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Content

Editorial

January 2016

The fourth issue of the Banco de Portugal Economic Studies, and the first of 2016, contains three papers studying Portuguese firms and their industries. All papers have an empirical basis i.e., they use and analyze economic activity data from Portugal. However, the issues, the methodologies and the spirit of the analyses show a heterogeneous relationship with modeling and with the Economics literature. The first paper is close to classical areas in financial economics, both in terms of theory and with regard to empirical work but with a link to this body of knowledge that is flexible enough for the analysis to contemplate some distinctive features of the financing of Portuguese firms. The second paper is based on a sufficiently detailed structural modeling effort to enable the preparation of counterfactuals for the performance of companies and industries. The resulting estimates of inefficiency levels emerge from the comparison between the original data and the counterfactuals generated. The third paper has a descriptive nature without a major underlying theoretical framework but capturing and documenting business behaviors of great importance and timeliness.

The first article of this issue of the Banco de Portugal Economic Studies was written by Luciana Barbosa and Paulo Soares de Pinho and it is titled "Structure of corporate funding". This study used detailed annual data on a large number of companies to analyze the corporate debt composition and estimate its main determinants. Data are from the Central Balance Sheet database of Portuguese firms that has been fed since 2006 by official data from the system of Simplified Business Information. The sample, covering the years 2006-2012 includes 655 000 observations corresponding to 147 thousand companies.

There are four funding sources studied in the analysis: bank credit, trade credit, tax liabilities and loans from shareholders or from other units of the same economic group. Some of these sources such as shareholders' loans have an importance much higher in the Portuguese economy than the relevance they are given in international references. The different types of funding are modeled econometrically as a system of equations. The variables explained are the value of each source of funding as a percentage of assets and the explanatory variables include, among others, measures of profitability, growth rates of sales, firm size, firm age and control variables for the year and the industry and for the inclusion of the firm in an economic group. The results show that corporate profitability is negatively correlated with the use of the four types of debt, indicating greater use of self-financing. The age of the firm generally has a negative effect on debt, which could have several explanations including factors associated with the life cycle of firms. Another result is a

positive effect of the growth rate of sales on debt levels, possibly due to the need to finance firms' growth. A further variable leading to higher debt levels is the volatility of sales. The paper contains several additional results for other variables of interest and finds some situations with significant heterogeneity, such as the effect of firm size in the use of the different funding sources.

The second paper is from Daniel Dias, Carlos Robalo Marques and Christine Richmond and it has the title "Comparing misallocation between sectors in Portugal". Following a literature dissecting efficiency problems by way of conducting international comparisons, the authors study whether services have higher levels of inefficiency than manufacturing, a result found in that literature. The analysis is based on a detailed specification of the production functions of companies in each industry and in determining the equilibrium amounts of production, capital, labor and intermediate inputs from equations that can be interpreted as summarizing competitive markets equilibria for inputs and monopolistic competition equilibria in the markets for final goods. The end result is a distribution of the use of inputs and outputs across firms which, in the absence of distortions, all firms in the same industry should have equal standards for the use of resources (eg. the same capital labor ratio). In fact, as the firms exhibit significant heterogeneity in the use of resources, this means that several distortions must be present, deteriorating the level of efficiency.

Potential efficiency gains can be estimated assuming that companies in each industry converge on the use of inputs to the correct values in that industry subject to the restriction of using the same aggregate resources by industry. To quantify the outputs in the situation with distortions the model is calibrated by making some assumptions (about substitution elasticities in demand and about the parameters of the Cobb-Douglas functions) and by using empirical data from 236 022 observations from 2008 and 230 157 from 2010 from the Simplified Business Information, a source cited previously. Comparing the output simulated by the model for the resource allocation without distortions and the actual output we obtain a measure of the existing levels of misallocation. The analysis of the results shows overall misallocation levels above 40% and much lower levels of inefficiency in manufacturing (around 16%) compared to services (between 43% and 50% depending on the year). These results change somewhat when various methodological options regarding assumptions and treatment of the raw data are modified. After a set of plausible methodological changes is adopted the results still indicate a substantial misallocation differences between services and manufacturing, although smaller. In a second part, the paper analyzes the sources of this difference, decomposing the effects in slow or no adjustment to shocks in productivity (including gaps in labor adjustments and rigidities in the setting of product prices), differences in corporate structures (distortions interpreted as consequences of the higher levels of informality in the services) and lastly differences in the age distribution of firms, the latter with a net contribution

to reducing the difference between the levels of misallocation in services and manufacturing.

The third and final article, by Fernando Martins and with the title "How the Portuguese firms reacted to the economic and financial crisis: Main shocks and channels of adjustment" explores a database collected between July 2014 and February 2015 with information on the behavioral changes of firms reacting to the problems stemming from the crisis. The design and collection of the database on Portuguese firms was part of an effort by economists at the European Central Bank and national central banks to document how firms experienced shocks in the years of economic and financial crisis, how they sought to deal with these shocks and how the shocks and reactions to them had an impact on labor markets. The data collected covered around 1400 companies, with diversified dimensions and from various industries.

With regard to the sources and nature of the shocks, the survey considered demand shocks, credit supply shocks, customers repayment shock, and supply shocks. Despite dominance of negative shocks, as expected, the data reveal surprising levels of heterogeneity. Only 3.7% of companies did not suffer shocks, 25.1% had only negative shocks, 14.3% had only positive shocks and 56.% had both positive and negative shocks, with the latter being more numerous. The most significant shocks were the deterioration in customer payment patterns and a drop in demand, followed by shocks in access to credit. The shocks were mostly described as having a permanent nature. When it comes to the reactions to these shocks, the survey considered two main areas: changes in pricing policies and adjustments to labor costs and employment. In the first area the increased flexibility in pricing stands out, for example with an increased frequency in the adjustment of prices due to competitive pressures. In the area of labor costs firms report adjusting the flexible components of salaries and the employment level by freezing hires of permanent workers and by non-renewal of temporary contracts at expiration.

Taken together, the various essays in this issue of the Banco de Portugal Economic Studies contribute to deepen our knowledge of Portuguese companies, their behavior and their large and sometimes neglected diversity.

Structure of corporate funding

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January 2016

Abstract
Funding is crucial for firms to invest but also to operate their daily business. Different types of debt have different characteristics and requirements for firms. This paper aims to identify the main determinants of the composition of corporate funding. In addition to bank and trade credit, two relevant funding sources, we also include in the analysis tax liabilities and loans from shareholders or intra-group operations. The results suggest that some firms' characteristics present a similar impact on alternative funding sources, such as profitability, while others show a heterogeneous effect. Moreover, the results suggest the relevance of variables related to firms' operational activity and business risk in funding structure. (JEL: G21, G32)

Introduction

Funding is crucial for firms to invest and to expand, but also to operate their daily business. Some firms rely more intensively on internal funds, while others rely more intensively on external funding. What determines a firm's capital structure and the heterogeneity across firms are important topics in corporate finance, but also for the real economy. The level of indebtedness of Portuguese firms and its implications for the economic recovery have often been discussed during the last years, in particular during the most recent crisis.

The literature on corporate capital structure is huge. In particular, this literature explores the advantages and disadvantages of capital and debt for firms, due to market frictions, conflict of interest or tax benefits. The *trade-off* theory (where leverage reflects debt's advantages and costs) and the *pecking order* theory (the optimal hierarchy of funding sources) are two of the most discussed theories in this field. However, it is also important to look carefully at the composition of corporate funding. Indeed, even for the set of firms that

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have relatively stable leverage ratios, a non-negligible share of these firms also changed the composition of their liabilities (as discussed in Rauh and Sufi (2010)).

Different types of debt have different characteristics and requirements for firms. For instance, each type of debt has a distinct market functioning, different sensitivity to firm's information and different payments schemes. Thus, it is also important to analyze debt components. Under this framework, some studies explore the composition of firm's liabilities as well as firm's access to financial markets. Due to their relevance in total external funding in several countries, bank and trade credit are two debt components that have received special interest in the literature.

This study explores the composition of corporate debt. In addition to the analysis of bank and trade credit, we also analyse debt components related to tax liabilities and shareholder or intra-group loans. Tax liabilities can be a relevant component for liquidity and working capital management. In turn, loans from shareholders or intra-group operations are important due to their nature, *i.e.* owners provide funding to firms thought debt instruments rather than own equity. The purpose of this study is to identify the main determinants of bank and trade credit, but also of tax liabilities and shareholders or intra-group loans. The analysis is performed using a unique and detailed micro dataset for Portuguese firms, the Central Balance Sheet database, which covers virtually the entire Portuguese corporate sector.

This study contributes to the empirical literature on corporate funding, given that it explores different debt components that have different characteristics and consequently expose firms to different shocks. Moreover, a particular contribution is related to the analysis of some debt components that are not usually documented in the literature of corporate funding or liquidity management, namely loans granted by shareholders or intra-group operations and tax liabilities.

According to the results, we observe that profitability is negatively related to the funding sources included in the analysis. We also find that variables related to the activity and operational cycle of firms play a role in determining the respective funding sources. Furthermore, firm's business risk seems also to be an important feature, in particular for tax liabilities and shareholders or intra-group loans.

The remainder of this article proceeds as follows: Section 2 briefly reviews some of the literature on corporate funding. Section 3 describes the data sources and presents some descriptive statistics. Section 4 presents the main econometric results. Section 5 explores heterogeneity across firms, while Section 6 presents a robustness test. Finally, Section 7 presents the main conclusions.

Review of the literature

According to Modigliani and Miller (1958), under some assumptions, in particular the absence of taxes, firm's capital structure is irrelevant to determine its value. However, as discussed in Modigliani and Miller (1963), the existence of corporate taxes and the possibility of recording interest payments as a cost (creating tax shields) alter considerably the *irrelevance proposition* presented previously, demonstrating that there are some benefits for firms holding debt. But, holding debt also has costs, such as the costs associated with financial distress.

Since these seminal papers, there was an explosion of (both theoretical and empirical) research on capital structure. Most of the empirical research has focused on testing the two main views of capital structure: the *trade-off* theory and the *pecking order* theory (Myers (1984) and Myers and Majluf (1984)). According to the former theory, firms have targets for the leverage ratios that balances several debt costs (*e.g.* financial distress costs, stockholders-bondholders agency conflicts) and debt benefits (*e.g.* tax savings, mitigate manager-shareholder agency costs). According to the *pecking order* theory, firms follow an optimal financing hierarchy in order to minimize adverse selection costs related to market imperfections. Under this theory, firms first use internal funds, then use debt and only issue equity once their debt capacity is exhausted. Even though these theories identified relevant facts related to firm's capital structure, some unexplained facts persist. Neither of these theories were able to explain the heterogeneity observed in the structure of corporate funding. More recently, other theories complement this analysis, trying to introduce alternative explanations for firm's capital structure decisions, such as the *dynamic trade-off* theory (related, for instance, to adjustment costs or endogenous investment), or *equity market timing* theory.[1]

Understanding firms' decisions between internal and external funding sources is a relevant topic. However, it is also important to look carefully to the composition of corporate debt. Indeed, even within firms that present relatively stable leverage ratios (*i.e.* own capital versus debt), some firms also adjust some funding components (as described in Rauh and Sufi (2010)).

Looking at financial debt, empirical studies (such as Barclay and Smith (1995), Gomes and Phillips (2005), Houston and James (1996) and Houston and James (2001), Johnson (1997), Cantillo and Wright. (2000), or Hadlock and James (2002)) investigate the relation between the access to financial markets and firms' characteristics. In general, these studies confirm the positive relation between the access to debt markets or financial institutions and firms' characteristics such as size, leverage, age, and the amount issued.

1. See Graham and Leary (2011) for a survey of the literature on capital structure.

Denis and Mihov (2003) also analysed differences within debt types, exploring the determinants of new debt issues. The authors argue that one of the main determinants is firm's credit quality. Their results suggest that firms with highest credit quality obtain credit in financial markets, firms with medium credit quality obtain funding from banks, while firms with the lowest credit quality borrow from non-bank private lenders.

More recently, Rauh and Sufi (2010) adopted a different perspective in analysing capital structure decisions and debt components, finding that the standard correlation between determinants and debt ratios can be quite different depending on the debt instrument in analysis. Moreover, they also show that firms rely on several debt instruments, depending on the firms' credit quality. By contrast Colla *et al.* (2013) extended the dataset used by Rauh and Sufi (2010) by including unrated public firms. They found instead a tendency towards debt specialization, *i.e.* the concentration in one type of debt. This study also highlights that looking more deeply into debt components contain relevant information about corporate funding.

Due to the relevance of bank credit as an external funding source to firms, given that a significant fraction of firms do not have access to wholesale debt markets in several countries, another important avenue of research explores this debt component and bank lending relationships. This literature is quite extensive and suggests an impact of these relationships on firm's access to external finance. According to the literature, firm-bank relationships play a critical role in mitigating asymmetric information, which is more relevant for smaller and younger firms. The literature suggests that a borrower should benefit from a smaller number of relations and longer bank lending relationships. However, empirical results on this topic are mixed.[2] In particular, a significant fraction of firms have more than one lending relationship. These lending relationships are conditioned by several factors: for both firms and banks, there is a trade-off between the benefits of a closer relationship and the benefits of a broader diversification of funding/borrowers, such as firm's hold-up problems, market competition or banks' portfolio diversification (Carletti *et al.* (2007)). The relation between the number of banking relationships and firm's credit quality has also been an important topic of research, but the arguments in this topic are divergent (*e.g.* Degryse and Ongena (2001), Farinha and Santos (2002), and Fok *et al.* (2004)).

Beyond financial debt markets and bank credit, there is some literature on other funding sources, namely non-financial funding, such as trade credit.

2. For instance, an increase of the number of lending relationships decreases the amount of credit (Petersen e Rajan (1994), Cole (1998) and Harho and Körting (1998)), while longer relationships increase the availability of credit (Petersen and Rajan (1994), Harhoff and Körting (1998)), and decrease collateral requirements (Harhoff e Körting (1998) e Berger e Udell (1995)). However, regarding interest rates the empirical evidence is mixed (e.g. Berger and Udell (1995), Houston and James (1996), Petersen and Rajan (1994), Bonfim et al. (2009)).

This was mainly motivated by the fact that trade credit is widely used and represents an important funding source for several firms. In the traditional perspective, trade credit plays a non-financial role for firms, such as the reduction of transaction costs, price discrimination, warranty of product quality, or to foster longer relationships with customers, (*e.g.* (Petersen and Rajan (1997)). Financial literature complemented this analysis, showing that trade credit also plays a role as a funding source for firms.

Given the implicit high cost of trade credit (based on the implicit interest rate), one of the main questions is the relation between trade credit and other funding sources (perceived as cheaper), namely bank credit. The predominant idea is that firms use trade credit because there are bank credit constraints (*e.g.* Petersen and Rajan (1994), Nilsen (2002), and Cuñat (2007)).[3] Trade credit is therefore seen as a substitute funding source, *i.e.* firms use alternative available forms of credit before trade credit (*e.g.* Atanasova and Wilson (2004)). Nevertheless, according to Biais and Gollier (1997) and Burkart and Ellingsen (2004), trade credit can also play a role as a complement to bank credit. Firm's suppliers may have a comparative advantage over banks in collecting information, assessing a firm's creditworthiness, and monitoring firm's decisions. Thus, due to suppliers' ability to discriminate between good and bad firms, trade credit may work as a signal about firm's credit quality.

This study explores the differences in funding components, as highlighted in Rauh and Sufi (2010). However, while the authors focus on financial debt instruments, we analyse firm liabilities in a broader perspective. Therefore, this article is related to papers that explore bank and trade credit, two of the main components of firm liabilities, but it explores additional debt components, namely tax liabilities and loans granted by shareholders or intra-group operations. These debt components are not so well documented in the empirical literature of corporate funding. Tax liabilities can be related to the possibility that firms explore the payment schedule of these liabilities (*e.g.* allowing firms to overcome/manage working capital needs). In turn, shareholders or intra-group loans are a topic that raises several questions, due to the holders of these loans and the relation to own equity. Depending on the contract, these loans can be perceived as capital by other debt holders. Indeed, in several jurisdictions, these loans are treated as capital when insolvency events occur. Moreover, the remuneration of these loans may also contribute to their attractiveness. For firms, the interest paid on these loans, under some circumstances, can be treated as a cost. Thus, for the other debt holders these loans can be seen as a "form of equity", but they may generate tax shields. Since in Europe equity decreases are seriously constrained, shareholders or

3. Cuñat (2007), looking at a panel of UK firms, found that trade credit is used at the margin, when other forms of credit have already been exhausted. Their results also suggest that the evolution of trade credit is related to the length of the commercial relationships, and that trade credit seems to be more prevalent when firms have lower levels of liquidity.

intra-group loans become a more flexible way to finance firms than equity. The reimbursement of these loans is limited by covenants imposed by the debt terms of these contracts instead of the general equity law. Additionally, from the shareholders' perspective, there can also exist some heterogeneous fiscal treatment on income earned by interests or dividends (loans versus capital remuneration). This may also have impact on shareholders' incentives between the two options to "invest" in firms.

Data and variables

Data sources

The data used in this article correspond to the annual information from the Central Balance Sheet database (CB) of the Portuguese corporate sector, available at Banco de Portugal.

The CB includes financial information, based on financial statements, and some additional firm's characteristics, such as the industry sector and the start-up date. Since 2006, the annual CB is based on the Simplified Corporate Information survey (Informação Empresarial Simplificada - IES) instead of a voluntary survey.[4] In order to exploit IES, which has almost universal coverage of the Portuguese corporate sector, the sample period begins in 2006 and goes up to 2012.

In 2010, there were some relevant changes with impact on the analysis. On one hand, there was a change in the accounting rules. On the other, a new IES's survey was implemented. These events required some adjustments in the information available in IES. Some variables need to be interpreted with special care due to the need to reconcile the two reports and establish a link between the two accounting schemes.[5]

Simultaneously, we impose some selection criteria in the definition of the dataset. Firstly, the financial sector and public administrations were excluded, as well as observations with misreported data for total assets, business volume, number of employees, and age. Furthermore, firms with less than 5 employees were also ruled out. Moreover, in order to remove outliers, we winsorize the variables at the top and bottom two per cent levels.

