving toward passive investment funds and consequently influencing the automotive industry. Therefore, from social network analysis, all of the properties suggest some structural prominence from investment funds, such as weight, centrality, betweenness, and eigencentrality. Therefore, Proposition 2 – “Financial institutions appear with high centrality and intermediation in the corporate control of automotive companies” – was also confirmed.

#### 4.3.3. Financial dependence: resources and arbitrage

A compelling question on this subject is how financial institutions influence strategies, structures, and outcomes (Fligstein, 2001). For example, General Motors and Ford have investment funds as the largest private holders. Recent results presented by Fichtner et al. (2017) showed how the investment funds use voting strategies to influence the management practices, as well as to exert influence over the companies. The “Big Three” have permanent boards in more than 40% of US companies (Fichtner et al. 2017, 322). Further, Vanguard Group has 15 people controlling approximately 13,000 companies worldwide, and BlackRock has two dozen people controlling 14,000 companies (Krouse et al., 2016). As

emphasized by Fichtner et al. (2017), BlackRock and Vanguard are at the forefront of asset managers with internally consistent proxy voting behaviors. This fact clearly shows that the Big Three are able and do indeed apply centralized voting strategies. The Big Three typically support management but will use their power to vote against management when they are dissatisfied (Fichtner et al. (2017)).

There are indications that the “Big Three” are beginning to exert more influence on corporations in which they hold ownership stakes. As pointed out by Fichtner et al. (2017), shareholders can exert power based on three mechanisms: 1) participate directly in the decision-making process; 2) simply exit the business as another way to exert power because it can impact negatively the share price; or 3) directly engage in management. Some recent news has shown how passive investment funds are becoming more active inside the companies. Ms. Edkins, Director of BlackRock, said she believes that “her team has influence on approximately 1,200 of the U.S. companies owned by its passive funds because of the size of BlackRock’s stake or the company’s structure. She said meetings behind closed doors can go further than votes against management” (Krouse et al., 2016). Similarly, Larry Fink, CEO of BlackRock, observed that they “can’t sell those stocks even if they are terrible companies. As an indexer, our only action is our voice, so we are taking a more active dialogue with our companies and are imposing more of what we think is correct” (Authers, 2016). These quotes are explicitly evident of the indirect or direct effects of passive investment funds in the companies’ behavior. Observing the auto industry, the Vanguard Group and BlackRock have more than 5% of shares in General Motors and Ford (Orbis Database). This level of participation exerts pressure on managers for financial and operational results in the short term. This concentration of corporate ownership can be dangerous since passive asset managers have the ability to exercise voting power and exert forms of control.

In addition, more than simple holders, passive investment funds can affect the way in which managers and owners frame decisions. On the edge, they can impose and support new forms of control (Fligstein, 1990). The conception of control is how organizations collectively manage the competitive problems of the field. Once put into practice, a conception will be shared in the sense of diminishing the complexity of the world. These problems are also articulated by the largest and most successful firms. These practices are propagated by business media and informal relationships between organizations. Subsequently, they are shared by organizations and field organizations (Fligstein, 1990; Sacomano Neto, Truzzi, & Kirschbaum, 2013).

Two other theoretical currents contribute to understanding the relationship between companies and shareholders: the resource dependence theory (Pfeffer & Salancik, 2003) and the sociology of arbitration (MacKenzie, 2003). Although in some companies the shareholders have low volumes of shares, there is a dependence on: 1) results; and 2) behavior between companies and shareholders (Pfeffer & Salancik, 2003). As pointed out by Pfeffer and Salancik (2003, p.), “the results achieved by A are interdependent with, or jointly determined with, the outcome achieved by B”. Already with behavioral dependency, “the activities are themselves dependent on the actions of another social actor”. Shareholders and companies depend on a type of symbiotic relationship (Pfeffer & Salancik, 2003). Confirming this dependence, Ng et al. (2009) explained that the investment funds support less management or fewer shareholder proposals when prior firm performance has been weak. The resource dependence theory (Pfeffer & Salancik, 2003) illustrates how passive investment funds implies an indirect influence on results and behavior.

