



UNIVERSIDADE CATÓLICA PORTUGUESA





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# Common Ownership in PSI-20

## Index: 1997 - 2019

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Presented to Universidade Católica Portuguesa  
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by

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"In the midst of chaos,  
there is also opportunity"

Sun-Tzu



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## Resumo

Nas últimas três décadas o fenómeno de *Common Ownership* entrou para a ordem do dia na teoria das finanças corporativas. Alguns investigadores portugueses têm estado na linha da frente, mas ainda não existia um estudo empírico à realidade empresarial nacional. Por este motivo, esta tese tem como intuito principal replicar o trabalho feito por Backus et al. (2019) para o S&P 500, no universo das empresas do PSI-20 entre 1997-2019. Depois da análise ao período, podemos concluir que o fenómeno em questão não tem grande significado na realidade do principal Índice Bolsista Nacional. Contrariamente ao verificado no caso Americano em que a tendência de crescimento do peso médio do lucro cruzado é clara ao longo dos últimos trinta anos.

Antes da análise empírica em si, há uma contextualização com a diferente literatura existente; apresentando as diferentes funções objectivo dos órgãos de gestão da empresa, assim como as distintas fórmulas de cálculo do peso dos lucros cruzados. Centrando a análise na formulação dominante por uma questão de comparação com a investigação feita à realidade americana.

**Palavras-chave:** Common Ownership, Participação Acionista Horizontal, Dispersão da Participação, Poder de Mercado, Regulação da Concorrência, PSI-20, Função Objectivo das Empresas.



# Abstract

Over the last three decades, the common ownership phenomenon has gained the interest of Corporate Finance researchers. Some of those researchers are Portuguese, so the need to do empirical research of the common ownership concentration in Portuguese firm reality. To do so, this thesis will replicate the Backus et al. (2019) approach over the S&P 500, to PSI-20 listed firms between 1997-2019. After this analysis, this thesis concludes that common ownership concentration does not have a significant presence in the Portuguese main Stock Index, in contrast to what has been happening in the U.S where the growth trend of the average cross profit weight is obvious over the last three decades.

Before the empirical analysis, this thesis presents a literature review where explains the different managers objective functions as well as the different formulations to compute cross profit weigh. The analysis is focused on the dominant formulation by a comparison issue with previous research on American reality.

**Keywords:** Common Ownership, Horizontal Shareholding, Ownership Dispersion, Market Power, Antitrust Regulation, PSI-20, Manager Objective Function.



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# Abbreviations

CoOCo - Common Ownership Concentration

PSI-20 – Portuguese Stock Index (share index with the 20 Euronext Lisbon Stock Exchange listed companies with highest market capitalisation)

S&P 500 - S&P Down Jones Index (500 American companies with the highest market capitalisation listed in NYSE, NASDAQ, Cboe BZX Exchange)

US - United States



# Introduction

Classical Economic and Finance theories have typically assumed that firms simply act and devise their own strategy to maximize their own profit/value, following the argument of Smith (1776) that self-interest “competition maximizes social welfare”. However, in some settings, shareholders may not want a firm-profit/value-maximization behaviour. In a common ownership setting, i.e. when shareholders have a financial stake in rival firms; shareholders may prefer the firm to take into account their interest in rival firms. In other words, shareholders may want the firm to take into account not only its own profit, but also their competitors’ profit. This implies a change in the classical objective function of the manager of the firm. In the last three decades, multiple authors have studied the theoretical possibility of shareholders that have diversified portfolios guided the firms to internalize in their managers objective functions the externalities that are a result of the different holding positions in the shareholders’ portfolio and consequently different interests over the different financial stakes.

Other authors had shown how this dominant formulation does not consider the importance of the proportion of the different holdings of each shareholder among market firm, to managers derive the objective function of their firms. So, the first alternative approach was used by Crawford et al. (2018) in its work about multichannel television markets and a second alternative approach by

Brito et al. (2018)., where the manager's objective function was reformulated, and the firm's strategy is now decided to "maximize a control-weighted sum of the relative expected return of the firm's shareholders". These two alternative formulations only differ from each other in computation terms.

The common sets of investors' interests can reduce the natural incentives to the firm's competition. Because an aggressive competitive behaviour by one individual firm, for example: a drastic price reduction or even a production capacity expansion, could increase the individual firm value. If by one hand, this hostile practice can produce a positive result in firm value, on the other hand may decrease the common owners' portfolio value, (Schmalz 2018). However, there is also a bright side to common ownership. Brito et al. (2020) concludes the overlapping ownership in a standard vertical different duopoly model can increase or decrease the gap between consumer surplus and firms' profit. In the case when this overlapping ownership leads the manager of a high-quality firm to place some weight on the low-quality firm's profit, the low-quality firm increase its value which benefit the consumer.

Rotemberg (1984) was the first author to model the interests of the shareholders into managers objective function. His work influenced O'Brien and Salop (2000) to develop the dominant formulation of the objective function of the managers that state that firms acts to "maximize a control-weighted sum of the expected return of the firm's shareholders.