4. IES is an electronic submission of accounting, fiscal and statistical of information nature that companies have to submit to the Ministry of Justice, the Ministry of Finance, Statistics of Portugal and the Banco de Portugal. Thus, instead of companies reporting nearly the same information to the different public entities in different moments in time and in different formats, as happened until 2006, they report once a year to the simplified system. As all firms have to submit the report, IES allows for a high coverage of the Portuguese corporate sector.

5. This topic will be analysed in more detail whenever relevant in the analysis.

The final dataset comprises of more than 655 000 observations, which corresponds to an unbalanced panel covering the period 2006 to 2012 and around 147 000 firms.[6]

Descriptive statistics

Table 1 displays some descriptive statistics on the capital structure and debt composition of firms included in the dataset. In turn, Table 2 presents the mean and median figures of the distribution of these variables in each year.

At the aggregate level, bank debt is the main external funding source for firms included in the dataset. Despite this fact, a significant share of firms in the sample do not have any bank credit (around 30 per cent). For Portuguese firms, bank credit corresponds to the main component of their financial debt. Debt securities represent a small share of this component, reflecting the fact that few firms have access to the wholesale debt market. Therefore, debt securities are included in the component "other funding", the omitted category. The two other sizable categories are trade credit and shareholders or intra-group loans. Tax liabilities amount to a smaller fraction of funding, but all firms use or manage the payment schedule of these liabilities.

In turn, when we observe the distribution of these variables in the sample, there are relevant differences. Total indebtedness levels are higher, both in terms of the mean and the median. This means that several smaller firms present higher leverage ratios than larger firms. The structure of funding sources is also different between aggregate values and the respective distribution. The share of trade credit increases significantly, while the bank credit decreases. Shareholders or intra-group loans also increase considerably in the first years of the sample period, but decrease afterwards. However this break is related mainly to changes in the accounting schemes and IES's reports introduced in 2010. These events seem also to affect the share of bank credit, but to a smaller extent.[7]

The results of the two approaches highlight the importance of complementing the analysis of the corporate sector at aggregate level, with additional analysis based on microdata due to the significant differences in firms' funding structure.

6. However, to lack of available data for some variables under analysis for all observations, the econometric analysis is performed in next sections could include a smaller set of firms.

7. The impact of the changes introduced in 2010 were not so evident at the aggregate level (*i.e.* with weighted figures). The impact of these events will be taken into account in the analysis presented in the next sections. The changes in accounting schemes and reports avoid the distinguish between loans from shareholders and loans from firms in the same economic group, which was possible in the period before 2010.

	N. of Firms	Equity	Total Funding	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group
2006	100 355	0.303	0.598	0.188	0.138	0.027	0.078
2007	102 373	0.303	0.596	0.179	0.132	0.024	0.090
2008	100 660	0.283	0.617	0.194	0.129	0.020	0.095
2009	94 741	0.286	0.605	0.189	0.124	0.021	0.101
2010	93 620	0.301	0.645	0.200	0.124	0.019	0.113
2011	86 148	0.293	0.655	0.181	0.123	0.017	0.141
2012	77 283	0.287	0.661	0.168	0.114	0.018	0.148
Share of observations with positive values		0.86	1.00	0.69	0.94	1.00	0.41

TABLE 1. Funding Sources at the Aggregate Level (Weighted average)

Note: All the variables are scaled by total assets at book value. Total funding corresponds to the ratio of total debt, excluding "Acréscimos e diferimentos" and provisions, over total assets. Thus, Total funding and Equity are not complements (the sum of the two variables may be different than one).

	N. of Firms	Equity	Total Funding	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group
2006	100 355	0.238	0.722	0.128	0.208	0.083	0.112
		0.226	*0.710*	*0.045*	*0.156*	*0.040*	*0.002*
2007	102 373	0.226	0.717	0.133	0.205	0.077	0.107
		0.243	*0.703*	*0.051*	*0.152*	*0.036*	*0.001*
2008	100 660	0.227	0.715	0.139	0.199	0.073	0.106
		0.247	*0.697*	*0.055*	*0.145*	*0.034*	*0.000*
2009	94 741	0.237	0.705	0.150	0.191	0.070	0.102
		0.259	*0.686*	*0.076*	*0.137*	*0.033*	*0.000*
2010	93 620	0.236	0.747	0.198	0.195	0.071	0.040
		0.268	*0.717*	*0.137*	*0.140*	*0.033*	*0.000*
2011	86 148	0.241	0.744	0.184	0.190	0.070	0.058
		0.283	*0.702*	*0.118*	*0.135*	*0.032*	*0.000*
2012	77 283	0.245	0.739	0.174	0.188	0.072	0.062
		0.300	*0.685*	*0.104*	*0.132*	*0.033*	*0.000*

TABLE 2. Funding sources - Distribution in the dataset (mean and median figures)

Note: The figures presented in italic corresponds to the median figures of each variable in each year. All the variables are scaled by total assets at book value. Total funding corresponds to the ratio of total debt, excluding "Acréscimos e diferimentos" and provisions, over total assets. Thus, Total funding and Equity are not complements (the sum of the two variables may be different than one).

Table 3 presents some summary statistics looking at the funding structure by firm's size (based on the assets, business volume, and number of employees) and age.[8] The empirical literature suggests that there are differences in the access to external finance due to firm size and age, which are are usually proxies for asymmetric information, information opaqueness, and firm's credit quality. By firm size, we observe that larger firms are more capitalized. Looking at the external funding sources, bank credit is more relevant for medium sized firms, while the weight of trade credit is relatively stable across categories. Tax liabilities and loans from shareholders or intra-group operations are particularly relevant in the funding structure of micro and small firms. By firm age, we see that younger firms are relatively less capitalized. They also present differences in the debt structure, with higher shares of tax liabilities and loans from shareholders or intra-group operations.

As far as firm characteristics are concerned, we first analyze the variables highlighted in the capital structure literature, *i.e.* variables related to internal funding, agency costs, bankruptcy costs, and asymmetric information. In line with *e.g.* Rajan and Zingales (1995), we consider profitability, growth opportunities, tangibility and size.

Profitability (PROFITABILITY) is defined as net earnings before provisions and depreciations over total assets. Sales growth (SALES GROWTH) is the year-on-year change of sales, and it intends to control for the firm's growth opportunities. Tangibility (TANGIBILITY) corresponds to the share of tangible assets in total assets, and is used to control for the assets that a firm can pledge as collateral in credit operations, which decrease agency costs. These assets should retain more value in case of liquidation and thus also decrease the cost of bankruptcy. Moreover, tangibility gives us some information about the assets structure of each firm. Firm's size (SIZE) is included in the analysis as the logarithm of total assets. Size is usually related to asymmetric information and credit quality. In particular, lenders see larger firms as a lower credit risk and more transparent. In the same line, age (AGE) is also included: older firms have established track records that lenders can evaluate. Additionally, age is also related to the firm's life cycle, and financial needs are usually higher in the initial years of firms.

As we intend to explore corporate funding in more detail, instead of the total leverage ratio, it is also important to control for additional factors that could be underlying the use of different funding sources. In particular, as some of funding sources considered are related to firm's activity and operational

8. Firms' size is defined according to the European Commission Recommendation of 6 May 2003 (2003/361/EC). Thus, micro firms are defined as those with less than 10 employees and less than 2 million euro of business volume or total assets; small firms are those with fewer than 50 employees and less than 10 million euro of business volume or total assets; medium firms are those with fewer than 250 employees and a business volume below 50 million euros or whose total assets is lower than 43 million euros. The remaining firms are considered large firms.

Panel A - Firm size

	Micro		Small		Medium		Large	
	mean	*median*	*mean*	*median*	*mean*	*median*	*mean*	*median*
Total funding	0.76	0.72	0.70	0.69	0.65	0.65	0.61	0.61
Equity	0.21	0.25	0.26	0.27	0.28	0.29	0.29	0.30
Bank credit	0.14	0.05	0.17	0.11	0.19	0.15	0.14	0.05
Trade credit	0.19	0.13	0.20	0.16	0.20	0.16	0.18	0.14
Tax liabilities	0.08	0.04	0.07	0.03	0.06	0.02	0.05	0.02
Ec. group and shareholders	0.11	0.00	0.07	0.00	0.05	0.00	0.07	0.00
Share of each class	52.39		40.35		6.19		1.07	

Panel B - Firm age

	Class 1		Class 2		Class 3		Class 4	
	mean	*median*	*mean*	*median*	*mean*	*median*	*mean*	*median*
Total funding	0.85	0.81	0.74	0.72	0.67	0.66	0.63	0.60
Equity	0.10	0.15	0.22	0.24	0.29	0.31	0.33	0.37
Bank credit	0.15	0.05	0.16	0.09	0.16	0.10	0.15	0.08
Trade credit	0.22	0.16	0.20	0.15	0.19	0.14	0.17	0.13
Tax liabilities	0.10	0.05	0.07	0.04	0.06	0.03	0.06	0.03
Economic group + shareholders	0.10	0.00	0.08	0.00	0.08	0.00	0.08	0.00
Share of each class	26.59		25.03		24.31		24.07	

TABLE 3. Funding sources by firm size and age

Note: All the variables are scaled by total assets and defined at book value. Total funding corresponds to the ratio of total debt, excluding "Acréscimos e diferimentos" and provisions, over total assets. Thus, total funding and equity are not complements. Age classes were defined based on the quartiles of the distribution. Class 1: age <6 years; Class 2: 6< age < 12 years; Class 3: 11<age<21 years; Class 4: age>20 years.

cycles, variables related to these dimensions are also explored. Therefore, we include variables directly related to firms' activity and working capital needs, such as inventories (INVENTORIES), account receivables (ACCOUNT RECEIVABLES), and the turnover ratio (TURNOVER). A variable related to the business risk of the firms is also included, using as proxy the volatility of the cashflow ratio (SD CASHFLOW).

Finally, the set of firm characteristics includes an indicator for wether firm belongs to an economic group (EC. GROUP). This control variable is motivated by the fact that the balance sheet data is not reported on a consolidated basis, which implies that the share of some funding sources may be affected by transactions within the group.

Table 4 presents some summary descriptive statistics of the considered variables. Table A.1 in the Appendix briefly describes each variable.

	N	mean	sd	p10	p25	p50	p75	p90
PROFITABILITY	655187	0.04	0.17	-0.11	0.01	0.05	0.11	0.20
SALES GROWTH	568450	-0.03	0.32	-0.38	-0.16	-0.02	0.11	0.30
TANGIBILITY	655187	0.27	0.24	0.02	0.07	0.20	0.41	0.64
SIZE	655149	13.07	1.57	11.23	12.02	12.95	13.97	15.07
AGE	655187	2.49	0.84	1.39	1.95	2.56	3.09	3.50
ASSET TURNOVER	655187	1.48	1.20	0.38	0.70	1.16	1.86	2.93
INVENTORIES	655187	0.18	0.23	0.00	0.00	0.09	0.28	0.54
ACCOUNT RECEIVABLE	655187	0.25	0.23	0.00	0.02	0.20	0.42	0.60
CASHFLOW VOLATILITY	638929	0.11	0.14	0.02	0.03	0.06	0.12	0.25

TABLE 4. Summary statistics: Firm characteristics

Note:"sd" stands for standard deviation; while p10, p25, p50, p75, p90 stand for, respectively, the percentiles 10, 25, 50, 75 and 90 of the distribution of each variable.

Determinants of firms funding sources

Empirical approach

As mentioned above, we are interested in analyzing firms' funding sources, namely bank credit (key component of financial debt), trade credit, loans from shareholders or intra-group operations, as well as tax liabilities. The econometric analysis is based on seemingly unrelated regressions (SUR), as a firm's alternative funding sources may be related. Each equation in the system has the following specification:

$$\frac{Funding^{j}_{i,t}}{Asset_{i,t}} = c + \beta X_{i,t-1} + \delta z_i + \varphi w_t + \mu^{j}_{i,t} \tag{1}$$

where j stands for each funding source, i is firm's identification and t corresponds to the time dimension. Therefore, the dependent variable corresponds to funding source j of firm i in period t, scaled by total assets. $X_{i,t-1}$ is a vector of firm i specific variables, which may affect firm's debt components, evaluated at $t-1$. Additionally, z_i and w_t correspond to industry sector and time effects, respectively. The industry sector dummies control for relevant differences in the market where firm operates, while time effects, represented by year dummies, control for changes that affect all firms simultaneously. Finally, $\mu^{j}_{i,t}$ corresponds to the error term of each equation.

The SUR approach estimates the four equations simultaneously and takes into account the relation between those error terms. Moreover, standard errors are robust and clustered at the firm level, controlling for the heteroscedasticity issues and the longitudinal dimension at firm level.

Empirical findings

Capital structure variables. As a starting point of the econometric analysis, the firm characteristics included as explanatory variables are motivated by the capital structure literature. Thus, the specifications include variables related to profitability, sales growth, size and tangibility. Firm's age is also included as it is a proxy for firm's information opaqueness and life cycle. Additionally, the specifications include a dummy variable that controls if a firm belongs to an economic group.

Table 5 contains the results under the SUR approach.[9] An overview of the results allows us to conclude that these variables are broadly statistical significant.

Profitability has a negative coefficient in all equations, suggesting that firms with more internal funds tend to use less external funding than other firms, which is in line with some findings in the literature. The comparison of the coefficients allows us to observe that profitability seems to have a larger impact on trade credit component. The negative relation between internal funds measures and external funding is usually presented as an evidence supporting the *pecking order* theory (*i.e.* due to asymmetric information, firms use internal funds before external funding sources), in opposition to the *trade-off* theory. Following the latter theory, profitability should be positively related to leverage, as it contributes to decrease the bankruptcy costs and allow tax shields.[10]

In turn, sales growth, when statistically significant, has a positive coefficient. This result may signal some financial needs, since sales growth should be related to firm's growth opportunity. However, the economic impact is relatively low, based on changes of a standard-deviation.

Size is always statistically significant, but has a heterogeneous impact on funding sources: a positive coefficient in bank and trade credit and the opposite sign in the remaining funding sources. The positive sign on bank and trade credit should be related to asymmetric information and firm's

9. As the set of regressors is the same in the four equations in the system, the coefficients estimated under the SUR approach coincide with those estimated with Ordinary Least Squares (OLS). However, as the SUR controls for the correlation between the residuals of the equations included in the system, the t-statistics and consequently the significance of the coefficients can be different under the two econometric approaches.

10. Nevertheless, as described in Section Review of the Literature, more recent researches in this field also identified alternative explanations for the negative coefficient of profitability, that are not necessarily contradicting the trade-off theory.

credit quality. Indeed, larger firms tend to have more information available to external agents and usually have associated lower credit risk, since they are usually more diversified, as discussed in Fama and French (2002). Therefore, the access to financial debt, in particular bank credit, should be easier to these firms. A potential reason underlying the positive relation between size and trade credit is the fact that larger firms may have more offers of credit by their suppliers, given that they are perceived as good firms. Moreover, large firms may also have some bargaining power with the suppliers and, consequently, they can obtain better contract conditions. This may be reflected, for instance, in higher credit amounts and/or longer periods to repay the credit.

In turn, tangibility also shows a heterogeneous impact on the various funding sources. This variable allows us to identify the share of assets that can be pledged as collateral in credit contracts, which contribute to a decrease of bankruptcy costs. For bank credit, as expected, we observe a positive coefficient (*e.g.* in line with Rauh and Sufi (2010)). Tangibility also denotes a positive coefficient for shareholders or intra-group loans. In turn, for trade credit and tax liabilities the coefficients are negative. The highest impact is recorded for bank credit. These results are consistent with the idea that fixed assets should be financed with longer term funding and also support the role of collateral in mitigating information asymmetries. Finally, age has a negative coefficient in all equations except shareholders loans. older firms appear to be less indebted than younger ones, for some specific debt components. These results may also be related to firm's life cycle, as firms tend to have higher financial needs in the beginning of their activity (*e.g.* they have lower levels of capital accumulated).

Time dummies capture differences that affect all the firms simultaneously, such as macroeconomic and financial developments. The inclusion of these variables in the analysis is crucial, as the sample period includes different phases of the economic business cycle: years of economic activity growth and years of severe economic recession. Moreover, the time dummies also control for the impact of changes in the IES' reports and accounting schemes mentioned previously, which took place in 2010 and were transversal to all firms. The specifications also include industry dummies. The literature emphasizes the importance of controlling for the business sector of firms, in particular in the analysis of funding issues (*e.g.* Fisman and Love (2003)). For simplicity the coefficients of these variables are not presented in the tables.

All in all, the results highlight the heterogeneous impact of some firms' characteristics on different funding sources. The exception is profitability which has a negative relation with all of the funding sources in analysis. Profitability is also within the variables with higher economic impact on the different funding sources (assessed by a standard-deviation).

The econometric results presented allow us to identify some correlation between key firm characteristics and funding components, which may contribute to a better understanding of corporate funding.

	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra group
PROFITABILITYt-1	-0.1913***	-0.2464***	-0.1310***	-0.2124***
	(-95.42)	(-130.68)	(-122.48)	(-124.46)
SALES GROWTHt-1	0.0004	0.0197***	0.0043***	0.0042***
	(0.50)	(24.68)	(9.51)	(5.83)
SIZEt-1	0.0273***	0.0076***	-0.0195***	-0.0157***
	(137.44)	(40.81)	(-184.46)	(-92.95)
TANGIBILITYt-1	0.1716***	-0.1164***	-0.0452***	0.0326***
	(134.31)	(-96.90)	(-66.36)	(30.00)
AGE	-0.0196***	-0.0384***	-0.0119***	0.0010***
	(-44.66)	(-93.15)	(-50.73)	(2.70)
Ec. Group	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes
Industry sector	yes	yes	yes	yes
N	434100			
R-sq	0.112	0.153	0.172	0.163

TABLE 5. Econometric analysis: Capital structure standard variables

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The t-statistics are in parenthesis. The results were obtained running a SUR, with robust standard errors and clustering at firm level. Firm's characteristics were included as regressors with a lag, with exception of the variable Age. All specification included a constant term.