Due to the high degree of uncertainty, investment funds function as arbitrators or frame makers, as emphasized by the sociology of arbitration (Beunza & Garud, 2007; MacKenzie, 2003; Muniesa et al., 2007). The arbitrage influences and constitutes the markets: “Arbitrage links asset classes, creating systematic connections between the prices of stocks and of stock-index futures, 1 of options and their underlying assets” (Beunza et al., 2006). As explained by this perspective, the entire modern theory of asset pricing relies on ‘arbitrage proof’. As explained by Beunza and Garud (2007), analysts confront this imitation of their colleagues’ opinions. The passive investment funds working as arbitrators can influence the forms



of valuation (Muniesa, Millo and Callon). The devices reduce the cognitive distance. The main contribution of the sociology of arbitrage is that economists perform the markets, so investment funds and their metrics and narratives influence investors' perceptions. This topic is an interesting issue and deserves future studies.

## 5. Final remarks

This paper analyzes the corporate ownership network of the largest automotive companies and accesses the structures, relations, and groups from the shareholder structure. As pointed out by Davis (2008), studies of corporate ownership network have been rare, even more so in the automotive sector. Therefore, our main question is: Who controls the automotive industry? The results reveal a great dependence on some assemblers of passive investment funds, mainly in American and European companies. The results exhibit differences in the shareholders' structures over the industry. The central argument from field theory is that managers and owners seek stable structures of interaction with major competitors (Fligstein, 2001). More studies are needed on this subject to understand how the varieties of capitalism, logic and multiple fields can explain these corporate structures.

However, banks, investment funds, and financial institutions are at the heart of the corporate-ownership network, with high levels of structural prominence, as the network properties indicate. The Vanguard Group, BlackRock, Fidelity, and State Street show high levels of weight centrality, betweenness, and eigencentrality. Thus, other studies are necessary to understand the network dynamics and how they change over time.

The results also show the strong structural position that the passive investment funds occupy in the economy, as shown by Fichtner et al. (2017) and Davis (2008). As pointed out by Fichtner et al. (2017), mutual funds have significantly increased their business over the past decade and actively influence corporate behavior. To observe these moves, more studies are needed of how boards' decisions to understand how the decision-making process occurs as a whole and how and when investment funds take positions in important decisions. In addition, an interesting subject is the influence of financialization on the chief executive officer (CEO) and the boards' trajectories. In any case, the results show how financialization is not a homogeneous process. Even inside one industry, multiple forms of control are possible, as emphasized by the variety of the capitalism literature (Hall & Soskice, 2001; Morgan & Kristensen, 2006), multiple logics (Thornton & Ocasio, 2008) and multiple fields perspectives (Gestel & Hillebrand, 2011; Klutts & Fligstein, 2016). The central argument from field theory is that managers and owners seek stable structures of interaction with major competitors (Fligstein, 2001). Once this structure becomes legal and profitable, companies establish fields that tend to produce or reproduce these structures (Fligstein, 2001). Beyond the networks and field theories, we explore two other theoretical currents contributing to understanding the relationship between companies and shareholders: dependence on resources (Pfeffer & Salancik, 2003) and the sociology of arbitrage (MacKenzie, 2003). This framework offers interesting thoughts about corporate control, financialization and resource dependence.

However, as a descriptive study, there are many limitations to explain control over the industry. The social network analysis also has limitations in connecting the macro- and micro-processes. Moreover, from a network analysis perspective, further studies are necessary to address the data from a longitudinal point of view. In addition, social network analysis offers other possible observations about the network structure. From an economic sociology perspective, further studies are necessary to address how forms of control affect strategies, structures and outcomes in the automotive industry in different institutional contexts. In this way, many subjects, such as the variety of types of capitalism, logics, fields, performativity, commensuration and shareholder value orientation, are exciting.

These topics constitute an instigating agenda on the impact of contemporary forms of economic activity on the institutions and practices of firms. Although this research reflects the strategies of large automotive companies in contemporary capitalism, this study contributes to reflections

on the influence of corporate control on the decisions and strategies of companies and organizations and institutions in general. Finally, this topic comprises a research agenda of relative importance for understanding the role of large corporations and various other phenomena in contemporary economics.

## CRediT authorship contribution statement

**Mario Sacomano Neto:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Marcelo José do Carmo:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Evandro Marcos Saidel Ribeiro:** Conceptualization, Data curation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Wilton Vicente Gonçalves da Cruz:** Conceptualization, Data curation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing.

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