Based on the dominant formulation, Backus et al. (2019) analysed the firms in the S&P 500 and found a strong increase of the weight assigned to the profit of competitors over the past 30 years, from 0.2 in 1980 to close 0.7 in 2017, which implies that these firms give to the competitors' profit almost the same weight as their own profit, with common ownership being increase over the U.S large trade firms. This thesis proposes to examine the same phenomenon for the

Portuguese reality, studying the principal Portuguese market index: from 1997 to 2019. The main research questions of this thesis are: What is the magnitude of common ownership in Portugal? How has common ownership developed over the last two decades?

In order to illustrate this phenomenon in Portuguese reality, *Table 1* and *Table 2* present the main shareholders of four large historical companies of PSI-20 in the last quarter of 2014. Displayed in *Table 1*, *Sonae SPSG S.A* was controlled and still until nowadays by its majority shareholder, the family of its' founders; and *Teixeira Duarte S.A* one of the biggest construction company in Portugal that is also controlled by a majority stockholder. This first table has two firms that seem to have the incentive to act accordingly to the largest shareholder interest. Assuming these largest shareholders do not have also a significant holding in other firms in the same industry, the firm must indeed maximize their own value. In this case diversified minority shareholders (e.g *Norges Bank Investment Management* (NBIM), BPI Private Equity) that have a diversified portfolio and multiple stakes, have no significant influence over managers main objective.

**Table 1:** Entrepreneurial Portuguese Firms.

This first table display the largest shareholders of two reference and historical firms / family groups of PSI-20 Index and correspond to the stakes of the last quarter of 2014. The data source is Thomson Reuters database.

Sonae SGPS SA		Teixeira Duarte SA	
Mendes de Azevedo (Belmiro)	52.64%	Teixeira Duarte - SGPS, S.A.	50.72%
BPI Private Equity S.G.P.S., S.A.	8.90%	Calainho de Azevedo Teixeira Duarte (Miguel)	10.18%
Bestinver Gestión S.G.I.I.C. S.A.	4.99%	Banco Comercial Portugues SA	9.82%
Fundação Berardo	2.49%	Coutinho Teixeira Duarte (Pedro Pereira)	2.45%
Norges Bank Investment Management (NBIM)	2.01%	Norges Bank Investment Management (NBIM)	0.72%
Fidelity International	0.67%	Dimensional Fund Advisors, L.P.	0.33%
Dimensional Fund Advisors, L.P.	0.48%	Santander Asset Management - S.G.F.I.M., S.A	0.33%

On the other hand, *Table 2* shows two other companies listed in PSI-20 index, but in this case, the stakes of top shareholders are more similar than the previous case, and the identification of a majority shareholder is not so clear. In this example are represented two example companies that have activity in completely different industries (a post company and a telecommunications company) and some of the major players are very similar, as *Norges Bank Investment Management*, *UBS Asset Management*, and *Morgan Stanley*.

**Table 2:** Non Entrepreneurial Portuguese Firms.

The second table shows the largest shareholders of other two reference firms of PSI-20 Index and correspond to the stakes of the last quarter of 2015, but without a clear majority shareholder. The data source is Thomson Reuters database.

Pharol SGPS SA		CTT Correios de Portugal SA	
Novo Banco, S.A.	12.57%	Aberdeen Standard Investments (Edinburgh)	6.67%
Alves Rocha dos Santos (Isabel Maria)	10.05%	Allianz Global Investors GmbH	6.01%
Telemar Participações S.A.	10.00%	Norges Bank Investment Management (NBIM)	4.42%
Norges Bank Investment Management (NBIM)	4.96%	Kames Capital	3.43%
UBS Asset Management (Switzerland)	3.56%	UBS Asset Management (Switzerland)	2.55%
Grupo Visabeira SGPS, S.A.	2.64%	Morgan Stanley Investment Management Inc. (US)	2.37%
Alves Ferreira de Oliveira (Joaquim Francisco)	2.28%	Amundi Ireland Limited	2.09%
Instituto de Gestão de Fundos de Capitalização da Segurança Social	2.26%	Artemis Investment Management LLP	2.07%
Morgan Stanley Investment Management Inc. (US)	2.16%	Fidelity Management & Research Company	2.06%

These overlapping sets of investors', in contrast of happen in **Table 1**, can change to a situation where the objective function of the managers is not the maximization of firm value/profit, but the maximization of shareholders interest.

This thesis has the following structure: Chapter 1 presents the theoretical literature of common ownership and the different views over the common ownership profit weight. Chapter 2 describes and explains the methodology used in this study, the replication of Backus et al. (2019) approach; as well as some empirical cases. Chapter 3 presents the results and the respective analysis. Chapter 4 presents and future research suggestions.



# Chapter 1: Literature Review

This Chapter reviews the literature on common ownership, and it is divided in two sub-sections. The first reviews empirical evidence on common ownership. The second reviews the literature that models the objective function of the manager in the presence of common ownership.

## 1.1. Empirical Evidence

The theoretical models (Schmalz, 2018) and (Gramlich and Grundl 2017) predicts that common ownership increases firms market power. So, this diversion of the perfect market situation has a social cost to the economy with the adverse consequences to tend to consumers side. Azar et al. (2018) examines over the U.S airline industry and Azar et al. (2019) examines the U.S commercial bank industry and found empirical evidence of large anticompetitive incentives due to common ownership links at the market level, and a direct relationship between ownership concentration and higher product prices, especially in U.S industry for which in some routes the common ownership concentration is found to be more than 10 times larger than the limit level defined by the U.S Antitrust Agencies' Horizontal Merger Guidelines for a case of a traditional merger. This raises the question: Are National Antitrust Agencies evaluating the impact of common ownership links? And their associated social costs?