Delving deeper into firm activity. The previous analysis focused on the key variables discussed in the capital structure literature. In order to look into the composition of funding in more detail, it is important to control for additional factors that can be underlying the use of the different funding sources. Therefore, we also include in the analysis measures related to the firm's operational cycle and activity as explanatory variables, namely variables related to inventories, credit granted by firms to customers, and turnover. We also include a variable related to firm business risk, given that this characteristic may affect the type of funding that the firm can obtain.

The results for the new specification are presented in Table 6. According to the results obtained, the new variables seem to contain additional information in the analysis of funding structure. Inventories present positive and statistically significant coefficients, with exception of tax liabilities, for which we observe a negative coefficient. This means that firms with a higher proportion of inventories have associated higher share of bank and trade credit, as well as shareholders or intra-group loans. Actually, for the latter funding source, inventories have the main impact. An increase of one standard-deviation implies an increase of 2.4 percentage points in the share

of these loans. The coefficient of account receivables is also positive for the funding sources in analysis, with exception of tax liabilities. These results may be related to a suitable cash management policy adopted by firms, allowing for a better match between inflows and outflows. This relation is particularly relevant, as expected, for trade credit. An increase of a standard-deviation implies an increase by 4.7 percentage points. The results obtained also suggest some impact on the other funding sources, even though to a smaller extent. The results are in line with some qualitative evidence. Indeed, according to the results of the Bank Lending Survey conducted in Portugal, inventories and working capital needs have been reported as a critical factor underlying bank loan demand in the corporate segment.

Turnover, which captures the volume of firm's activity, has a negative coefficient for bank credit and shareholders or intra-group loans and a positive coefficient for trade credit and tax liabilities. These results seem to be in line with the argument that firms exploit payments schemes and "grace periods" provided by suppliers.

In turn, the proxy for the business risk shows a positive coefficient in all equations, *i.e.* firms with higher volatility in their cash flows tend to rely more on the funding sources under analysis than on omitted sources in the system. Note that equity is a key component of the omitted category. The positive relation suggests that firms with more instable performances need more external funding to operate their activity. For bank credit, this could be somewhat counterintuitive. Nevertheless, the results suggest that the ability of riskier firms to obtain bank credit seems to be lower in comparison to the other funding sources, given the significant difference in the magnitude of the coefficients. For riskier firms, tax liabilities seem to be an important funding/liquidity management tool and one of the main drivers underlying this component. Indeed, a standard-deviation increase implies a increase by around 2 percentage point of these liabilities. To a smaller extent, loans granted by shareholders or intra-group operations also seem to play an important role for these firms.

Regarding the other variables included in the specifications, the results described in the previous section remained broadly the same. Therefore, based on these results, across the different funding sources in analysis, profitability and size are in the set of variables with higher economic impact. For bank credit, the main driver is tangibility (around 4.5 percentage points based on a standard-deviation increase). For trade credit, account receivables and, to a smaller degree, inventories should also be highlighted (4.7 and 2.7 percentage points respectively). In turn, for loans from shareholders or intra group operations, inventories and the business risk show sizable economic impact (2.4 and 1.4 percentage points, respectively). For tax liabilities, a sizeable impact is from the measure of business risk (a standard-deviation increase implies an increase by 2.1 percentage points in those liabilities).

	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Ec. Group
PROFITABILITYt-1	-0.1573***	-0.2321***	-0.1089***	-0.1553***
	(-74.04)	(-120.01)	(-98.80)	(-86.54)
SALES GROWTHt-1	0.0023***	0.0052***	-0.0006	0.0068***
	(2.74)	(6.68)	(-1.26)	(9.52)
SIZEt-1	0.0262***	0.0156***	-0.0134***	-0.0162***
	(120.09)	(78.49)	(-118.49)	(-87.81)
TANGIBILITYt-1	0.1955***	-0.0101***	-0.0544***	0.0580***
	(132.72)	(-7.52)	(-71.21)	(46.66)
AGE	-0.0204***	-0.0359***	-0.0089***	0.0005
	(-46.59)	(-90.05)	(-39.30)	(1.25)
INVENTORIESt-1	0.0870***	0.1211***	-0.0583***	0.1052***
	(55.06)	(84.19)	(-71.17)	(78.82)
ACCOUNT RECEIVABLESt-1	0.0204***	0.2013***	-0.0146***	0.0116***
	(13.24)	(143.40)	(-18.28)	(8.91)
TURNOVERt-1	-0.0060***	0.0281***	0.0057***	-0.0098***
	(-21.28)	(109.60)	(38.70)	(-41.05)
SD CASHFLOWt-1	0.0420***	0.0653***	0.1597***	0.1067***
	(17.65)	(30.17)	(129.48)	(53.11)
Ec. Group	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes
Industry sector	yes	yes	yes	yes
N	434100			
R-sq	0.120	0.215	0.226	0.185

TABLE 6. Econometric analysis: Activity and business risk variables

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The t-statistics are in parenthesis. The results were obtained running a SUR, with robust standard errors and clustering at firm level. Firm characteristics were included as regressors with a lag, with exception of the variable age. All specifications included a constant term.

Heterogeneity by firm size

In this section, we explore whether the determinants of the funding sources in analysis change for different groups of firms based on firm's size. Thus, we run the previous specification taking into account different size cohorts. The results are presented in Tables 7.[11]

11. In line with the European Commission Recommendation 2003/361/EC, presented previously

According to the results obtained, based on the approach that already includes activity and business risk indicator, we observe that profitability preserves the negative coefficient in all specifications. Although the negative relation is consistent, the impact on the funding sources is heterogeneous across firm size groups. For instance, for micro firms, the largest impact occurs in trade credit and shareholders or intra-group loans. In turn, for medium and large firms, the largest impact occurs for bank credit. Looking at tangibility, we observe the same relation observed for whole sample, *i.e.* the coefficient is positive for bank credit and shareholder or intra-group loans and negative for the other funding sources. In turn, some adjustments occur for the size and sales growth variables in some equations.

The results for age are also in line with the results of the full sample for micro and small firms segments, *i.e.* the coefficient is positive for shareholders or intra-group loans and it is negative for the remaining funding components considered. For medium firms, the coefficients are negative, while for large firms the age coefficient is positive for bank credit. In general, these results are in line with asymmetric information hypothesis, and the higher capital level of elder firms.

Looking at the activity indicators, inventories preserve, in general, the same impact described for the whole sample. In particular, the coefficient is negative for tax liabilities and positive for the other funding sources. The exceptions are loans from shareholders or intra-group operations for medium firms, as it is not statistically significant, and for large firms, for which it presents a negative coefficient. The coefficient for account receivables is positive and statistically significant, regardless of firm size, for bank credit and for trade credit. The impact is quite relevant for the former. For tax liabilities, the relation is negative. Looking at shareholders or intra-group loans the results are mixed. In turn, turnover presents some heterogeneous impact across firm size and in comparison to the full sample results. Consistently across size cohorts, it presents a positive relation with trade credit.

Finally, as far as business risk is concerned, the positive coefficient recorded for whole sample, in all the funding sources in the analysis, remained for micro and smaller firms. For medium and larger firms, the coefficient of this variable is negative for bank credit, which is in line with what we would expect regarding firm's risk and external sources availability (in particular bank credit and trade credit), as discussed in Section Review of the Literature.

	Micro				Small				Medium				Large			
	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group
PROFITABILITYt-1	-0.1334***	-0.2201***	-0.0886***	-0.1593***	-0.1892***	-0.2513***	-0.1280***	-0.1484***	-0.2474***	-0.2598***	-0.1184***	-0.1352***	-0.4349***	-0.2408***	-0.0612***	-0.0787***
	(-44.15)	(-76.00)	(-56.73)	(-55.03)	(-52.61)	(-79.26)	(-69.22)	(-55.34)	(-25.12)	(-32.27)	(-26.64)	(-22.11)	(-18.17)	(-12.39)	(-6.77)	(-4.17)
SALES GROWTHt-1	-0.0022	0.0060***	-0.0012*	0.0125***	0.0022*	0.0064***	-0.0002	0.0048***	0.0040	0.0092***	0.0028*	0.0016	0.0221**	-0.0096	0.0055*	0.0066
	(-1.57)	(4.60)	(-1.74)	(9.52)	(1.66)	(5.55)	(-0.28)	(4.91)	(1.14)	(3.22)	(1.74)	(0.75)	(2.52)	(-1.35)	(1.67)	(0.95)
SIZEt-1	0.0387***	0.0218***	-0.0233***	-0.0173***	0.0311***	0.0227***	-0.0255***	-0.0134***	0.0118***	0.0165***	-0.0279***	0.0028***	-0.0072***	0.0131***	-0.0147***	0.0047***
	(71.99)	(42.38)	(-83.80)	(-33.62)	(70.24)	(58.11)	(-111.79)	(-40.41)	(11.25)	(19.35)	(-59.19)	(4.29)	(-3.33)	(7.46)	(-17.94)	(2.73)
TANGIBILITYt-1	0.1734***	-0.0162***	-0.0486***	0.0747***	0.2090***	-0.0035*	-0.0672***	0.0539***	0.2035***	-0.0250***	-0.0339***	0.0209***	0.1640***	-0.0000	-0.0136***	0.0455***
	(77.61)	(-7.55)	(-42.14)	(34.91)	(90.63)	(-1.70)	(-56.69)	(31.35)	(34.28)	(-5.16)	(-12.64)	(5.66)	(12.59)	(-0.00)	(-2.77)	(4.43)
AGE	-0.0264***	-0.0393***	-0.0062***	0.0023***	-0.0208***	-0.0347***	-0.0113***	0.0020***	-0.0199***	-0.0159***	-0.0054***	-0.0092***	0.0196***	-0.0228***	-0.0014	-0.0117***
	(-38.77)	(-60.22)	(-17.78)	(3.53)	(-30.55)	(-57.63)	(-32.14)	(3.88)	(-11.91)	(-11.64)	(-7.22)	(-8.89)	(5.51)	(-7.87)	(-1.04)	(-4.17)
INVENTORIESt-1	0.0398***	0.1170***	-0.0383***	0.1243***	0.1240***	0.1268***	-0.0679***	0.0843***	0.2318***	0.1167***	-0.0668***	0.0043	0.1758***	0.1381***	-0.0420***	-0.0301*
	(17.61)	(54.05)	(-32.83)	(57.41)	(47.60)	(55.21)	(-50.71)	(43.43)	(28.12)	(17.32)	(-17.95)	(0.85)	(7.65)	(7.40)	(-4.83)	(-1.66)
ACCOUNT RECEIVABLESt-1	0.0073***	0.1885***	-0.0070***	0.0206***	0.0225***	0.2152***	-0.0275***	0.0125***	0.0544***	0.1584***	-0.0163***	-0.0078*	0.0398***	0.0753***	-0.0029	-0.0092
	(3.09)	(83.58)	(-5.74)	(9.13)	(9.32)	(100.91)	(-22.15)	(6.94)	(8.44)	(30.03)	(-5.59)	(-1.94)	(2.74)	(6.37)	(-0.52)	(-0.81)
TURNOVERt-1	0.0014***	0.0270***	0.0001	-0.0109***	-0.0044***	0.0359***	0.0002	-0.0078***	-0.0222***	0.0443***	0.0008	-0.0002	-0.0297***	0.0541***	0.0088***	-0.0027
	(3.06)	(61.02)	(0.50)	(-24.76)	(-9.45)	(86.92)	(0.73)	(-22.44)	(-17.74)	(43.27)	(1.34)	(-0.30)	(-10.10)	(22.67)	(7.91)	(-1.15)
SD CASHFLOWt-1	0.0628***	0.0815***	0.1459***	0.1122***	0.0462***	0.0623***	0.1543***	0.1065***	-0.0472***	0.0528***	0.1543***	0.1050***	-0.0686*	0.0972***	0.1068***	0.0673**
	(17.91)	(24.26)	(80.56)	(33.41)	(11.95)	(18.27)	(77.58)	(36.93)	(-4.14)	(5.67)	(30.01)	(14.83)	(-1.78)	(3.11)	(7.35)	(2.22)
Ec. Group	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry sector	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	179350				179008				27924				4907			
R-sq	0.107	0.211	0.223	0.220	0.138	0.227	0.264	0.163	0.158	0.263	0.310	0.176	0.203	0.344	0.481	0.229

TABLE 7. Econometric analysis: Activity and business risk variables – by firm size

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The t-statistics are in parenthesis. The results were obtained running a SUR, with robust standard errors and clustering at firm level. Firm characteristics were included as regressors with a lag, with exception of the variable age. All specifications included a constant term.

Robustness test

We performed some additional specifications in order to analyse the sensitivity of the results obtained in the previous sections to some of the hypothesis adopted. Due to the relevant changes introduced in 2010 (IES's reports and accounting rules), that required the adoption of some hypothesis and some adjustments, in this section we split of the sample period in two sub-periods, namely: 2006-2009 and 2010-2012. Therefore, we re-estimate the previous specification for both sub-periods.

Table A.2 in the Appendix Section presents some descriptive statistics for firms' characteristics for each of the two sub-periods. The econometric results are presented in Tables A.3 and A.4.

The main conclusions obtained for the full sample period do not change when we analyze the results for the two sub-periods. Therefore, even though the magnitude of the coefficients estimated is different (as was expected), the relations observed between firms' characteristics and funding sources persist. Nevertheless, there are some changes that worth mentioning. In particular, the coefficient of sales growth does not preserve the positive coefficient after 2009 for some funding sources. Additionally, account receivables has a differential impact over the two sub-periods, namely for bank credit (it is not statistically significant for the period before 2009, and positive afterwards) and loans from shareholders or intra-group operations (with opposite coefficients in the two sub-periods, positive and negative, respectively).

Final Remarks

Funding is crucial for firm's activity. The analysis of firm's capital decision (capital versus debt) is important, but it is also relevant to explore the composition of corporate funding. Different types of debt have different characteristics and different requirements. This may be particularly relevant as firms in several countries, such as Portugal, present high leverage ratios.

This study analyse firm's funding components. In addition to bank credit and trade credit, the two main corporate funding sources and quite discussed in the literature, we also include in the analysis tax liabilities and loans from shareholders or intra-group operations. These funding sources are relevant in some corporate segments and raise several questions due to their particular characteristics. Tax liabilities may be related to firm's liquidity management, while loans from shareholders and intra-group operations suggest that there are some differences how owners finance their firms, *i.e.* trough debt rather than equity. Therefore, this study also sheds some light on these debt components.

In the first part of this article, we explore the relevance of the main variables highlighted in the capital structure literature. Given the specificities

of some funding sources under analysis, we also include variables related to firm's activity and business risk as explanatory variables. Consistently across all specifications, profitability presents a negative relation with the funding sources in analysis. Moreover, it is among the variables with higher economic impact across the funding sources. The other variables show heterogeneous impact on funding sources. The results suggest that the variables related to firms' activity contain additional information in the analysis. In particular, working capital needs seem to be a relevant factor for different type of funding, even for bank credit and shareholders or intra-group loans. For riskier firms, tax liabilities and, to a smaller extent, loans from shareholders or intra-group operations seem to be particularly relevant.

The breakdown of the dataset by firm size broadly confirm the main conclusions, even though it highlights the relevance of some variables for some size cohorts.

This study presents some relevant relations between firms' characteristics and the respective debt composition. The definition of a casual inference between the two dimensions is not easy in the current framework. Nevertheless, this analysis contributes to increase what we know about the structure of corporate debt and to identify potential vulnerabilities of firms to economic and financial developments.

Variables		Definition
Funding sources		
	BANK CREDIT	Bank debt over total assets
	TRADE CREDIT	Account payables over total assets
	TAX LIABILITIES	Tax liabilities over total assets
	SHAREHOLDERS & INTRA-GROUP LOANS	Loans from shareholders and loans from firms in the same economic group over total assets
Firm's characteristics		
	PROFITABILITY	Net earnings before provisions and depreciation over total assets
	SALES GROWTH	Year-on-year change rate of sales
	SIZE	Natural logarithm of real total assets
	TANGIBILITY	Tangible assets over total assets
	AGE	Natural logarithm of (1+ age in years)
	INVENTORIES	Inventories over total assets
	ACCOUNT RECEIVABLES	Account receivables over total assets
	TURNOVER	Sales over total assets
	SD CASHFLOW	Standard deviation of cashflow over total assets
	ECONOMIC GROUP	Dummy variable which takes the value 1 if the firm belongs to an economic group
	BUSINESS SECTOR	Dummy variables of business sector (13 sectors)

TABLE A.1. Variables definition

Panel A: Firm characteristics 2006-2010

	N	mean	sd	p10	p25	p50	p75	p90
PROFITABILITY	398136	0.05	0.17	-0.09	0.01	0.06	0.12	0.21
SALES GROWTH	334054	-0.01	0.32	-0.35	-0.14	-0.01	0.12	0.33
TANGIBILITY	398136	0.27	0.24	0.02	0.07	0.20	0.41	0.64
SIZE	398136	13.05	1.57	11.20	12.00	12.93	13.95	15.05
AGE	398136	2.41	0.89	1.10	1.95	2.48	3.04	3.47
ASSET TURNOVER	398136	1.50	1.19	0.40	0.72	1.19	1.89	2.96
INVENTORIES	398136	0.19	0.23	0.00	0.00	0.09	0.30	0.56
ACCOUNT RECEIVABLE	398136	0.24	0.23	0.00	0.01	0.20	0.41	0.59
CASHFLOW VOLATILITY	387523	0.11	0.15	0.02	0.03	0.06	0.13	0.26

Panel B: Firm characteristics 2010-2012

	N	mean	sd	p10	p25	p50	p75	p90
PROFITABILITY	257051	0.02	0.17	-0.15	0.00	0.04	0.10	0.17
SALES GROWTH	234396	-0.06	0.31	-0.41	-0.18	-0.04	0.09	0.27
TANGIBILITY	257051	0.26	0.24	0.01	0.06	0.19	0.41	0.65
SIZE	257013	13.11	1.57	11.27	12.07	12.99	14.01	15.12
AGE	257051	2.63	0.74	1.61	2.20	2.64	3.18	3.53
ASSET TURNOVER	257051	1.45	1.20	0.36	0.67	1.12	1.81	2.89
INVENTORIES	257051	0.17	0.22	0.00	0.00	0.07	0.26	0.51
ACCOUNT RECEIVABLE	257051	0.26	0.24	0.00	0.02	0.21	0.42	0.61
CASHFLOW VOLATILITY	251406	0.11	0.14	0.02	0.03	0.06	0.12	0.23

TABLE A.2. Summary statistics: Firm characteristics

	2006-2009				2010-2012			
	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group
PROFITABILITYt-1	-0.2254***	-0.2415***	-0.1236***	-0.3235***	-0.1625***	-0.2584***	-0.1374***	-0.1458***
	(-81.03)	(-88.49)	(-78.73)	(-115.22)	(-46.40)	(-79.41)	(-75.06)	(-59.37)
SALES GROWTHt-1	0.0031***	0.0207***	0.0031***	0.0050***	-0.0041**	0.0222***	0.0062***	0.0064***
	(2.83)	(18.96)	(4.91)	(4.44)	(-2.56)	(14.85)	(7.38)	(5.65)
SIZEt-1	0.0298***	0.0093***	-0.0195***	-0.0247***	0.0259***	0.0055***	-0.0207***	-0.0037***
	(107.44)	(34.01)	(-124.41)	(-88.20)	(73.35)	(16.93)	(-112.04)	(-15.14)
TANGIBILITYt-1	0.0852***	-0.1245***	-0.0454***	0.0534***	0.2492***	-0.1054***	-0.0447***	0.0094***
	(49.06)	(-73.06)	(-46.34)	(30.50)	(110.12)	(-50.11)	(-37.75)	(5.92)
AGE	-0.0125***	-0.0366***	-0.0108***	0.0012**	-0.0265***	-0.0409***	-0.0129***	0.0002
	(-21.24)	(-63.32)	(-32.35)	(1.99)	(-33.43)	(-55.54)	(-31.16)	(0.29)
2008	0.0068***	-0.0062***	-0.0047***	-0.0009				
	(7.51)	(-6.95)	(-9.27)	(-0.93)				
2009	0.0159***	-0.0148***	-0.0082***	-0.0061***				
	(17.48)	(-16.53)	(-15.95)	(-6.63)				
2012					-0.0120***	-0.0005	0.0019***	-0.0002
					(-12.03)	(-0.50)	(3.66)	(-0.24)
Ec. Group	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Industry sector	yes	yes	yes	yes	yes	yes	yes	yes
N	220639				139163			
R-sq	0.092	0.162	0.156	0.114	0.131	0.144	0.194	0.310

TABLE A.3. Econometric analysis: Capital structure standard variables - Sub periods

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The t-statistics are in parenthesis. The results were obtained running a SUR, with robust standard errors and clustering at firm level. Firm characteristics were included as regressors with a lag, with exception of the variable age. All specifications included a constant term.

	2006-2009				2010-2012			
	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group	Bank Credit	Trade Credit	Tax Liabilities	Shareholders & Intra Group
PROFITABILITYt-1	-0.1844***	-0.2383***	-0.0980***	-0.2292***	-0.1248***	-0.2160***	-0.1047***	-0.1110***
	(-62.27)	(-84.40)	(-60.47)	(-77.86)	(-33.36)	(-64.65)	(-55.17)	(-42.42)
SALES GROWTHt-1	0.0047***	0.0075***	-0.0021***	0.0086***	-0.0010	0.0029**	0.0001	0.0068***
	(4.23)	(7.07)	(-3.45)	(7.81)	(-0.60)	(1.97)	(0.14)	(5.98)
SIZEt-1	0.0293***	0.0153***	-0.0126***	-0.0261***	0.0254***	0.0166***	-0.0141***	-0.0023***
	(95.58)	(52.35)	(-75.36)	(-85.80)	(65.36)	(47.73)	(-71.74)	(-8.28)
TANGIBILITYt-1	0.1087***	-0.0187***	-0.0617***	0.0974***	0.2701***	-0.0003	-0.0491***	0.0181***
	(53.86)	(-9.74)	(-55.87)	(48.55)	(104.79)	(-0.11)	(-37.57)	(10.02)
AGE	-0.0132***	-0.0347***	-0.0078***	0.0013**	-0.0267***	-0.0374***	-0.0101***	-0.0001
	(-22.45)	(-61.95)	(-24.27)	(2.20)	(-33.71)	(-52.86)	(-25.04)	(-0.20)
INVENTORIESt-1	0.0962***	0.1147***	-0.0619***	0.1565***	0.0584***	0.1281***	-0.0522***	0.0515***
	(45.47)	(56.86)	(-53.51)	(74.42)	(20.26)	(49.70)	(-35.66)	(25.52)
ACCOUNT RECEIVABLESt-1	0.0018	0.2053***	-0.0162***	0.0309***	0.0374***	0.1939***	-0.0117***	-0.0081***
	(0.88)	(102.96)	(-14.17)	(14.87)	(13.74)	(79.64)	(-8.43)	(-4.24)
TURNOVERt-1	-0.0033***	0.0258***	0.0030***	-0.0145***	-0.0087***	0.0300***	0.0083***	-0.0023***
	(-8.88)	(72.00)	(14.47)	(-38.73)	(-17.26)	(66.31)	(32.24)	(-6.57)
SD CASHFLOWt-1	0.0563***	0.0628***	0.2296***	0.2048***	0.0990***	0.1244***	0.1645***	0.0881***
	(13.91)	(16.27)	(103.75)	(50.92)	(21.97)	(30.90)	(71.97)	(27.93)
Ec. Group	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
Industry sector	yes	yes	yes	yes	yes	yes	yes	yes
N	220639				139163			
R-sq	0.104	0.219	0.217	0.152	0.138	0.215	0.248	0.318

TABLE A.4. Econometric analysis: Activity and business risk variables - Sub periods

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The t-statistics are in parenthesis. The results were obtained running a SUR, with robust standard errors and clustering at firm level. Firm characteristics were included as regressors with a lag, with exception of the variable age. All specifications included a constant term.

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Comparing misallocation between sectors in Portugal

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Abstract
Recent empirical studies documented that the level of resource misallocation in the service sector is significantly higher than in the manufacturing sector. In this article, we try to understand to what extent the documented differences are due to methodological reasons or reflect structural differences between the two sectors. Our results suggest that about 50 percent of the original estimated differences can be attributed to methodological choices, while the other 50 percent can be attributed to differences in the characteristics of the two sectors. We also conclude that higher output-price rigidity and labour adjustment costs, together with higher informality in the service sector, account for the remaining differences of allocative efficiency between the two sectors. (JEL: D24, O11, O41, O47)

Introduction

The empirical literature has recently documented that the level of resource misallocation in the service sector is significantly higher than in the manufacturing sector (see, for instance, the evidence in Dias *et al.* (2015a), Garcia-Santana *et al.* (2015) and Benkovskis (2015) for Portugal, Spain and Latvia, respectively). This is an important finding. The service sector accounts for about 80 percent of total GDP both in the U.S. and the euro area, while the contribution of the manufacturing sector is below 20 percent. Thus, being by far the most important sector, significantly higher levels of resource misallocation in the service sector have dramatic consequences for aggregate productivity. In particular, the impact of misallocation on aggregate productivity estimated in the literature, using data from the manufacturing

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sector alone for several countries, is likely to strongly underestimate the real importance of misallocation in those countries.

This finding also has important consequences for developing countries and economies undergoing structural transformation. Hsieh and Klenow (2009) show that differences in misallocation in the manufacturing sector are important for understanding the differences of total factor productivity between developed and developing countries. Using data for the manufacturing sector in China and India, the authors conclude that eliminating distortions in these economies would increase productivity by 30-50 percent in China and 40-60 percent in India relative to the U.S. levels. However, if a significant difference of allocative efficiency between manufacturing and the service sector, similar to that documented for Portugal, Spain or Latvia are present in other countries, the importance of resource misallocation to explaining productivity differences between developed and developing countries may even be higher than currently documented in the literature. Duarte and Restuccia (2010) demonstrate that differences in productivity in the service and agriculture sectors across countries are one of the main factors behind productivity differences between countries and that, in particular, low productivity in the service sector and lack of catch-up will explain the experiences of slowdown, stagnation, and decline observed across economies. In turn, the evidence for some southern European economies suggests that low productivity in the service sector and lack of catch-up across countries may be reflecting higher and increasing levels of misallocation in this sector (see, Dias *et al.* (2015a) for Portugal, Garcia-Santana *et al.* (2015) and Gopinath *et al.* (2015) for Spain, Calligaris (2015) for Italy).

In this article we try to understand to what extent the documented differences of allocative efficiency between manufacturing and services stem from methodological reasons or, more importantly, reflect structural differences between the two sectors of economic activity. We resort to the theoretical framework developed in Hsieh and Klenow (2009), but extend their model to consider a production function with intermediate inputs as a third factor of production, as in Dias *et al.* (2015a).

Using data for the Portuguese economy for 2008 and 2010, we document that the significantly higher levels of allocative inefficiency in the service sector are not the result of a small number of industries with abnormal levels of resource misallocation, but rather the result of a strong regularity: among the 50 percent of the industries with the highest allocative efficiency only 7.1 percent belong to the service sector. By investigating the consequences of using alternative assumptions for our model, we conclude that about 50 percent of the original estimated differences of misallocation between the service and the manufacturing sectors can be attributed to methodological choices and the other 50 percent to differences in the characteristics of the two sectors.

Productivity shocks, which capture the impact of (capital and/or labour) adjustment costs and/or output-price rigidity on misallocation, is the most important factor contributing to the differences of misallocation between the two sectors. However, the contribution of productivity shocks stems more from the difference of the impacts, than from differences of the shocks between the two sectors. In particular, the impact of productivity shocks in the service sector is significantly higher than the impact in the manufacturing sector. Overall, it appears that the bulk of the difference in misallocation due to productivity shocks is consistent with the hypothesis of higher output-price rigidity and higher labour adjustment costs in the service sector.

The sectoral structure, which captures the impact on misallocation of size-dependent distortions, and is proxied by the skewness of the productivity distribution, emerges as the second most important factor to explaining the difference of misallocation between the two sectors. Again, the bulk of the contribution of this regressor comes from its higher impact in the service sector, which we see as a result of the higher informality that makes the enforcement activity of tax collection much more difficult than in the manufacturing sector.

Finally, our empirical model suggests that the proportion of young firms also has a bearing on the difference of misallocation between the two sectors. We link this impact to the presence of credit constraints imposed by financial institutions on young firms, because they have no credit history or because they have insufficient guaranties. This regressor contributes with two opposite effects to the difference between misallocation in the manufacturing and the service sectors. On the one hand, the impact of the difference between the mean of this regressor in the manufacturing and the service sectors contributes to increase the difference in misallocation between the two sectors, but, on the other hand, the difference in the impact between the two sectors has the opposite effect, so that the total contribution of this regressor is negative.

The rest of the article is structured as follows. Section 2 provides a brief description of the theoretical framework. Section 3 describes the dataset used in the empirical analysis. Section 4 computes misallocation under alternative assumptions as a way of evaluating the part of the difference between the two sectors that is due to methodological choices. Section 5 presents the empirical results and discusses their interpretation and section 6 summarizes the main findings.

Theoretical framework

This section summarizes the methodology used to identify the linkage between aggregate productivity and resource misallocation that results from the existence of distortions and frictions affecting the optimal allocation of resources at the firm-level. We adopt the framework developed in Hsieh and

Klenow (2009, 2011), but extend their model to consider a production function with intermediate inputs, as a third factor of production. The model with three factors of production, as well as the derivation of the full set of results was presented elsewhere, so that here we just briefly review the model and summarize the main results needed for the purposes of the present article.[1]

A first assumption of the model is that within each industry there is monopolistic competition and the production function is the same for all firms. In particular, the gross output of a generic firm *i* in industry *s* is given by the following Cobb-Douglas production function with constant returns to scale:

$$Y_{si} = A_{si} K_{si}^{\alpha_s} H_{si}^{\beta_s} Q_{si}^{1-\alpha_s-\beta_s} \tag{1}$$

where Y_{si}, A_{si}, K_{si}, H_{si} and Q_{si} stand for the firm's gross output, total factor productivity (TFP), capital stock, labour and intermediate inputs, respectively. Parameters α_s and β_s stand for the output elasticities of capital and labour, respectively.

A second assumption is the existence of distortions or wedges in the economy, the importance of which may vary from firm to firm, and can impact the prices of the inputs or directly affect the output of the firm. In particular, it is assumed that there are three distortions that we designate by the output distortion, the capital distortion and the labour distortion. Such distortions take the form of a tax or a subsidy on revenues, on capital services and on labour costs, respectively.

From the profit maximization conditions, given the model assumptions, it is possible to obtain the expression of the so-called total factor revenue productivity for firm *i* in industry *s* ($TFPR_{si}$):

$$TFPR_{si} = \frac{\sigma}{\sigma - 1} \Psi_s \frac{(1+\tau_{k_{si}})^{\alpha_s} (1+\tau_{h_{si}})^{\beta_s}}{(1-\tau_{y_{si}})} \tag{2}$$

where $\tau_{y_{si}}$, $\tau_{k_{si}}$ and $\tau_{h_{si}}$ stand for the output, capital and labour distortions, respectively; σ measures the elasticity of substitution between varieties of differentiated goods and Ψ_s is a constant, which is common to all firms of industry s (and is a function of the prices of inputs, as well as of other parameters of the model).

The output, capital and labour distortions are identified in the model by comparing the ratio of factor costs in the firm with the average ratio of these costs in the corresponding industry. For example, we infer the presence of a capital distortion in a firm when the ratio of intermediate consumption to the capital costs is high relative to what one would expect from the output elasticities with respect to capital and intermediate inputs.

1. The interested reader if referred to Dias *et al.* (2015a) and Dias *et al.* (2016) for further details on the theoretical model and derivation of the full set of results.

Equation (2) is very important because it shows that in the context of the model, TFPR, which by definition corresponds to the product of the price of output and TFP, i.e., $TFPR_{si} = P_{si}A_{si}$, does not vary across firms within the same industry, unless they face some kind of distortion. Intuitively, this equation tells us that, in the absence of distortions, more capital, labour and intermediate inputs will be allocated to the most productive firms (with higher TFP) to the point where their higher output results in a lower price, implying the same TFPR for all firms. In contrast, in the presence of distortions, a high (low) TFPR is a sign that the firm confronts barriers (benefits from subsidies) that make it produce below (above) the optimal level.

Let us now assume a hypothetical exercise in which the distortions in a given industry are eliminated so that TFPR is equalized across firms. According to equation (2), however, there are several alternative solutions for this TFPR, which vary according to the assumptions we make to the distortions $\tau_{y_{si}}$, $\tau_{k_{si}}$ and $\tau_{h_{si}}$. One possibility would be to use the TFPR that would result if all distortions or wedges were equal to zero ($\tau_{y_{si}}$=$\tau_{k_{si}}$=$\tau_{h_{si}}$=0). However, this definition does not guarantee that in equilibrium the demand for factors of production at the industry level will be the same before and after the reallocation of resources. This would have general equilibrium effects which would lead to changes in the prices of the factors of production. An alternative solution, that we will adopt here, is the one that is obtained when all firms face the same average wedges $(1+\overline{\tau}_{k_s})$, $(1+\overline{\tau}_{h_s})$ and $(1-\overline{\tau}_{y_s})$, and these are such that the demand for factors of production at the industry level is the same before and after the reallocation of resources. Thus, our hypothetical exercise will involve a reallocation of the available resources away from firms that were benefitting from subsidies towards firms that were being taxed. The new TFPR, common to all firms in the industry, which is obtained under these conditions, is the so-called efficient TFPR of industry *s*, and will be represented by $TFPR_s^*$. It can be shown that $TFPR_s^*$ may be written as:

$$TFPR_s^* = \frac{\sigma}{\sigma-1}\Psi_s \frac{(1+\overline{\tau}_{k_s})^{\alpha_s}(1+\overline{\tau}_{h_s})^{\beta_s}}{(1-\overline{\tau}_{y_s})} \tag{3}$$

so that from equations (2) and (3) we get:

$$ln\left(\frac{TFPR_{si}}{TFPR_s^*}\right) = \alpha_s log\left(\frac{1+\tau_{k_{si}}}{1+\overline{\tau}_{k_s}}\right) + \beta_s log\left(\frac{1+\tau_{h_{si}}}{1+\overline{\tau}_{h_s}}\right) - log\left(\frac{1-\tau_{y_{si}}}{1-\overline{\tau}_{y_s}}\right) \tag{4}$$

Equation (4) allows us to decompose the (log) scaled TFPR ($TFPR_{si}/TFPR_s^*$) for each firm as a weighted sum of the (log) scaled capital, labour and output wedges. If scaled TFPR is above one, the firm is being "taxed" so that it will increase production if distortions are eliminated from the economy. By looking at the right-hand side of this equation we are able to tell where the increase in production comes from. If, for instance, the scaled capital wedge, $(1+\tau_{k_{si}})/(1+\overline{\tau}_{k_s})$, is larger than one, the firm is facing a capital distortion, so that it will increase the capital stock if the distortion is eliminated. Similarly for

the scaled labour wedge. In contrast, firms for which the scaled output wedge, $(1-\tau_{y_{si}})/(1-\overline{\tau}_{y_s})$, is above one are benefitting from output subsidies, so that they would decrease production if those subsidies were eliminated.