These results motivated some criticisms from other authors as Dennis et al. (2017) and Kennedy et al. (2018) who claimed estimation problems in both studies Azar et al. (2018) and Azar et al. (2019) to criticism, claiming problems of reliability of methods and results used by the critics. The debate of arguments has been growing in recent years, as Azar and Schmalz (2019) pointed. On one hand of the fence are the industrial organization authors that have been claiming that this common ownership phenomenon has been increasing in western economies. On the other side the big mutual funds (e.g Vanguard, Blackrock, etc.) who respond with criticism of the estimation procedures and the objective function of the manager used.

## 1.2 Managers Objective Function

First of all, it is important to contextualize with the used nomenclature, to a clear understanding of all different theories

### 1.2.1 The Setup

This thesis uses general settings that combine features from previous papers: Brito et al. (2014), Azar (2016, 2017), and Brito et al. (2018 a, b). Considering  $K$  as the number of external shareholders to the industry, indexed by  $k$ .  $N$  as the number of firms at the market, indexed by  $j$ . The total stocks of the firms are composed of voting stock and non-voting stocks, both stock groups give the right to a part of the firm's profits.

The  $\phi_{k,j} \in [0, 1]$  term represents the total stocks held by shareholder  $k$  in firm  $j$ , regardless of the proportion of total stocks that is voting or non-voting,  $v_{k,j} \in [0, 1]$  term represents the holding of voting stocks by shareholder  $k$  in firm  $j$ . Other important term is  $\gamma_{k,j} \in [0, 1]$  that represents the power or right to influence the decisions of firm  $j$  by shareholder  $k$ . This power to influence the

governance firm decision does not necessarily equals to the voting rights that shareholder  $k$  holds in firm  $j$ .

It is also relevant to know  $\Theta$  represents the sets of existing shareholders, so  $\Theta_j$  represents the subset of individual shareholders that have a stake of firm  $j$ ;  $x_j$  represents the strategy of firm  $j$ ; and  $R_k$  the return of shareholder  $k$ , that depends of the profits of all firms that this specific shareholder  $k$  have a stake. The return of shareholder  $k$  is a function defined as  $R_k = \sum_{k \in \mathfrak{S}} \phi_{k,g} \Pi_g$ , where  $\mathfrak{S}$  represents all the firms in the market,  $g$  a specific firm, and  $\Pi_g$  the total profit of firm  $g$ .

### 1.2.2 Formulation Evolution:

Since the early 80s, the literature argues that shareholders diversification portfolios leads the managers to internalize the interests of common shareholders among firms. As mentioned earlier the first author to address this issue was Rotemberg (1984), who assumes that the firm acts to “maximize a control-weighted sum of the expect return of the firm’s shareholders”. This option by the managers can be explained by the fact that the decision of keeping the manager in office is directly taken by stockholders. However, the portfolios of each shareholder differ, so the different investors will disagree about the optimal strategy that firm should follow.

Under the dominant formulation defined by O’Brien and Salop the weight  $w_{j,g}$  that manager of firm  $j$  assigns to the expected return of the rival  $g$  is given by:

$$w_{j,g} = \frac{\sum_{k \in \Theta} \gamma_{k,j} \phi_{k,g}}{\sum_{k \in \Theta} \gamma_{k,j} \phi_{k,j}} \geq 0 \quad (1)$$

Where  $\gamma_{k,j}$  represents the power of decisions in firm  $j$  by shareholder  $k$ . And  $\phi_{k,j}$  and  $\phi_{k,g}$  the total stocks held by shareholder  $k$  in firm  $j$  and  $g$  respectively.

Azar (2016, 2017) and Brito et al. (2018a, 2018b) microfound these profit weights modelling the election of firm managers on a voting model, in which the manager is elected at the general shareholders' meeting. Shareholders can decide between two potential candidates: an incumbent and a challenger. They assume (i) candidates as opportunistic, i.e their only motivation is to be elected to the position. (ii) shareholders' only motivation is the expected utility that results from their expected returns that are different for each different strategy proposal; (iii) shareholders vote simultaneously (so the absence of interest cooperation between different shareholders during the voting process is presumed), and (iv) shareholders have profit irrelevant bias from (or against) the challenger, because the credibility (or lack of credibility) of the incumbent, it is already known by shareholders, while in challenger case is a shot in the dark.

The dominant formulation has also been criticized in the literature.

Authors as Brien & Waehrer (2016), Gramlich & Grundl, (2017) and Crawford et al. (2018) argue that as ownership of the firm becomes disperse among many infinitesimal shareholders, the objective function of the firm should be a mirror of the shareholders interest, even if these shareholders become smaller and smaller. However, the dominant formulation yields that as non-common shareholders become smaller and smaller, the manager will only take into account the interests of common shareholders, even if they hold solely a small stake of the firm

In order to address this issue, the literature suggested alternative formulations. The first author who used an alternative approach was Crawford et al. (2018) in their work about multichannel television markets. While the second alternative approach was developed by Brito et al. (2018). In both cases,

authors reformulate the managers objective function, and the firm's strategy is now decided to "maximize a control-weighted sum of the relative expected return of the firm's shareholders". Now the bias of each shareholder, that was explained in voting model, is measure; being proportional to the stake of each shareholder in the firm.