Given the expression for $TFPR_s^*$, it is possible to compute the output of the industry *s* that would be obtained in the absence of distortions, i.e., the level of efficient output. Comparing the efficient output with the actual output, we can compute the industry reallocation gains. It can be shown that the real gross-output gains in industry *s* are given by:

$$\frac{Y_s^*}{Y_s} = \left[\frac{1}{\sum_{i=1}^{M_s} \omega_{si} . \left(\frac{1}{TFPR_{si}^{**}} \right)^{\sigma-1}} \right]^{\frac{\sigma}{\sigma-1}} \tag{5}$$

where Y_s^* and Y_s stand for the efficient and actual gross output in industry *s*, M_s is the number of firms, $TFPR_{si}^{**}$ is scaled TFPR (=$TPFR_{si}/TFPR_s^*$) and $\sum_{i=1}^{M_s} \omega_{si} = 1$. Equation (5) shows that efficiency gains in industry *s* are a weighted sum of the inverse scaled TFPR ($1/TFPR_{si}^{**}$) across firms, where the weights, ω_{si}, are the contribution of each firm to the efficient industry TFP. The smaller is this weighted sum, the larger are the efficiency gains obtained if distortions are eliminated from the industry. In particular, this sum will be small and, thus, efficiency gains will be large if there is a strong positive correlation between the weights ω_{si} and $TFPR_{si}^{**}$. In other words, efficiency gains will be higher if, on average, more productive firms face higher distortions. From (5), we can also intuitively see that, everything else constant, efficiency gains will be higher the larger the dispersion of ($TFPR_{si}^{**}$).[2]

Equation (5) will be used to compute industry gross output reallocation gains. As the exercise fixes the total amount of inputs and calculates how much gross output could be increased by reallocating resources between firms within each industry, it follows that potential gross-output gains coincide with potential TFP gains, so that (5) gives us the potential efficiency gains both in terms of gross output and TFP. In the empirical section we compute gross-output gains for the agriculture, manufacturing and services, by aggregating the (weighted) efficiency gains of the industries belonging to each sector.[3]

2. Note that efficiency gains are zero if $TFPR_{si}^{**} = 1$ for all firms, i.e., if there are no distortions in the industry, which means that dispersion of $TFPR_{si}^{**}$ is zero. Introducing distortions implies, in practice, making the dispersion of $TFPR_{si}^{**}$ differ from zero.

3. The exercise assumes that eliminating all the distortions identified in the context of the model is a good thing to do. It may, however, be argued that there are distortions that cannot or should not be completely eliminated. For example, we can think of an optimum situation in which the cost of capital (interest rate) differs across firms according to some risk criteria.

The data

In this article we use firm-level balance-sheet data and industry-level factor shares. The firm-level data draws on annual information for Portuguese firms reported under the *Informação Empresarial Simplificada* (IES). IES data exist from 2006 onwards and covers virtually the universe of Portuguese non-financial firms. The almost universal coverage of IES emerges from the fact that it is the system through which firms report mandatory information to the tax administration and the statistical authorities like the *Instituto Nacional de Estatística* (INE), the Portuguese Statistics Institute, and the *Banco de Portugal*, the Portuguese central bank. The data provide very detailed information on the firms' balance sheets and income statements. From this dataset we get information on firms's gross output, value added, consumption of intermediate inputs, labour costs (wages and benefits including social security contributions), employment (average number of employees), gross investment (or gross fixed capital formation), annual and accumulated depreciations, and the book values of gross and net capital stock.

For the purpose of this article, even though we report results only for 2008 and 2010, we also use data for 2007 and 2009, because we need sequential years for the construction of some ancillary variables such as productivity shocks. In the IES there are 375,783 observations (different firms) in 2008 and 370,326 observations in 2010. Before using the data, we clean the dataset by dropping firms that do not report strictly positive figures for gross output (production), labour costs, employment, capital stock, intermediate consumption and value added. After cleaning the data, we are left with 236,022 and 230,157 observations for 2008 and 2010, respectively.

Table 1 records the relative importance of agriculture, manufacturing and services in our dataset in terms of employment, gross output and value added. Note the small contribution of agriculture for total employment and value added (around 2 percent), while the service sector contributes around 75 percent. Manufacturing, that has been the focus of most empirical studies, contributes only 22-24 percent to total value added.

	2008			2010		
	Agric.	Manuf.	Serv.	Agric.	Manuf.	Serv.
Employment	1.97	25.34	72.69	2.04	23.69	74.26
Gross output	2.42	34.46	63.12	1.92	32.71	65.36
Value added	2.35	23.57	74.08	1.76	22.24	76.00
Number of firms	6,069	34,257	195,696	6,351	32,096	191,710

TABLE 1. Relative importance of each sector in the dataset (percentage)

Agriculture also includes forestry, fishing, mining and quarrying; services also include construction and energy.

The exercises in this article are conducted with industries defined at the 3-digit NACE code (Rev. 2.1). Overall, this classification implies 213 different industries for 2008 (16 for agriculture (including forestry, fishing, mining and quarrying), 101 for manufacturing and 96 for services (including energy and construction)) and 215 industries for 2010 (16 for agriculture, 101 for manufacturing and 98 for services).

For the industry-level factor shares, we use the average factor shares that are observed in the U.S. during the period 1998 to 2010, which are published by the BEA (Bureau of Economic Analysis).[4]

Misallocation under alternative assumptions

In order to take the model to the data, a set of assumptions are needed, which may have important implications for the final quantitative results. In particular, implementation requires assumptions for the elasticity of substitution parameter (σ), but the final outcome also depends on some practical issues related to the sample, such as the way outliers are dealt with or the type of firms that are analysed. In our case we are especially interested in investigating if changes in these assumptions impact on manufacturing and service sectors differently, thus significantly affecting the difference between the two sectors in terms of efficiency gains.

In line with other studies (see, for instance, Hsieh and Klenow (2009), Ziebarth (2013) and Dias *et al.* (2015a)), we define a baseline by making the following set of assumptions: i) the elasticity of substitution, σ, equal to 3; ii) trimming the top and bottom 1.0 percent tails of the TFP and TFPR distributions across industries; iii) inclusion of all firms in the retained industries.[5]

The efficiency gains for 2008 and 2010, obtained under the baseline assumptions, are recorded in Table 2. We can see from the first row that, if distortions in the economy were eliminated, the gross-output efficiency gains (or TFP gains) for the whole economy would be around 43 percent in 2008 and 49 percent in 2010 (this figure also includes firms from agriculture). Efficiency gains are also clearly higher in the service sector (around 59 percent in 2008 and 66 percent in 2010) than in the manufacturing sector (around 16 and 17 percent in 2008 and 2010, respectively). Thus, the service sector emerges as far

4. This means that the U.S. are taken as a benchmark of a relatively undistorted economy.

5. In order to avoid computing misallocation with a very small number of firms, we drop industries that are left with less than 10 firms after the trimming. This condition is imposed in all the variants considered in Table 2 below, to ensure comparability. After excluding industries with less than 10 firms, we are left with 162 different industries for 2008 (7 for agriculture, 80 for manufacturing and 75 for services) and 163 industries for 2010 (8 for agriculture, 79 for manufacturing and 76 for services).

more inefficient than the manufacturing sector in line with the results in Dias *et al.* (2015a).

	2008				2010			
Assumptions	Total	M	S	S-M	Total	M	S	S-M
1) Baseline	43.36	16.02	59.19	43.18	49.33	16.81	66.46	49.65
2) $\sigma = 4.5$	63.48	19.93	90.65	70.72	71.55	20.33	100.84	80.51
3) Trimming=2.5%	36.35	16.36	47.43	31.07	40.00	17.12	51.42	34.30
4) Employment>10	28.31	12.92	38.33	25.41	31.37	13.43	41.68	28.25
5)= 2)+3)+4)	28.46	14.15	37.66	23.51	31.28	14.43	40.82	26.39

TABLE 2. Efficiency gains under alternative assumptions

Efficiency gains in the baseline are computed taking all firms in the dataset, assuming $\sigma = 3.0$ and trimming 1 percent tails of the TFP and TFPR distributions. M stands for manufacturing and S for services. S-M is the difference between the service and the manufacturing sectors. The total also includes firms from agriculture.

Figure 1 depicts industries ordered by the level of efficiency gains for 2008. The striking message from this figure is that the significantly higher levels of efficiency gains in the service sector are not the result of a small number of industries with abnormal levels of efficiency gains, but rather the result of a strong regularity: the bulk of the industries pertaining to the manufacturing sector ranks first, while the bulk of the industries of the service sector appears on the right-hand side of the chart. More specifically, among the 50 percent of the industries with the lowest TFP gains (77 industries) only 11 industries (7.1 percent of the total) belong to the service sector. This strongly suggests that the presence of higher levels of inefficiency is a widespread phenomenon in the service sector.

One question that may arise here is whether the documented difference in misallocation between the two sectors can be explained by one or more of the assumptions that underlie the baseline results. We thus now consider the implications of alternative assumptions to the baseline.

Elasticity of substitution

In the absence of country specific estimates, the empirical literature usually assumes σ=3 as a way of computing a conservative estimate for the importance of misallocation. However, the estimates available for Portugal (see Amador and Soares (2013)) imply an (non-weighted) average of σ=4.5 for the Portuguese economy. Thus, in what follows, we use σ=4.5, as a more realistic number for Portugal. From Table 2 (second row), we see that the estimated efficiency gains increase vis-à-vis the baseline in the two sectors. Moreover, the increase in the service sector is significantly higher implying that the difference between the two sectors increases from around

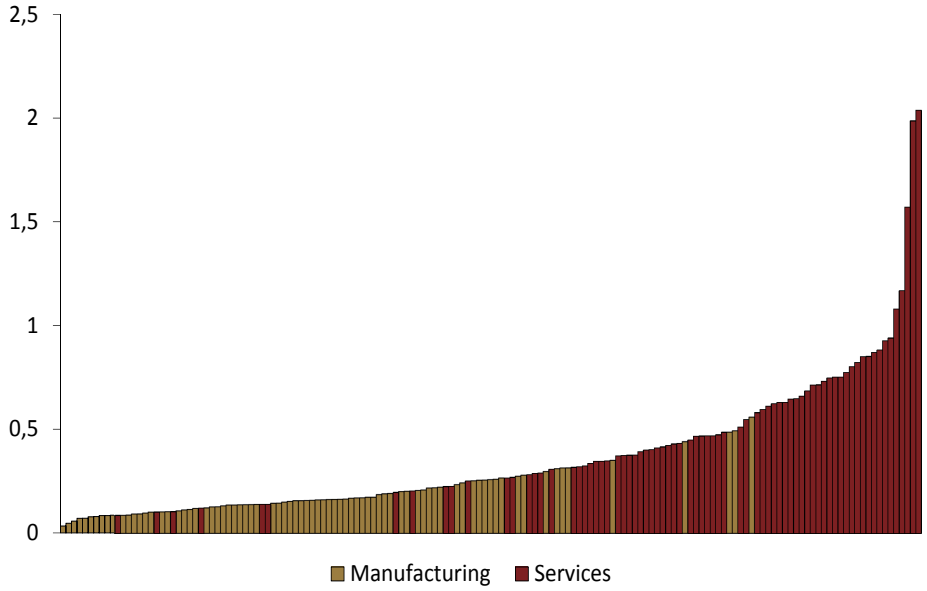

FIGURE 1: TFP gains from reallocation in 2008 (baseline assumptions)

43 percentage points (pp) to around 71 pp in 2008, and from around 50 pp to around 81 pp in 2010.

Treatment of outliers

The presence of outliers also has strong implications for the empirical estimates of efficiency gains. For example, if a firm mistakenly reports very low input factors it will generate very large numbers for TFP and TFPR, giving rise to spurious misallocation. One way to deal with this problem is to trim the TFP and the TFPR distributions. Of course, the choice of the trimming is largely ad-hoc, but it has implications for the results, especially in cases of possible large measurement errors. The way changes in the trimming affects the difference of efficiency gains between the service and the manufacturing sectors will depend on how outliers are distributed across the two sectors.

Table 2 (third row) reports the estimates for TFP gains when we trim 2.5 percent on each tail of the TFP and TFPR distributions. Interestingly, we see that estimated efficiency gains decrease in the service sector, but remain basically unchanged in the manufacturing sector, so that the difference between the two sectors is reduced from 43 to 31 percent, thanks only to changes in the service sector. This result shows that a significant part of

the baseline difference between the two sectors is due to outliers that are concentrated in the service sector.

Minimum firm size

Another important issue is that of the minimum firm size to consider in the exercise. Technically, it is possible to compute the efficiency gains stemming from labour distortions for firms with one or more employees. However, it is unclear whether one should base the estimates of the industry efficiency gains on micro or very small firms. In fact, the reallocation gains in some of these firms may be somewhat overestimated, either because the model does not allow for indivisibilities in the input factors (labour force or capital stock), which mainly affect micro and small firms, or because some of these units (young firms) might be growing at a faster pace, as they are in the process of converging to their optimal size.

When we compute efficiency gains for different groups of firms defined by their size according the numbers of employees we conclude that heterogeneity (efficiency gains) within small firms is higher than heterogeneity between small and large firms.[6] We believe that misreporting of some relevant items, like sales or gross output might be an explanation for such an outcome. Thus, for purpose of the present exercise, we restrict the analysis to firms with more than 10 employees. The chosen cut-off is somewhat ad-hoc but we believe that given the importance of small and medium-sized firms in the Portuguese economy this solution strikes a balance between the need to reduce the importance of spurious misallocation and the representativeness of the final sample. By dropping firms with 10 or less employees, the number of firms in the dataset is reduced from 236,022 to 41,123 in 2008 and from 230,157 to 38,675 in 2010. Despite representing around 83 percent of the total number of firms, firms with 10 or less employees account only for 16.8 percent of total gross output and 25.4 percent of total employment in 2008 (the figures for 2010 are similar). From Table 2, we see that if we drop firms with 10 or less employees from the dataset, the efficiency gains for the whole economy are reduced from around 43 to about 28 percent (row 4), and the difference between the two sectors is reduced from 43 pp to 25 pp in 2008 and from 50 pp to 28 pp in 2010.

Finally, if we consider the three changes to the baseline altogether (σ=4.5, trimming=2.5 and employment>10), the efficiency gains for the whole economy drop from about 43 in the baseline to about 28 percent in 2008, and from about 49 to about 31 percent in 2010 (see last row in Table 2). In turn, the differences between the service and the manufacturing sectors drop from about 43 pp to about 24 pp in 2008 and from about 50 pp to about 26 pp in 2010. Summing up, the evidence in this section shows that after accounting

6. For further details, see Dias *et al.* (2016).

for possible methodological reasons there still remains a significant difference in allocative efficiency between the manufacturing and service sectors, that we will try to explain in the next section.

Explaining differences in misallocation between the service and manufacturing sectors

In this section, we use regression analysis and the Gelbach decomposition to identify which factors are the most relevant to explaining the differences between misallocation in the service and manufacturing sectors.

Let us denote the efficiency gains in industry s by Z_s=Y_s^*/Y_s and let D be a dummy variable which equals 1 if the industry belongs to the service sector and 0 if it belongs to the manufacturing sector.[7] In the simple cross-section regression

$$Z_s = a_0 + a_1 D_s + u_s \tag{6}$$

the coefficient a_1 measures the difference between the efficiency gains in the service and manufacturing sectors. The D variable in this simple regression may be thought of as proxying for differences of certain factors between the manufacturing and service sectors.

For reasons that will become clear below, we consider as regressors in our model the (industry-level) productivity shocks, the skewness of the productivity distribution and the proportion of young firms, denoted by X_{1s}, X_{2s} and X_{3s}, respectively. If we account for the possibility of each regressor having a different impact on the service and manufacturing sectors, the general model may be written as:

$$Z_s = a_0 + a_1 D_s + b_1 X_{1s} + c_1 D_s X_{1s} + b_2 X_{2s} + c_2 D_s X_{2s} + b_3 X_{3s} + c_3 D_s X_{3s} + v_s \tag{7}$$

Using the Gelbach decomposition of omitted variable bias (see Gelbach (2014)), we are able to quantify the contribution of each regressor to explaining the difference of misallocation between the two sectors. In particular, it may be shown that the contribution of each regressor may be divided into the sum of two components: i) one component that stems from the fact that the mean of the regressor differs across the two sectors; ii) a second component that stems from the fact that the impact of the regressor differs across the two sectors.

The results of the Gelbach decomposition are presented in Table 3 for 2008 and 2010, with robust standard errors in parenthesis. The first row records the original difference between efficiency gains in the service and

7. In the analysis that follows we drop the agriculture sector, as we are only interested in explaining the differences between misallocation in the manufacturing and service sectors.

the manufacturing sectors, that is, the estimate of a_1 in equation 6.[8] The second row reports the explained difference, that is the sum of contributions of the 3 regressors. Finally, the second row from bottom records the residual unexplained difference, that is, the estimate of a_1 in equation 7. For each regressor the total contribution is divided into the two above mentioned components, which are denoted "mean differences" and "impact differences".

An important result is that the model fully accounts for the difference of efficiency gains between the two sectors. The residual unexplained difference is not significantly different from zero both in 2008 and 2010.

Productivity shocks emerge as the most important factor explaining misallocation differences between the two sectors. Importantly, the contribution of productivity shocks stems mostly from the difference of the impacts between the two sectors. In particular, the impact of productivity shocks in the service sector is significantly higher than in the manufacturing sector. This is an interesting result that warrants some explanations.

According to literature on misallocation, we may expect industry-level efficiency gains to be positively correlated with productivity shocks (see, for instance, Asker *et al.* (2014) and Bartelsman *et al.* (2013)). In the presence of adjustment costs, a firm can adjust capital or labour only with some time lags as it takes time to install capital or to hire new employees. A similar process takes place in the presence of output price rigidity. Thus, when hit by an idiosyncratic productivity shock, a firm responds with a lag and adjusts the input level or the output price sluggishly, which leads to variation of TFPR across firms. With this lagged response, greater idiosyncratic shocks lead to greater variation of TFPR across firms and thus, to greater misallocation. However, for the impact of productivity shocks on misallocation to differ across sectors, we need to assume that the importance of input adjustment costs (capital and/or labour) or the degree of price rigidity vary across industries.

In order to investigate this issue, we use equation (4). By looking at the correlation between TFP shocks and the dispersion of the individual wedges, we are able to tell whether the impact of TFP shocks on misallocation stems mainly from the presence of capital, labour or output distortions. The correlations suggest that the higher impact of productivity shocks on the service sector is likely to stem from higher price rigidity and higher labour adjustment lags in this sector (see Dias *et al.* (2016) for further details). It is well known that price rigidity is higher in less competitive markets and that, on average, competition, is lower in the service sector (see Dias *et al.* (2015b) and ECB (2006)). Thus, higher output price rigidity, stemming from lower product market competition, emerges as a natural explanation for the higher

8. Note that the difference in efficiency gains between the two sectors in Table 3 is a non-weighted average, which explains the difference vis-à-vis the figures reported in the last row of Table 2.