These two alternative formulations differ from each other in computation terms. While in the Crawford et al. (2018) the equation of the relative expected return of an individual shareholder ( $k$ ) in the firm ( $j$ ) is the relation of the expected return of the shareholder  $k$  in firm  $j$  over all the stakes that shareholder  $k$  holds. So under the first alternative formulation, the weight  $w_{j,g}$  that manager of firm  $j$  assigns to the expected return of the rival  $g$  is given by:

$$w_{j,g} = \gamma_{k,j} \frac{\phi_{k,g}}{\phi_{k,j} + \phi_{k,g}} \geq 0 \quad (2)$$

This means, in this first alternative formulation the cross weight is the relation between total stocks held by shareholder  $k$  in firm  $g$  over total stocks held by shareholder  $k$ .

And in second alternative formulation, the cross weight is measure:

$$w_{j,g} = \gamma_{k,j} \frac{\phi_{k,g}}{\phi_{k,j}} \geq 0 \quad (3)$$

In Brito et al. (2018) the derivation of the cross weight is the relation between total stocks held by shareholder  $k$  in firm  $g$  over total stocks held by shareholder  $k$  only in firm  $j$ .



## Chapter 2: Theoretical Framework

Chapter 2 presents the theoretical framework behind the dominant formulation for the objective function of the manager (and the corresponding profit weights). The focus on the dominant formulation is explained by the need to compare with previous work of Backus et al. (2019), that used the dominant formulation to quantify the prevalence of common ownership on the S&P 500 index.

This section explains in detail all the steps incurred until achieving the profit weight associated to the dominant formulation.

The main ad-hoc assumption it is that shareholders can have different stake positions and the respective voting right over distinct firms of the same industry. This assumption is the key condition that can induce a conflict of interests shareholders, so the main goal is to measure the weight of shareholder interest over the decision-making process of the company and how managers tend to deal with this “pressure”.

As previously mentioned, one of the first authors to approach to common ownership concentration was Rotemberg (1984), that assumed firms maximize a weighted average of their total shareholders returns.

The universally accepted as the dominant formulation in common ownership studies states the maximization of the objective function of managers as:

$$\max_{x_j} \sum_{k \in \Theta_j} (\gamma_{k,j} E[R_k]) = \sum_{k \in \Theta_j} (\gamma_{k,j} E[R_k]) \quad (4)$$

So, the manager of the initial firm  $j$ , will maximize a weight sum of the expected profits not only of firm  $j$ , but eventually all the firms in the industry, that can be derived by:

$$\max_{x_j} \sum_{k \in \Theta_j} (\gamma_{k,j} E[R_k]) = \sum_{k \in \Theta_j} (\gamma_{k,j} E[R_k]) + \sum_{g \in \mathfrak{S}, g \neq j} \left( \sum_{k \in \Theta_j} \gamma_{k,j} \phi_{k,g} \right) \cdot E[\Pi_g] \quad (5)$$

It is useful to normalize the weight on own expected profit to one, where  $w_{jj}$  is the weight that manager of firm  $j$  assigns to the expected return of that same firm  $j$ , then comes the normalization  $w_{jj} = 1$

$$\Leftrightarrow \max_{x_j} E[\Pi_j] + \sum_{g \in \mathfrak{S}, g \neq j} \left( \frac{\sum_{k \in \Theta_j} \gamma_{k,j} \phi_{k,g}}{\sum_{k \in \Theta_j} \gamma_{k,j} \phi_{k,j}} \right) E[\Pi_g] \quad (6)$$

The weight that manager of firm  $j$  gives to the expected profit of firm  $g$  and is represented by the term  $w_{jg}$ , over the derivation of the dominant formulation, this weight can be given by, as derived before:

$$w_{jg} = \left( \frac{\sum_{k \in \Theta_j} \gamma_{k,j} \phi_{k,g}}{\sum_{k \in \Theta_j} \gamma_{k,j} \phi_{k,j}} \right) \geq 0^1 \quad (1)$$

Knowing  $j, g \in \mathfrak{S}$  and  $j \neq g$ .

It is important of note in markets without common ownership  $\gamma_{k,g} = 0$ , the manager of a firm  $j$  completely ignore the expected rivals' profit, so  $w_{jg} = 0$ , i.e the objective managers function is to maximize its own profit. On the other hand, if  $\gamma_{k,g} = \gamma_{k,j}$  for all the shareholders, as consequence  $w_{jg} = 1$  that

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<sup>1</sup>  $w_{jg} \geq 0$ , because  $\phi_{k,j} \in [0,1]$ ,  $\phi_{k,g} \in [0,1]$ , and  $\gamma_{k,j} \in [0,1]$  for all  $k \in \Theta_j$  and all  $j, g \in \mathfrak{S}$ .

represents the case where the manager takes into account the profit of the firms where the shareholders of his firm also have a stake with the same weight as the given weight to his own profit.

Authors like Bresnahan (1987) or Nevo (2001) studied the specific case of mergers, and the weights evolve from a null case to 1,  $w_{jg} = w_{jg} = 0 \rightarrow 1$ .