	2008	2010
Difference in efficiency gains	0.202	0.205
	(8.31)	(7.90)
Explained difference:	0.225	0.207
	(2.36)	(2.45)
a) Productivity shocks	0.175	0.123
	(1.82)	(1.64)
a_1) Mean differences	0.027	0.023
	(1.77)	(2.17)
a_2) Impact differences	0.148	0.099
	(1.44)	(1.23)
b) Sectoral structure	0.086	0.113
	(2.60)	(3.07)
b_1) Mean differences	0.016	0.002
	(2.15)	(0.33)
b_2) Impact differences	0.069	0.112
	(2.00)	(2.85)
c) Importance of young firms	−0.036	−0.029
	(−0.96)	(−0.97)
c_1) Mean differences	0.021	0.014
	(1.83)	(1.70)
c_2) Impact differences	−0.057	−0.042
	(−1.32)	(−1.37)
Unexplained difference	−0.023	−0.002
	(−0.26)	(−0.02)
Number of industries	154	154

TABLE 3. Difference of efficiency gains between services and manufacturing - Gelbach decomposition

Efficiency gains are obtained assuming case (5) in Table 2. Difference in efficiency gains is given by the coefficient of the industry-dummy in regression (6), while the unexplained difference is given by the coefficient of the industry-dummy in regression (7). Robust t-statistics in parentheses.

impact of productivity shocks on misallocation in the service sector. In turn, higher informational frictions (stemming from higher spatial dispersion of firms due to local markets) might explain why labour adjustment lags appear to be higher in the service sector.

The sectoral structure, as proxied by the skewness of the productivity distribution, emerges in Table 3 as the second most important factor to explaining misallocation differences between the two sectors. We use the skewness of the productivity distribution as a way of summarizing the industry-level characteristics that may affect the impact of size-dependent distortions. The aggregate impact of a size-dependent policy varies across industries according to the characteristics of the size distribution of each industry. In an economy where special lines of credit (with subsidized interest rates) or employment subsidies are available to small and medium sized firms, we would expect the impact on misallocation of such distortions to be higher in industries where the skewness of the size distribution is higher,

that is, where a reasonable proportion of these (less productive) firms operates together with a few large firms that do not have access to such benefits.[9]

From Table 3 we see that the bulk of the contribution of the sectoral structure comes from the higher impact of this regressor in the service sector, which means that there must be size-dependent distortions in this sector that are not present or are present to a less extent in the manufacturing sector. The analysis of the correlations between TFP and the individual wedges shows that what distinguishes the two sectors, in qualitative terms, is the output wedge in the sense that a higher proportion of firms appears as benefiting from output subsidies in the service sector (see Dias *et al.* (2016)). In the model, firms that misreport sales (for tax reasons, for instance) will tend to show up as less productive firms, both in terms of TFP and of TFPR and so, as benefiting from output subsidies (they appear as being producing more than what they should given their TFP levels). The anecdotal evidence suggests that informality is higher in the service sector. Part of this informality stems from characteristics of the sector that make the enforcement activity of tax collection much more difficult than in the manufacturing sector. We believe that this might be part of the story behind the documented difference between the two sectors, but this is certainly an issue deserving further investigation.

Finally, according to the model, the importance of young firms, proxied in the model by the proportion of firms with 3 years of age or less, also has a bearing on the difference of misallocation between the two sectors. We link this impact to the presence of financial constraints imposed by financial institutions on young firms, because they have no credit history or because they have insufficient guaranties (see, for instance, Midrigan and Xu (2014), Moll (2014) and Gilchrist *et al.* (2013)).[10]

From Table 3, we conclude that this regressor contributes with two opposite effects to the difference in misallocation between the manufacturing and the service sectors. On the one hand, the impact of the difference in the mean of this regressor between the manufacturing and the service sectors contributes to increase the difference in misallocation between the two sectors (2.1 pp in 2008), but the difference in the impact of the regressor between the two sectors has the opposite effect (-5.7 pp), so that the total impact of this regressor is negative (-3.6 pp). This means that the impact on misallocation of the proportion of young firms in the service sector (despite being positive) is lower than the corresponding impact on the manufacturing sector. By looking at the relationship between firms' age and scaled wedges,

9. Note that distortions in the model are identified in relative terms, so that, in the limit, if special lines of credit were available to all types of firms in the same industry because, say, there are only small or medium sized firms in that industry, the model will not identify any capital distortion.

10. Indivisibilities in the input factors (labour force or capital stock) or faster grow of (small) young firms might also contribute to justify higher misallocation levels within these firms.

we conclude that young firms, on average, face higher distortions (higher TFPR) than older firms, stemming from higher capital costs and the presence of output distortions. Again, as in the case of the skewness regressor, the output wedge emerges as the main responsible for the differences in the impact of this regressor between the two sectors: output distortions for young firms are much less important in the service than in the manufacturing sector, contributing for a smaller contrast between younger and older firms in the former.

Conclusions

The empirical literature on misallocation has recently documented that resource misallocation in the service sector is significantly higher than in the manufacturing sector. Because the service sector is by far the most important sector of activity in developed economies, significantly higher levels of misallocation in this sector may have serious consequences for aggregate productivity.

Using data for the Portuguese economy, we document that the significantly higher levels of allocative inefficiency in the service sector are not the result of a small number of industries with abnormal levels of inefficiency, but rather the result of a strong regularity. The great majority of the industries belonging to the manufacturing sector rank among the industries with the lowest misallocation.

By exploring the consequences of using alternative assumptions for our model, we conclude that about 50 percent of the original estimated differences of misallocation between the service and the manufacturing sectors can be attributed to methodological choices. In order to understand which factors explain the remaining gap we resorted to regression analysis, where the regressors were defined so as to capture the impact of the different sources of misallocation suggested in the literature.

Productivity shocks, which capture the impact of (capital and/or labour) adjustment costs and/or output-price rigidity on misallocation, is the most important factor contributing to the differences of misallocation between the two sectors. Such contribution stems from the fact that the impact of productivity shocks in the service sector is significantly higher than in the manufacturing sector. Overall, the bulk of the difference in misallocation due to productivity shocks is likely to originate from the presence of higher output-price rigidity and higher labour adjustment lags in the service sector.

The sectoral structure, which captures the impact on misallocation of size-dependent distortions, and is proxied by the skewness of the productivity distribution, emerges as the second most important factor in explaining the difference of misallocation between the two sectors. Also in this case, the bulk of the contribution comes from its higher impact in the service sector, which

we see as a result of the higher informality that makes the enforcement activity of tax collection much more difficult than in the manufacturing sector.

Finally, the empirical model suggests that the proportion of young firms also has a bearing on the difference of misallocation between the two sectors, but its impact in the service sector is lower. We link the impact of this regressor to the presence of credit constraints imposed by financial institutions on young firms, because they have no credit history or because they have insufficient guaranties.

Our findings have important implications for economic policy. A significant part of the difference of allocative efficiency between the two sectors may be attributed to higher output-price rigidity in the service sector, so that measures aimed at increasing competition in the product market in the service sector will contribute to increase allocative efficiency in this sector and thus, will boost aggregate productivity. Also, less productive firms appear as benefitting from capital and labour subsidies, which suggests that there might be a trade-off between employment creation and aggregate productivity. Thus, size-contingent laws passed by the economic authority and aimed at boosting employment creation in small or medium-sized firms (special lines of credit with subsidized interest rates and/or labour subsidies), to the extent that they contribute to the survival of unproductive firms, especially in the service sector where competition is weaker, will increase misallocation and have a strong negative impact on aggregate productivity.

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How the Portuguese firms adjusted to the economic and financial crisis: main shocks and channels of adjustment

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Abstract
This article reports the findings of a survey conducted in 2014/2015 on a sample of Portuguese firms with the main purpose of identifying the major shocks faced by firms during the recent crisis and detecting their response in terms of wage-setting, price setting and labour force composition. Firms' difficulties in being repaid by their customers and the decline of demand were reported as the two most important factors affecting firms negatively during the crisis. The impact of these two shocks was particularly felt in very small firms, in sectors such as construction, energy or trade and in firms that sell mostly to domestic markets. Reducing employment was the main instrument to accommodate negative shocks, in particular through the freeze or reduction of new hires, non-renewal of temporary contracts at expiration or individual dismissals. An increasing number of firms also froze the base wages of their workers and reduce their prices. (JEL: J23, J30, J50)

Introduction

The impact of the economic and financial crisis in Portugal was particularly severe as it involved a strong adjustment of the macroeconomic imbalances built up over the previous decades. The adjustment process has entailed considerable costs in terms of economic activity and employment. The Economic and Financial Assistance Programme agreed with the European Commission, the ECB and the IMF in May 2011 was designed to finance the economy, rebuild confidence, enabling the economy

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to restore a sustainable growth path and safeguard the financial stability. The program was implemented in an adverse international environment, marked by the stabilisation of economic activity in the main trading partners and continued financial fragmentation in the euro area.

The reform of the labour market was elected as one of the key areas of the overall adjustment programme. Measures included in the programme were designed in order to tackle all the main policy-induced distortions that were identified: an extreme level of employment protection; a wage setting system governed by strong multi-year increases in the minimum wage and sectoral collective wage agreements traditionally extended without regard to the competitive position of non-affiliated firms; and the most generous unemployment benefit system in Europe, in terms of replacement ratios but particularly with respect to duration.

Against this background, this article reports the main findings of a survey conducted by the Banco de Portugal in 2014 and 2015 on a sample of Portuguese firms with the main purpose of collecting information about firms' changes in practices in the last few years as a result of the crisis. The survey was made in the context of the third wave of the Wage Dynamics Network (WDN)[1], a research network consisting of economists from the European Central Bank and the national central banks of the EU countries, that elaborated an harmonised questionnaire with the purpose *inter alia* of identifying the main shocks faced by firms during the recent crisis and detecting their response in terms of wage-setting, price setting and labour force composition.

It is worth to mention that, despite some improvement recently, the labour market deteriorated considerably between 2010 and 2013. Unemployment had been creeping up even before the Great Recession, but after that, it reached heights the Portuguese economy had not experienced before. This is particularly true in the case of long-term unemployment. Unemployment incidence among the younger cohort of workers (15 to 24 year-olds) has been of particular worry, with unemployment rates in this group topping at over 40 percent in early 2013. In addition, growth in participation in Portugal has declined since the Great Recession started in 2008, and rates have hovered around 73 percent. Employment, which until the Great Recession had grown in line with overall population and had been above the EU

1. The WDN gathered for the first time in July 2006 with the purpose of identifying the sources and features of wage and labour cost dynamics in Europe and clarifying the relationship between wages, labour costs and prices both at the firm and macro-economic level. One of the lines of research investigated the information collected from an ad-hoc survey on wage and price setting behaviour at the firm level was conducted at the end of 2007/beginning of 2008. Later on, in 2009, some countries launched a follow-up survey specifically designed to assess the response of wages and labour costs during the 2009 crisis period (the second wave of the WDN). This follow-up survey, more limited that the original one, collected data on firms' perceptions of the crisis and their actual response to it.

average as a percentage of the population, has plummeted since then, with the employment-to-population ratio falling from a peak of 69 percent to a trough of 60 percent, well below that of European peers.

The Portuguese Labour Market: a brief characterisation

The way the labour market behaves is moulded by the way the economic cycle and the actions of economic actors interplay but also by the country's idiosyncratic structure, such as the labour market institutions and the characteristics of firms and the labour force. In this context, the Portuguese labour market is characterized by several structural features that may make it more exposed to economic cycle downturns. Despite recent major improvements, the Portuguese labour force still reveals low educational attainment, especially when compared to European Union countries; the firm size distribution is still very heavy on small and medium-sized enterprises, which tend to be less resilient under economic stress; and the characteristics of labour market institutions like the collective bargaining and wage setting systems, employment protection and unemployment insurance are important constraints to the adjustment process. A very centralized bargaining system, together with an often-used extension mechanism, account for collective bargaining coverage of around 90 percent of workers. Indeed, most of the collective agreements are industry/sector wide, as opposed to firm-specific or for a small group of firms. They then get extended to workers and firms beyond the ones represented by the unions and employers' associations that signed the original agreement by the government via the extension mechanisms.[2]

The degree of employment protection afforded to open-ended contracts has been much higher than that afforded to fixed-term contracts. This employment protection gap resulted in a two-tier system that has been characterized by the increasing use of the latter type of contracts. In addition, the Portuguese unemployment insurance is characterised by its high generosity in terms of duration.[3]

2. In October 2012, for an agreement to get extended through a portaria de extensão, the firms subscribing the agreement would have to employ at least 50 percent of the workers in the sector. More recently, in June 2014, a clause was added that alternatively to the 50 percent representativeness, allows agreements where at least one third of the subscribing firms are SMEs to be extended. This is contrary to the spirit of the initial change and does not guarantee representativeness.

3. Recently, the system underwent some changes. It is now easier to qualify: it requires social security contributions of 360 days in the last 24 months (as opposed to 450 days) and some self-employed workers may also qualify; but the duration is shorter, as subsidies can last from 150 to 780 days depending on both age and past contributions (it used to be between 270 and 1140 days). The replacement rate is very similar to that of other European countries: 65 percent of the

These structural characteristics seemed largely innocuous during the economic boom period of the late 90s. However, once the economy started to struggle in the early 2000s, their influence began to show, and by the time Portugal was swept by the twin effects of the Great Recession and the Debt Crisis, the consequences of their inadequacy became clearer. The result has been a record-high unemployment rate, a significant increase in unemployment durations, affecting mainly young workers and leading to skill erosion and scarring effects that compromise workers' future expected gains and the economy's future expected performance. The large negative shocks that took place in the recent recession led some firms to lower their total labour costs. This could have been done by a combination of real wage cuts and/or an adjustment in employment levels and its composition. The existing wage bargaining system implied a degree of nominal wage rigidity that, combined with low inflation, made it harder to adjust real wages. Therefore, even though there was real wage growth moderation, most of the adjustment came from large reductions in employment and changes to its composition.

In turn, the high (and unequal across types of contracts) levels of employment protection conditioned this employment adjustment. The fact that it was very costly for firms to use the separation margin (especially for open-ended contracts) meant that the adjustment process was delayed as it was achieved mostly by reducing hires (again, especially for open-ended contracts). This process also meant that the majority of the churning and net employment reduction took place for fixed-term contracts. The incidence of this type of contracts among younger workers may partly explain the increased unemployment rates experienced by this age group. To complete the story, note that unemployment insurance duration was very high. When combined with worsened employment perspectives this may have resulted in marked increases in unemployment duration.

Sample selection and survey design

The survey was carried out by the Banco de Portugal between July 2014 and February 2015 on a sample of firms with 10 or more employees covering manufacturing, energy, construction, retail and wholesale trade, transport and communications, education, health, financial services and other business services. A total of 5,000 firms were contacted to participate selected as

---

average wages in the year before unemployment subject to a floor and a cap. After 6 months the subsidy drops by 10 percent. Furthermore, the unemployed workers who do not qualify for UI or have ran through the maximum duration of the subsidy, may qualify (depending on past contributions and household income) for social unemployment insurance lasting for as long as the UI itself at its minimum floor.

a stratified random sample from the Ministry of Employment Personnel Database (Quadros de Pessoal, QP).[4] Given the prevalence of very small firms in the Portuguese production structure, a pure random selection of firms would clearly have led to over-representation of smaller-scale firms.

Against this background, the sample selection was split into two stages. For the first, it was decided to include all firms with 250 or more employees in the sectors mentioned above. This provided 813 firms. In the second stage, the remaining firms were chosen on the basis of random stratification. The strata were defined in 28 industry groups from 73 two-digit NACE sectors and 4 size categories: i) firms with 10 to 19 employees; ii) firms with 20 to 49 employees; iii) firms with 50 to 99 employees; iv) firms with 100 to 249 employees. Grouping these in the 28 industry groups chosen led to 112 mutually exclusive strata. The number of firms to be drawn from each stratum was set on the basis of their employment weight obtained from the QP for 2013. Once this figure was reached, the firms within each stratum were chosen randomly. The final sample included 1,514 firms from manufacturing, 69 from the energy, 434 from construction, 824 from trade, 95 from financial services and 2,064 from other business services, such as education, healthcare, transport and communications. These firms represented around 55 per cent of total employment in Portugal in the selected sectors.

Structure and methodology for carrying out the survey

The questionnaire was developed within the scope of the WDN and was based on a set of common questions for all the national central banks involved. It was organised in five sections, corresponding to 32 questions. The opportunity provided by the survey was also used to include some additional questions, as a way to look into some aspects of the labour market which are particularly relevant in the case of Portugal (e.g., the change in worker flows during the recession or the relevance in some of replacing workers with lower wages). An attempt was made to avoid technical language in the questions so that as many people could understand them as possible. After the sample was set up, in June 2014, a first version of the questionnaire was sent to 30 firms. This pilot questionnaire turned out to be very useful for an initial assessment of how the project was received and whether it was viable. A number of firms were contacted on the basis of the first replies and some questions were rephrased or cut out, making the questionnaire shorter and easier to understand.

4. The Ministry of Employment Personnel Database is collected annually by the Strategy and Planning Department of the Ministry of Employment from all Portuguese firms. The data is therefore tantamount to a census and is an extremely important source of information for a microeconomic analysis of the labour market in Portugal, making it possible to undertake longitudinal analysis of firms and employees.