In very special cases, the variable  $w$  may even exceed the value 1. These are circumstances where the managers give more weight to the profit of the other horizontal shareholding firms than the weight he grants to his own profit, this can happen if the shareholder profit of his stake in firm  $g$  is greater than the shareholder profit of his stake in firm  $j$ .

To demonstrate how CoOCo can be a serious problem for market competitiveness, assume an extreme situation where shareholders are fully diversified, this means have the same fraction of shares over all (symmetric) firms. Under this assumption all the incentives to compete in the product market disappear, reaching a monopoly market level. Rotemberg (1984) also refers, in this situation all the incentives to deviate from a monopolistic situation are dissolved, in a nutshell, each manager objective function is simply a maximization of the shareholders' unilateral interest.



# Chapter 3: Empirical Analysis

## 3.1 Data Description

To collect the data required to construct the profit weights, I used the commercial database Thomson Reuters. The ownership data in Thomson Reuters was found to have gaps and errors in the information, as stated by Backus et al. (2019), who also found a lot of missing data during their data search, making the database and as consequence the data not so reliable as idyllically desirable.

During data collection, I selected the 100 biggest shareholders of each PSI-20 listed firm presented in the sample as well as the respective financial stake in each firm, for each quarter over the time window 1997-2019.

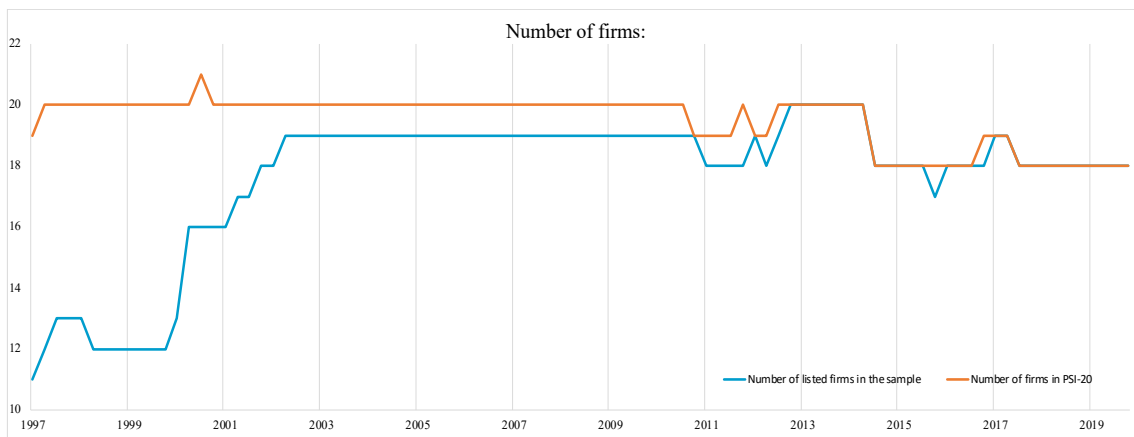
I consider that the cash-flow rights of each shareholder are equal to the fraction he holds of the total shares of the firm. And, as the voting rights that each shareholder exercises over the firm governance is a less transparent data; and most of the time is very difficult or even impossible to obtain reliable information. I follow most of the corporate finance literature and assume that

$$\gamma_{k,j} = \phi_{k,j}.$$

The total number of years under analysis (23), yields a total number of 92 quarters, which multiplied by the number of firms presented in the sample for each quarter: yields a total number of 1623 excel files downloaded from Thomson Reuters.

### 3.2 Sample Characteristics

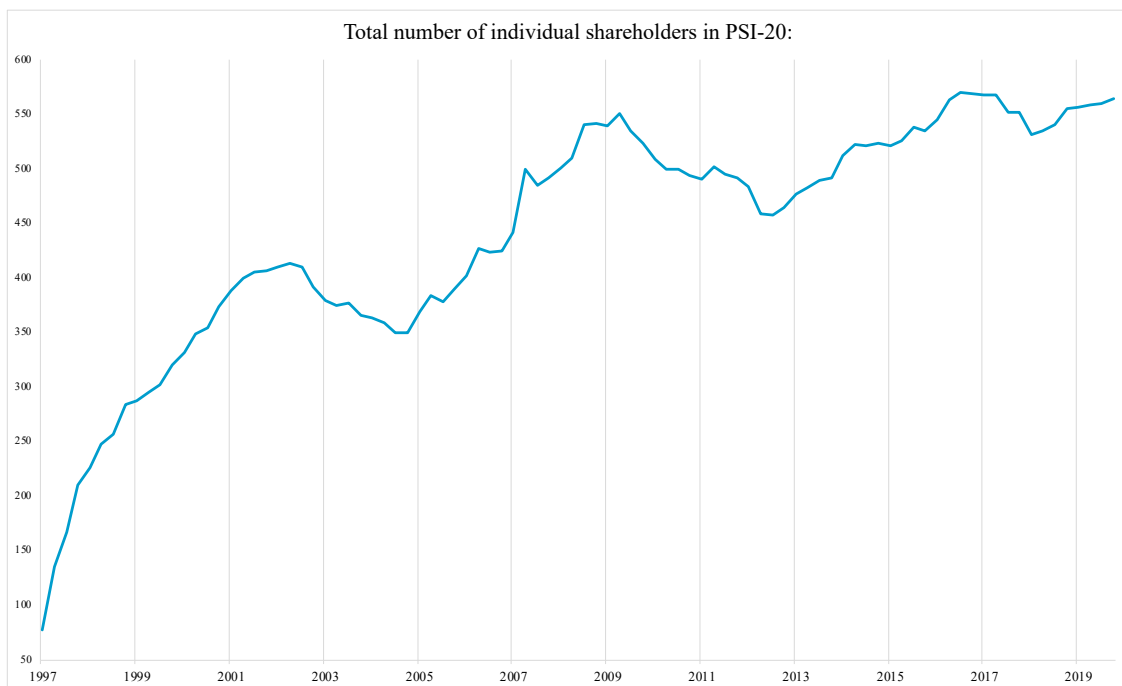
As mentioned before, the panel data is composed of firms listed in the main Portuguese Stock Index (PSI-20), in the time period 1997-2019, quarterly. This does not mean in itself that exists a sample of 20 firms for each analysed year. The number of firms listed in this index fluctuated between [16-21] range, and the inflow and outflow of firms in the Portuguese Index happen frequently. Further, Thomson Reuters has some missing data over the years. **Figure 1** presents, the number of firms presented in the sample over time.