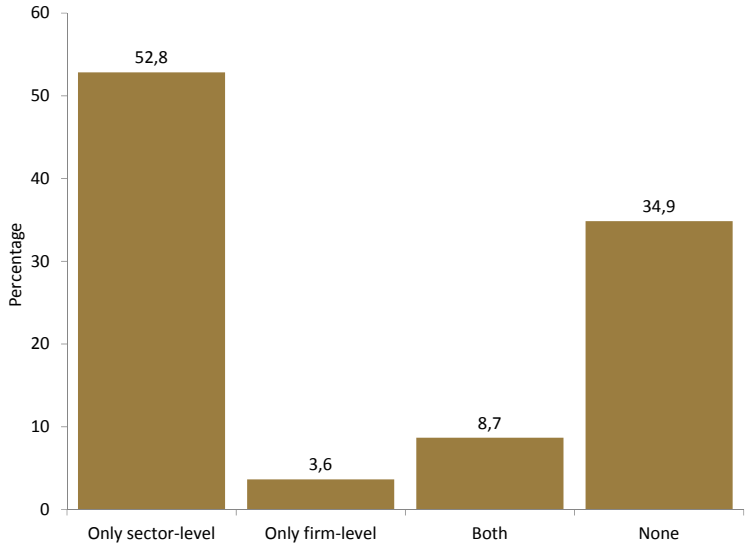

FIGURE 1: Share of firms that apply collective wage agreements (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

In October 2014, a revised version was sent to all the firms chosen, together with a letter signed by the Governor of the Banco de Portugal. This letter made it clear, among other things, that the questionnaire should be answered by someone who was very well aware of the range of procedures underlying wage and price determination. More than one person could answer it, as long as there was an overall consistency in the replies. After receiving the questionnaire, the firms had one month to send their replies, which could be either paper based or through an Internet site specially set up for this purpose.[5] However, a number of questionnaires were received well after this deadline.

The survey was concluded in April 2015 with 1,383 valid questionnaires received, which corresponds to a 28 per cent response rate. This percentage was a bit lower than the one obtained in 2008 under the first wave of the Wage Dynamics Network (WDN 1). Differences in response rates may reflect *inter alia* the way questions are formulated or the economic outlook in which they occur. At this, respect it is important to mention that the WDN1 survey was carried out slightly before the beginning of the crisis. Table A.1 in the Appendix shows further details on the sample coverage and the response rate.

5. A help line was set up for firms to request clarification. They were able to use telephone, fax or e-mail.

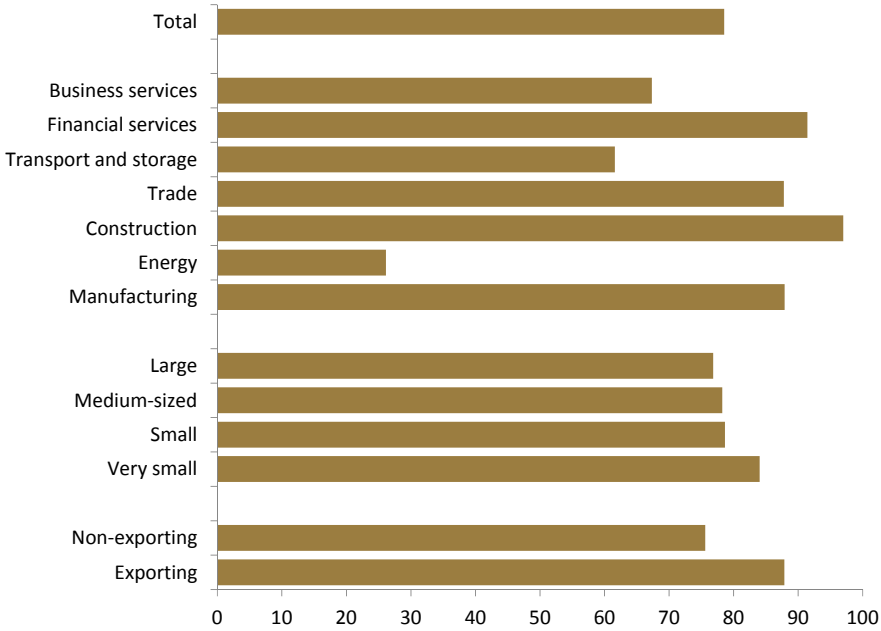

FIGURE 2: Share of firms perceiving their competition to be very high (in percentage)
Source: Survey on firms' adjustment over the period 2010-2013.

The information obtained revealed that a considerable percentage of firms (65 percent) apply some type of collective wage agreement. Sector-level agreements dominate but the share of firm-level agreements is non-negligible in particular in larger firms where frequently the two levels of agreements coexist (Figure 1).[6] The percentage of workers covered by both agreements is slightly above 90 percent. However, about 30 percent of the firms applying sector-level collective agreements are not members of any of the employer's associations taking part in the negotiations. Concerning the level of competition in their markets, most firms perceived it as being strong or very strong. The only exception is those firms operating in the energy sector (Figure 2). In addition, for the majority of firms the level of competition increased during the great recession.

In the analysis that follows, I use employment-based weights in the weighted summary statistics. The evidence is thus made to represent total

6. In the analysis that follows, firms were split into 4 size groups according to their number of employees: very small firms (with 10 to 19 employees), small firms (with 20 to 49 employees), medium-sized firms (with 50 to 199 employees), and large firms (with 200 or more employees).

employment in the population of firms with 10 or more employees in selected sectors.[7]

Sources and size of shocks

In order to assess firms' response during the crisis the survey considered five different types of shocks. In particular, reporting firms were asked about the way the recent crisis affected: i) the level of demand for their products and services (demand shock); ii) the uncertainty of demand for their products and services (uncertainty shock); iii) the access to external financing through the usual financial shocks (credit supply shock); iv) the ability of their customers to pay and meet contractual terms (customers repayment shock); v) the access to supplies from their usual suppliers (supply shock). Firms had five alternative answers to report the impact of each shock (strong decrease, moderate decrease, unchanged, moderate increase and strong increase).

The results show that only 3.7 percent of firms were completely unaffected by the crisis while about one quarter experienced only negative shocks during the period (Figure 3). The results also reveal that even in times of crisis an important share of firms faced positive shocks which suggest that the impact of the recession was heterogeneous across firms and sectors. However, even though 57 percent of firms faced both positive and negative shocks, 79 percent had only one positive shock whereas 62 percent were hit by two or more negative shocks (Figure 4).

The numbers are more revealing when we observe that 82 percent of the firms were hit by at least one negative shock (Figure 5). The inability of customers to pay or meet contractual obligations and the decline of demand were reported as the two most important factors affecting firms negatively during the crisis (Figure 6). The breakdown by sector, size and market orientation shows that the negative impact of the crisis was particularly felt in very small firms, in sectors such as construction, energy or trade and in firms that sell mostly to domestic markets (Figure 7).

The access to external financing through the usual financial channels ("credit shock") was reported as the third most important factor affecting firms' activity during the recession. This factor was particularly important in construction and energy, where almost three quarters of firms had credit

7. More precisely, the purpose of the sampling weights is to correct for possible imperfections in the sampling procedure in order to ensure that the distribution of the realized sample of firms reflects as closely as possible the distribution of the total population of firms. To that end, the sampling weights correct for the unequal probability of firms ending up in the final sample of 1,383 firms (i.e. correct both for unequal probability of selection of firms into the gross sample of 5,000 firms and for potential non-response biases) and adjusts for differences in the importance of each stratum in terms of the number of employees the strata represents in the population.

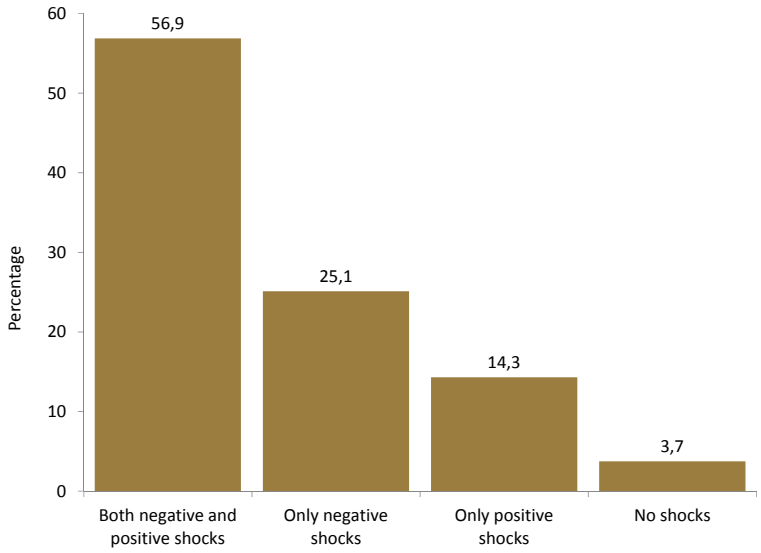

FIGURE 3: Share of firms affected by negative and positive shocks (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

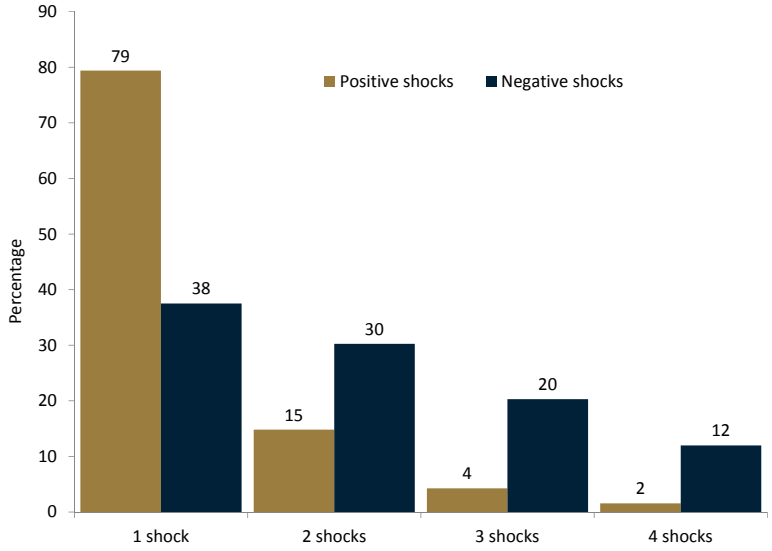

FIGURE 4: Share of firms affected by both negative and positive shocks (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

restrictions, but also in very small firms and in firms operating in highly competitive markets.[8].

8. In the context of the survey, credit restrictions assumed two different forms: credit was virtually unavailable or credit was available but with conditions (interest rates or other

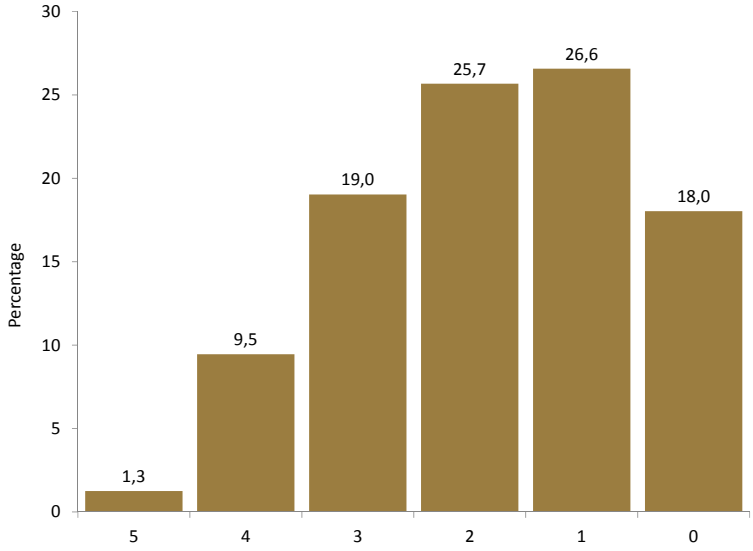

FIGURE 5: Number of negative shocks (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

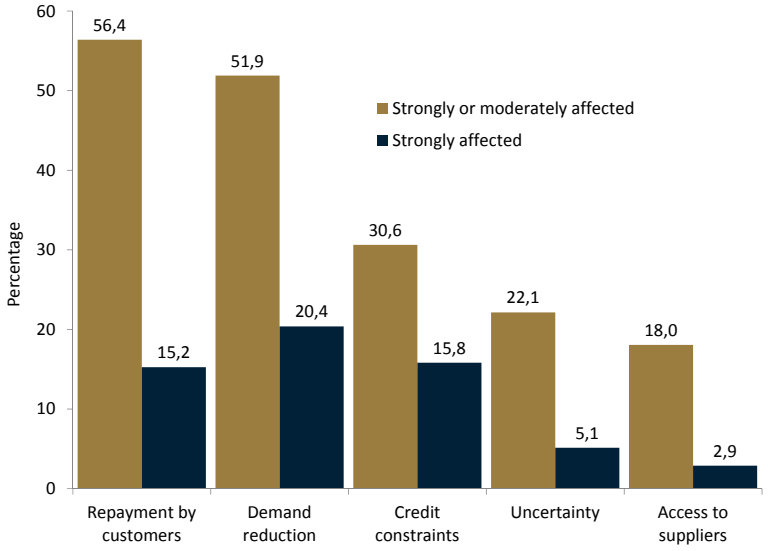

FIGURE 6: Share of firms affected by each negative shock (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

contractual terms) that were too onerous. This latter option was considered an important

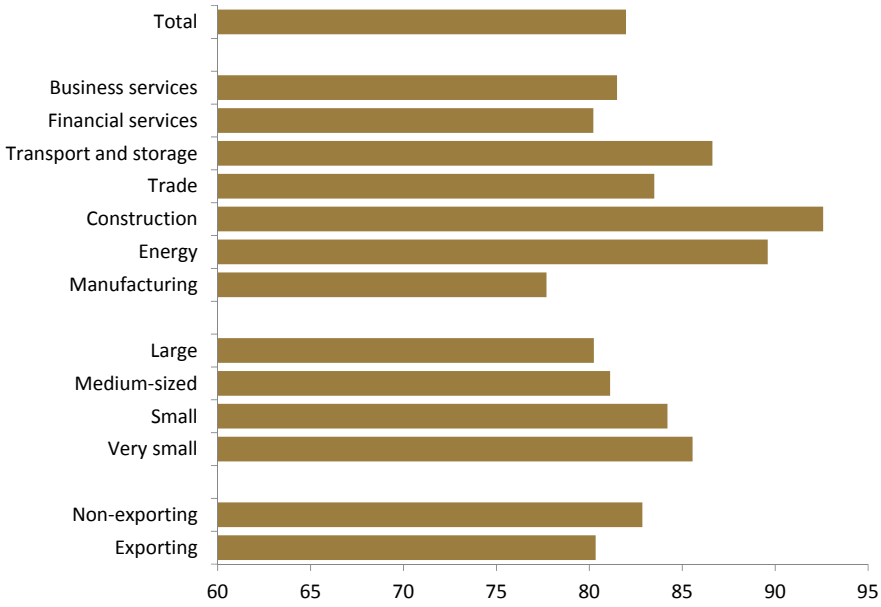

FIGURE 7: Share of firms affected by negative shocks (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

Table 1 provides estimates of the marginal effects of some firms' features on the incidence of each negative shock. In general, it confirms a higher negative impact of the crisis on firms from construction, energy and trade. In particularly, these firms reported higher falls in demand during the crisis. The results also reveal that credit contraints were particularly important for very small firms and firms that operate in more competitive markets. In addition, firms that sell mostly to foreign markets were in general less affected by the different shocks.

It is important to note that many firms (55 percent) were negatively affected by more than one shock over the period. Table 2 displays the tetachoric correlation coefficients between the different pairs of negative shocks revealing in most cases positive and significant correlations.

Firms were also asked to specify whether the shocks that affected them more negatively were regarded as transitory, partly persistent or long lasting. Most firms considered the negative shocks that hit them as persistent. The degree of persistence seems to vary slightly by the type of shock. Figure 8 shows that negative demand shocks seem to be relatively less persistent

limitation by almost 50 percent of the firms whereas the former was deemed to be relevant by 39 percent of the firms.

Variables	Demand reduction	Customers ability to repay	Credit constraints	Higher uncertainty	Access to supplies
Size:					
Small firms (20-49)	−0.056	0.010	−0.090**	0.010	−0.014
	(0.048)	(0.047)	(0.045)	(0.037)	(0.039)
Medium-sized firms (50-199)	−0.137***	−0.065	−0.091**	0.067 *	−0.052
	(0.045)	(0.045)	(0.043)	(0.035)	(0.036)
Large firms (>199)	−0.050	−0.024**	−0.022	0.080 **	−0.022
	(0.048)	(0.048)	(0.047)	(0.039)	(0.040)
Sectors:					
Energy	0.207**	−0.051	0.314 ***	−0.133**	0.048
	(0.084)	(0.092)	(0.089)	(0.053)	(0.080)
Construction	0.196***	0.208 ***	0.228 ***	0.023	0.195 ***
	(0.051)	(0.048)	(0.051)	(0.045)	(0.050)
Trade	0.163***	0.147 ***	0.010	−0.033	−0.026
	(0.045)	(0.044)	(0.041)	(0.036)	(0.035)
Transport and Storage	0.143**	0.042	0.012	0.051	−0.072*
	(0.061)	(0.063)	(0.057)	(0.056)	(0.045)
Business services	0.026	0.011	−0.011	−0.006	−0.056**
	(0.035)	(0.036)	(0.033)	(0.029)	(0.027)
Financial services	0.139**	0.019	−0.071	0.078	−0.093**
	(0.070)	(0.072)	(0.058)	(0.064)	(0.045)
Exporting firms	−0.106***	−0.064**	0.005	−0.015	−0.024
	(0.029)	(0.030)	(0.028)	(0.025)	(0.024)
High competition	0.172***	0.093 ***	0.103 ***	0.061 ***	0.014
	(0.025)	(0.026)	(0.025)	(0.023)	(0.021)
Firm age	0.001*	0.001 **	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations:			1,381		
Wald χ^2 (12):	120.72***	67.31***	67.78***	24.69***	45.62***

TABLE 1. The determinants of the incidence of each negative shock (marginal effects from probit estimates)

Source: Survey on firms' adjustment over the period 2010-2013. Robust standard errors are in parentheses; ***,** and * denote significance at 1, 5 and 10 percent, respectively.