**Figure 1:** Evolution of the number of firms in the sample.

The number of firms presented in the sample grew over the first 5 years, to reach a level of 19 firms in mid- 2002. The number of firms remained constant until 2011 and over the last decade, the number of firms presented in the sample varied slightly, but not in a significant way that needs to be highlighted. Thereby, this growth of the number of firms in the sample, over the first five years, tends to match with the real number of listed firms in PSI-20.

Having describe the number of firms in the sample, I now address the number of individual shareholders. Bearing in mind that for a sake of significance, only the larger 100 shareholders of each company over each quarter have been taken into account, **Figure 2** represents the evolution of individual shareholders during the period. This study of the number of individual shareholders has significant meaning because evaluates the dispersion of holdings in the considered firms.



**Figure 2:** Evolution of the number of the individual shareholders.

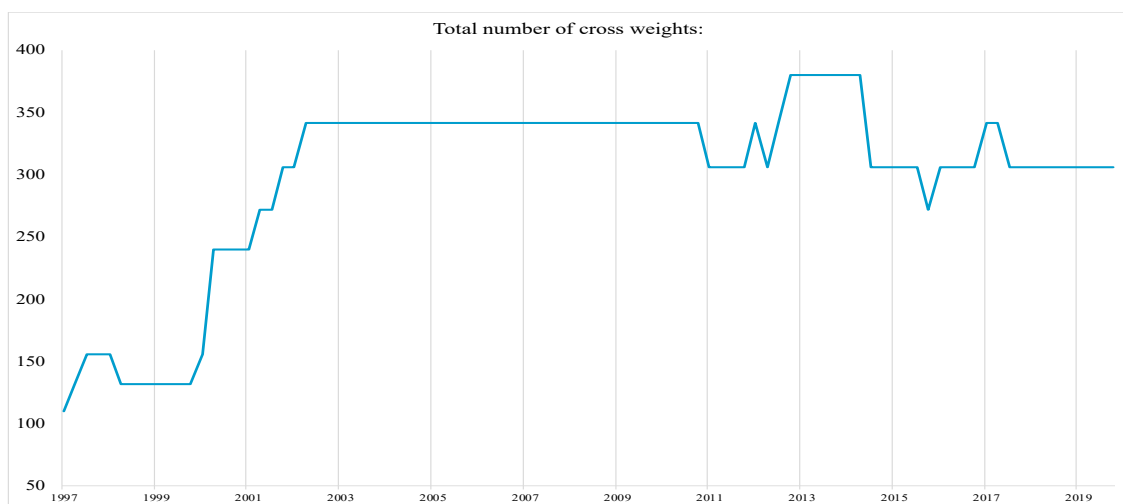
A very superficial analysis of **Figure 2** shows a clear growth trend of individual shareholders over the last two decades. Just some fluctuations in the chart evolution can be explained by the constant inflows and outflows of firms in the index. This persistent growth in the number of the individual shareholders can be a sign of an equal growth in the holdings dispersion but

drawing this conclusion by itself could be a mistake because the holding proportion of each individual shareholder is not taken into account.

### 3.3 Average Cross-Profit Weight in the PSI-20

I computed the profit weight between each firm in the PSI 20 index for each quarter. **Figure 3** presents the number of cross profit weights computed over the different periods, which yields a total of 27520 profit weights.

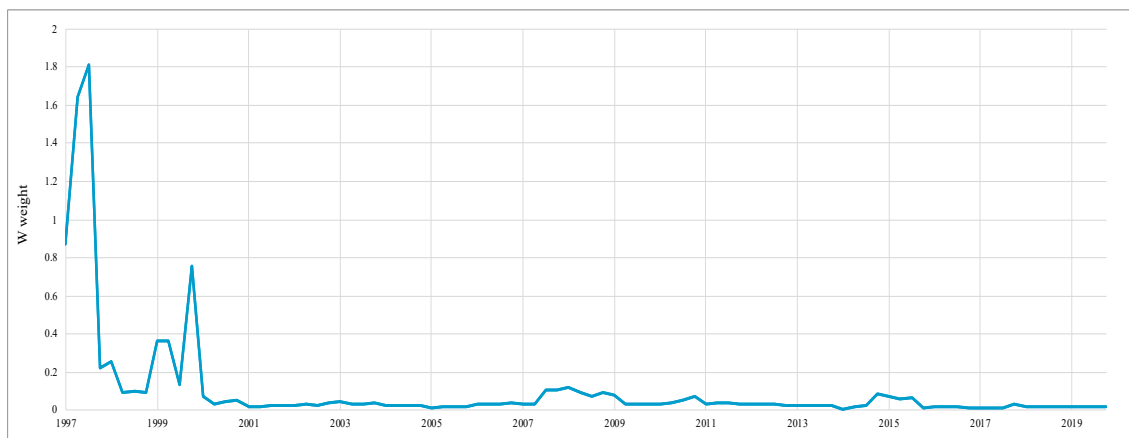
I performed these computations in Octave, making use of a matrix representation of the profit weights (see Appendix A and B for the matrix representation and the Octave code, respectively).



**Figure 3:** Evolution of the total number of cross weights.

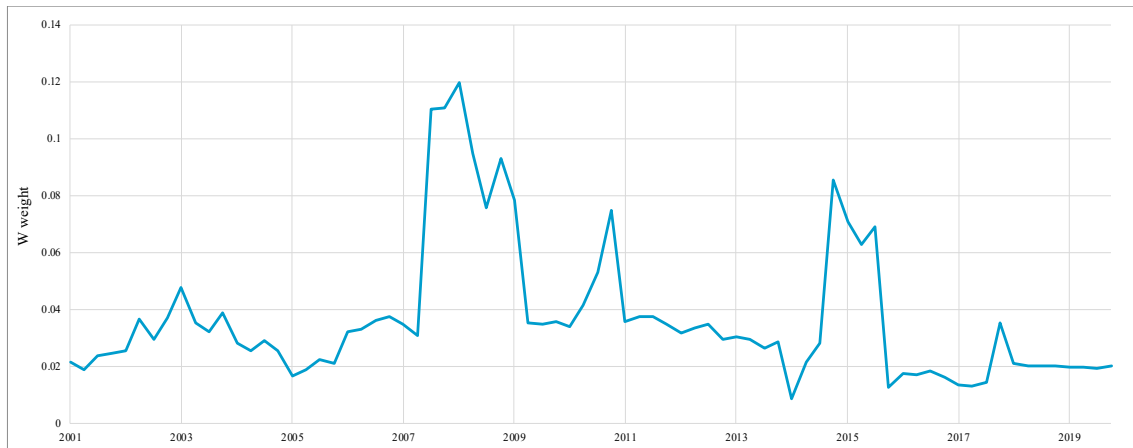
**Figure 4** is the main goal of this thesis, measuring the evolution of the average cross profit weight, represented on the vertical axis, over the period under analysis. This captures the average weight that a manager of a firm in the PSI-20 Index gives to the expected profit of the remaining firms of the index in which shareholders of also have a stake.

Taken into account all the signs, the previous figures, and also during the data extraction and cleaning process, the data of the first four years should be discarded of the data analyses. Because all indicate little likelihood and significance data in this first period, the firm sample is also relatively small to draw any kind of conclusion. Doing the remark over Thomson Reuters database, the correction of this error data situation is crucial to future similar researches.



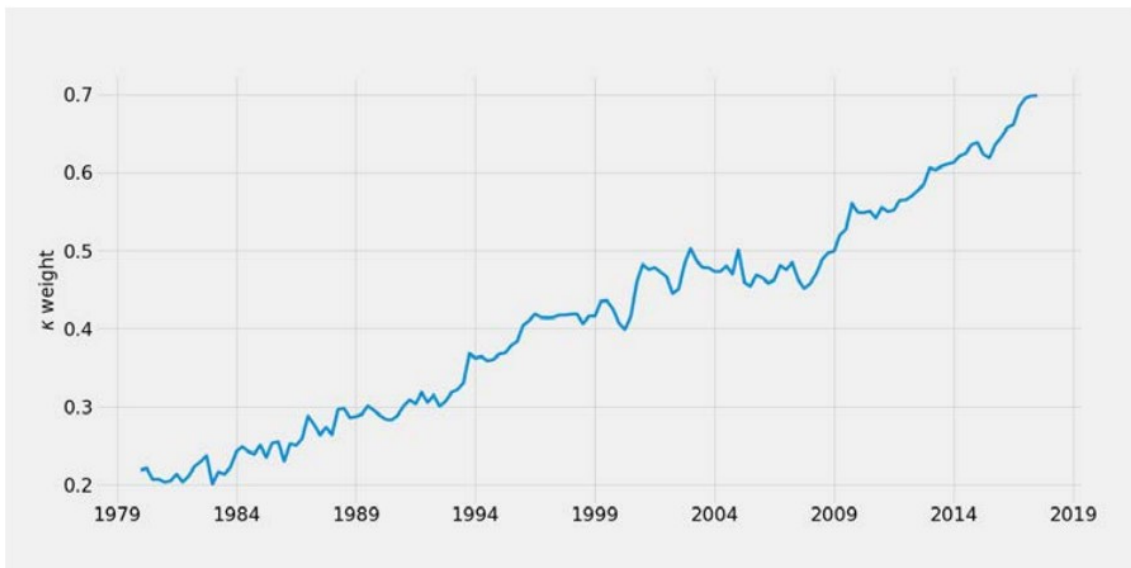
**Figure 4:** Evolution of the Common Ownership Profit Weights over time.

**Figure 5** replicates **Figure 4** for the sub-period from 2001 to 2019.



**Figure 5:** Evolution of the Common Ownership Profit Weights over the sub-period (2001-2019).

From the beginning of 2001 till the end of 2019, the average cross profit weight has a stable behaviour, only with two small climbs, in 2008 and in early 2015. But these fluctuations are so small that don't have relevant meaning to the question. The average cross profit weight in Portugal never crosses the 0.14 level. This implies that PSI-20 managers give very little weight to the profit of the other firms of the index in which their shareholders also have a stake, being in a situation of almost indifference to the profits of the other firms, so the managers only take into account their own profit. This situation is constant over time. To sum up, that common ownership concentration in Portugal main stock index is relatively small, almost asserting that is impossible to exist a market power position as a result of common ownership phenomenon.



**Figure 6:** Evolution of the Common Ownership Profit Weights over time in S&P 500 Index. The figure source is Backus et al. (2019)

Considering that Backus et al. (2019) called to the average cross profit weight variable : “K Weight”. The Portuguese case seems to be the opposite of the U.S case. The plot constructed by Backus et al. (2019) finds that the common ownership hypothesis tripled among S&P 500 firms, from 0.2 in 1980 to almost 0.7 in 2017. One growth tendency line, very well defined, which suggest that American managers give on average almost the same weight to the profits of other S&P 500 firms that they give to their own profit. A totally different case is the Portuguese reality where the profits of other PSI-20 firms are almost ignored by Portuguese managers during the decision-making process.



# Chapter 4: Conclusions and Future Research

The purpose of this thesis is a study of the common ownership phenomenon for the Portuguese reality, being a pioneer work to apply the procedure of Backus et al. (2019) to the PSI-20 index.

I conclude that the presence of common ownership in the main Portuguese Index is limited over the period under analysis, at least; when compared to Backus et al. (2019)'s results for the U.S S&P 500 index. While in S&P 500 average cross profit weight increased more than 3 times over the last three decades, from just 0.2 in 1980 to almost 0.7 in 2017; the average cross profit weight in Portuguese main stock index is almost stable and takes values that allow me to conclude that managers of PSI-20 firms attribute very little weight to the profit of other PSI-20 firms. This constitutes a setting very similar to the one stated by Friedman (1953) in which managers only have a goal: maximize the value of its own firm.

As mentioned in previous sections, the dominant formulation has some weaknesses, because does not incorporate the relative weight of each shareholder in the total value of the firm. But this first approach over the Portuguese reality wants to serve as a motto to future more in-deep researches. The challenge to future authors is to use the alternative formulations of Crawford et al. (2018) and Brito et al. (2018), to measure the common ownership

phenomenon over the same index or even with a large sample of Portuguese firms. Future works should also use different databases, to compare the results with the Thomson Reuters data, as well as more reliable data. And correlate common ownership with variables as the prices in certain industries or even firms' market share, to be possible to measure the social costs over the Portuguese economy.





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# Appendix

## Appendix A – Matrix Level

The profit weights under the dominant formulation can be written in matrix notation. For each quarter, let  $F$  denote the  $K \times N$  matrix capturing the financial rights, with the typical elements  $\phi_{k,j}$ . Let  $C = F$  denote the matrix capturing the control rights.

The (non-normalized) matrix of profit weights is given by  $L = C^T F$ . While the matrix of normalized profit weights is given by  $W = \text{diag}(C^T F)^{-1} C^T F$ , that is the goal matrix.

## Appendix B – Octave Code

Figure 7 : Example (for 1997, Q3) of the Octave Code used to compute the matrix of normalized profit weights.

```
1 #open csv file;
2 x=importdata('/Users/josesalazar/Desktop/octave_projects/dados_octave/1997/03-97.csv');
3
4 #ungroup X by columns;
5 vector_companies = x(:, 1);
6 vector_shareholders = x(:, 2);
7 X = x(:, 3) / 100;
8 vector_perc_outstanding = X;
9
10 #Company unique;
11 list_companies = unique(x(:, 1));
12
13 #Shareholder unique;
14 list_shareholders = unique(x(:, 2));
15
16 #create a variable that define the number of companies;
17 number_of_companies = rows(list_companies);
18
19 #create a variable that define the number of shareholders;
20 number_of_shareholders = rows(list_shareholders);
21
22 #create a matrix with the size equal to the number of companies;
23 F = zeros(number_of_shareholders, number_of_companies);
24
25 #loop over loop to find the comun shareholders;
26 disp('loop company over company');
27 for j = 1: number_of_shareholders;
28     for jj = 1: number_of_companies;
29         A = (vector_shareholders == list_shareholders(j) && vector_companies == list_companies(jj));
30         if sum(A) > 0;
31             F(j, jj) = vector_perc_outstanding(A);
32         endif
33     endfor
34 endfor;
35
36 #transpose matrix;
37 C = F;
38 CT = C.';
39
40 #compute matrix L;
41 L = CT * F;
42
43 #create a zero matrix;
44 W = zeros(number_of_companies, number_of_companies);
45
46 #loop to compute 'W';
47 for t = 1: number_of_companies;
48     W(t, :) = (L(t, :) / L(t, t));
49 endfor;
```