	Demand reduction	Higher uncertainty	Credit constraints	Customers ability to pay	Availability of supplies
Demand reduction	1.000				
Higher uncertainty	0.038	1.000			
Credit constraints	0.377***	-0.021	1.000		
Customers ability to pay	0.432***	0.054	0.412***	1.000	
Availabity of supplies	0.373***	-0.090	0.435***	0.414***	1.000

TABLE 2. Tetachoric correlations between the different negative shocks affecting firms

Source: Survey on firms' adjustment over the period 2010-2013.***,**,* denote significance at 1, 5 and 10 percent level, respectively.

whereas difficulties in being repaid by customers appear to be the most persistent. The persistence of shocks appears to be higher in construction and for very small firms. For the three most relevant shocks (demand drop, credit constraints and difficulties in being repaid by customers), the information also shows that they affected firms more negatively in 2012 and 2013 (Figure 9).

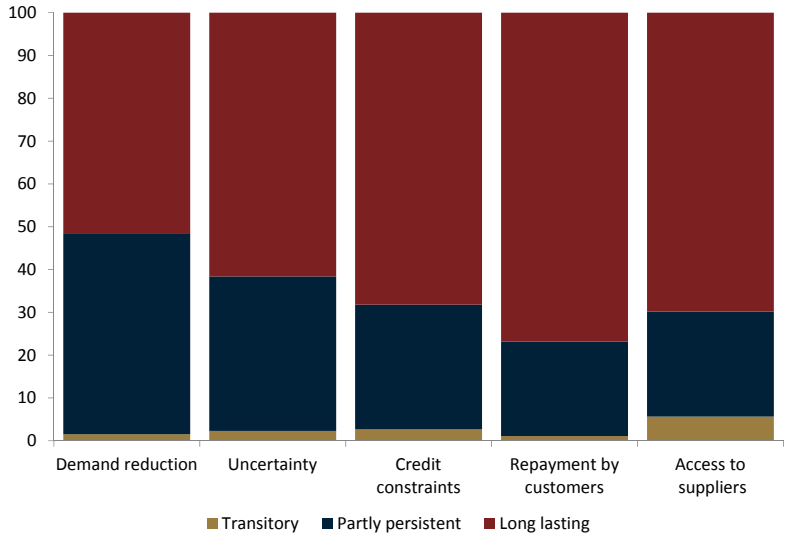

FIGURE 8: Impact of each negative shock (share of firms in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

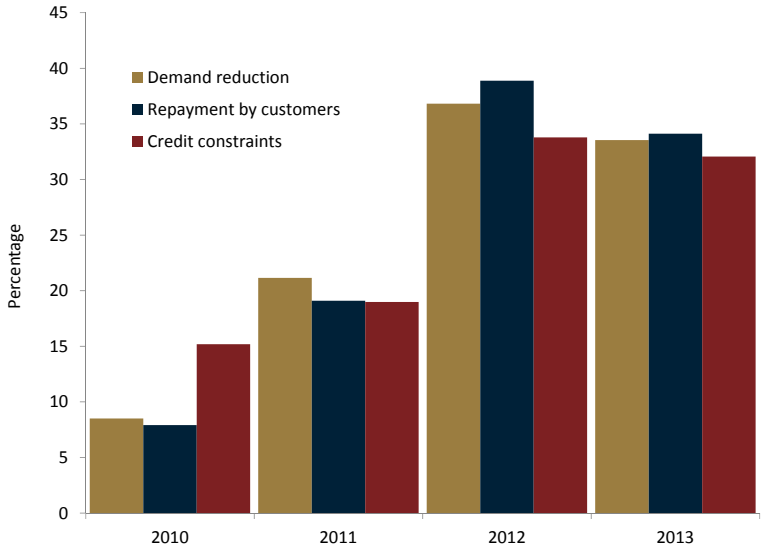

FIGURE 9: Year when each negative shock was more intense (share of firms in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

Main results on employment adjustments and price and wage-setting changes

The way firms respond to shocks by adjusting their prices, wages and employment is an essential feature of microeconomic and macroeconomic adjustment. Shaped by the institutional and structural characteristics of the economy, firms' reactions to shocks mould the dynamics of employment, prices and wages with important and controversial consequences over welfare. While collective bargaining often privileges wage stability, employment protection legislation aims at stabilising employment. In addition, more intense product market competition makes it more difficult for firms to absorb shocks by changing their prices.

Changes in price setting behaviour

The fall in demand reported by the Portuguese firms has mostly a domestic component as 54 percent of firms reported a decline in domestic demand whereas only 25 percent a decrease in external demand (Table 3). About 40 percent of the firms reported an increase in external demand, which is consistent with favourable performance of exports over this period. This behaviour is also consistent with a lower fraction of firms decreasing prices in the foreign markets (25 percent) than in domestic markets (43 percent). Over this period, a significant share of firms also reported an increase in their competitive pressures, which is common to both exporting and non-exporting firms.[9]

	Strong increase	Moderate increase	No change	Moderate decrease	Strong decrease
Demand					
Domestic market	2.5	22.9	20.7	31.7	22.2
External market	10.2	28.8	36.4	19.6	5.0
Prices					
Domestic market	2.1	21.4	33.2	29.6	13.7
External market	1.6	25.7	47.4	22.5	2.8
Competitive pressures					
Domestic market	34.5	29.0	30.3	5.2	1.0
External market	26.7	34.5	34.6	3.4	0.7

TABLE 3. Developments in demand, prices and competitive pressures in domestic and external markets between 2010 and 2013

Source: Survey on firms' adjustment over the period 2010-2013.

9. Exporting firms are defined as those whose exports account for at least 20 percent of total sales.

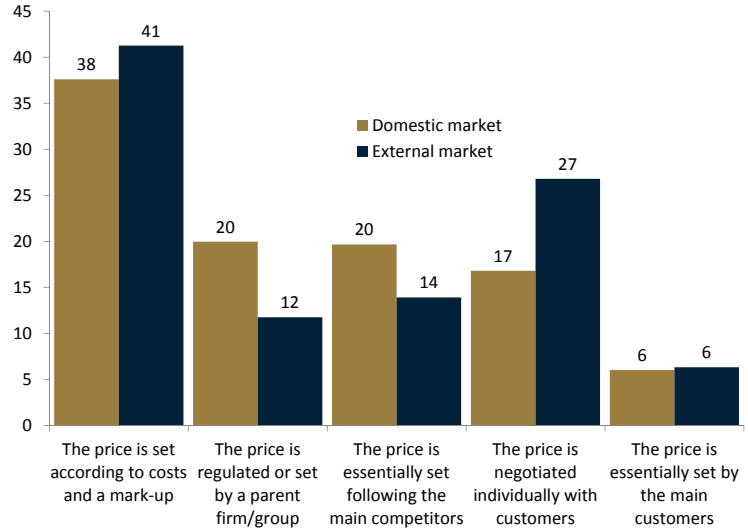

FIGURE 10: Degree of price setting autonomy (share of firms in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

In terms of firms' price setting behaviour, it is also relevant to notice that 30 percent of the firms increased the frequency of their price reviews in the period 2010-2013 which in most cases was due both to higher competitive pressures and more frequent prices changes by the main competitors. This sign of higher price flexibility is also consistent with the high percentage of firms (58 percent) that follow state-dependent price changing strategies, i.e. firms that review their prices only when there is a sufficiently large shift in market conditions. In the two previous surveys conducted in 2004 and 2008 this percentage was, respectively, 40 and 43 percent (Dias *et al.* (2013), Martins (2015) and Martins (2010)). It is important to mention that an important fraction of firms (about 60 percent in both the domestic and the external market) do not have an autonomous pricing policy (Figure 10).

Even in a context of increased competition, lower prices and lower demand, about 60 percent of Portuguese firms did not their costs over this period (Figure 11). This is particularly noticeable in the case of firms affected by a decrease in demand where 57 percent reduced their total costs, whereas this share is only 21 percent for firms not negatively affected by this shock (Figure 12).

Adjusting the labour costs: wages versus labour force size and composition

Besides the price setting behaviour, firms were also asked about how they changed their wages and labour force composition in the period 2010-2013.

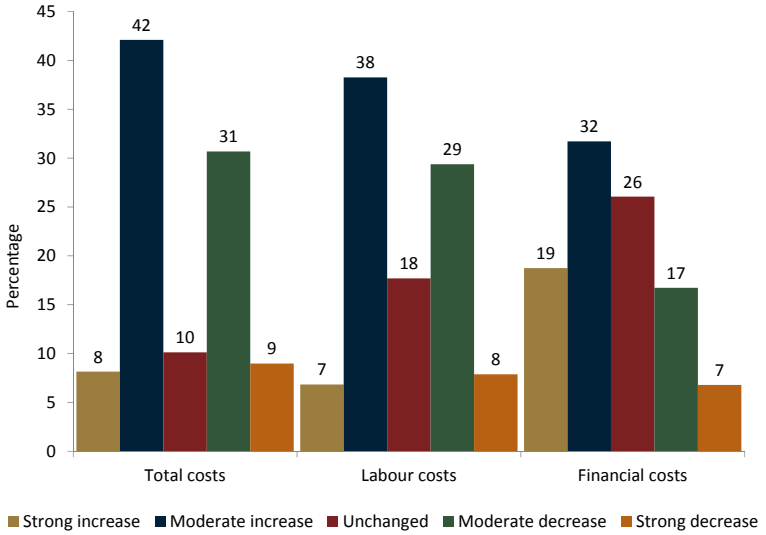

FIGURE 11: Change in costs between 2010 and 2013 (share of firms in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

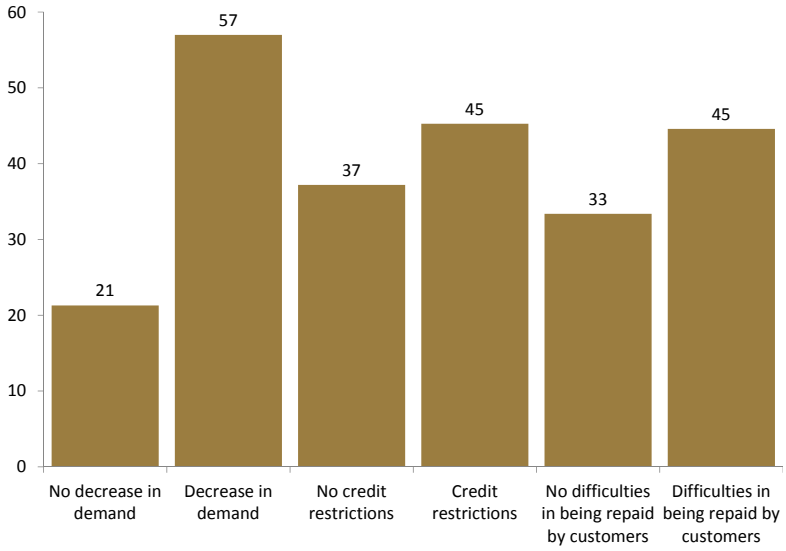

FIGURE 12: Share of firms that cut total cost (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

As expected, given the wage setting restrictions in Portugal, the share of firms reporting reductions in average base wages was quite low (Table 4).

An additional margin of adjustment of total compensation is provided by the flexible wage components. However, the use made by firms does not seem to be substantial.

	Strong increase	Moderate increase	No change	Moderate decrease	Strong decrease
Average base wages	0.5	39.8	48.7	9.0	2.2
Flexible wage components	1.2	23.0	54.3	15.7	5.8
Permanent employees	3.2	27.3	37.9	24.8	6.8
Temporary employees	4.5	29.7	34.8	21.7	9.3
Average number of hours	0.5	15.1	73.4	9.9	1.1

TABLE 4. Changes in labour cost components between 2010 and 2013

Source: Survey on firms' adjustment over the period 2010-2013.

Since the adjustment in base wages and hours was rather restricted, the main instrument to accommodate negative shocks was the reduction in the number of employees. This affected more intensively workers under temporary contracts. Not surprisingly, the use of the several strategies to adjust labour costs is higher for firms hit by negative shocks. Figure 13 illustrate this for the demand shocks but this is also true for the other three types of shocks. The differences between firms affected and not affected by shocks are especially noticeable regarding the reduction in the number of employees (both permanent and temporary). In the presence of a negative demand shock, 45 percent of the firms reduced the number of permanent employees whereas 41 percent reduced the number of temporary employees (16 and 19 percent, respectively, for those firms not affected by the demand shock).

Margins of employment adjustment

Concerning the employment adjustment, the number of options explored in the survey was quite extensive. It included collective layoffs, individual layoffs, temporary layoffs, reduction of working hours, non-renewal of temporary contracts at expiration, early retirement schemes, freeze or reduction of new hires, reduction of agency workers and hiring workers with wages lower than those who have left recently. Firms could have chosen more than one option. Table 5 shows that the most used strategies to reduce labour input during the crisis were the freeze of hires, non-renewal of temporary contracts at expiration and individual dismissals. In contrast, early retirement schemes, temporary layoffs and collective dismissals were relatively less used. Not surprisingly those sectors that were more affected by shocks (construction, trade and energy) were also those that used more intensively the different margins of adjustment.

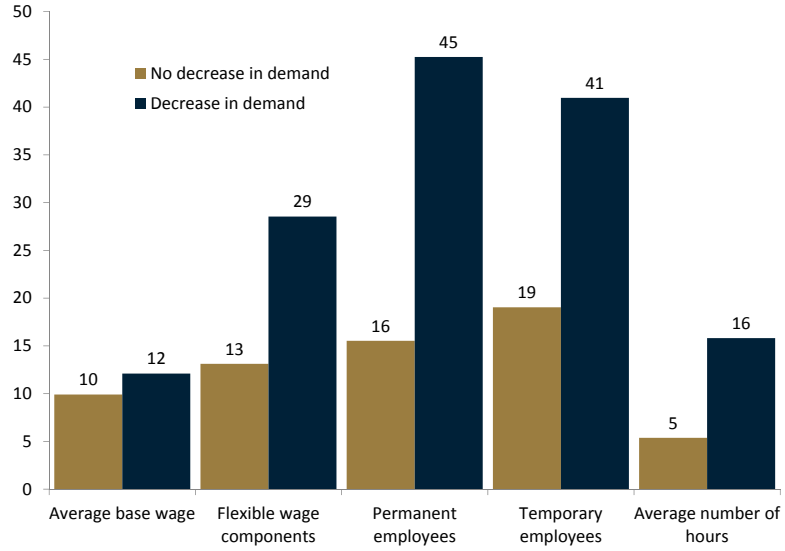

FIGURE 13: Labour cost adjustment and demand shocks (share of firms that used each margin in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

Sectors	Collective dismissals	Individual dismissals	Temporary layoffs	Reduce hours	Non-renewal tempor. contracts	Early retirement	Hiring freezes	Reduce freelancers	Cheaper hires
Manufacturing	5.6	15.1	4.3	14.8	27.5	4.6	27.0	11.4	8.3
Energy	0.0	12.4	0.0	14.3	29.2	17.0	48.1	23.9	18.3
Construction	26.3	47.0	18.4	40.5	49.9	22.7	50.0	38.3	35.3
Trade	9.0	24.3	1.4	13.0	37.3	3.1	40.0	19.1	18.1
Transport and Storage	5.3	12.5	0.0	8.6	24.9	17.3	43.9	9.2	13.6
Business services	8.1	18.3	1.3	16.5	39.7	4.1	37.8	20.4	18.9
Financial services	4.6	9.5	0.0	8.0	40.9	35.1	53.1	24.0	7.2
Total	7.1	18.7	2.1	14.9	35.4	6.5	37.0	17.2	14.8

TABLE 5. Main strategies used to reduce employment between 2010 and 2013

Source: Survey on firms' adjustment over the period 2010-2013.

As mentioned before the two-tier system that characterizes the Portuguese labour market resulted into an increase use of temporary contracts, which become one of the preferred margins for firms to adjust to external shocks. This margin was particularly used in construction and business services. Hiring freezes was exceptionally used in energy, construction, financial services and transport and storage, whereas individual dismissals were relatively more used in construction and trade.

As mentioned before the job creation rate in Portugal declined substantially between 2011 and 2013. Since the beginning of 2014 we have observed some recovery in employment although it is still timid and very

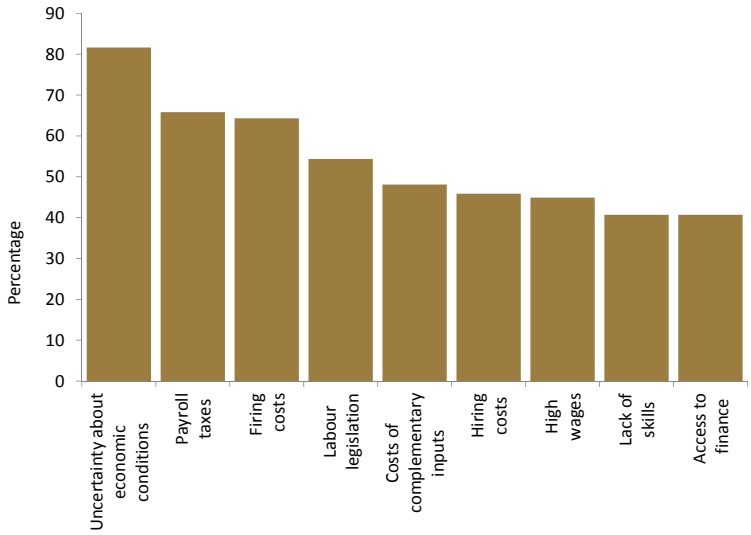

FIGURE 14: Main obstacles for hiring workers with permanent contract (share of firms considering each option as relevant or very relevant in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

much concentrated on temporary jobs. In this context, the survey explored the main reasons that make firms reluctant to hire workers with permanent contracts. Uncertainty about economic conditions was referred as a relevant or very relevant obstacle to permanent hires by 80 percent of the firms (Figure 14). Also important are the constraints imposed by the level of payroll taxes, the firing costs or the labour legislation in general. In contrast, credit restrictions or the presence of skill mismatch seem to play a less important role.

Another important piece of information obtained from the survey related to the employment adjustment is the reported change in the total number of workers between 2010 and 2013. On average, the number of workers declined by 3 percent in this period. Given that the sample is obviously biased towards more successful firms (only those firms that survived during the period were included in the survey) this figure is likely to underestimate the total decline in employment during the crisis. Employment reduction was particularly intense in sectors more affected by the crisis: in construction the number of workers fell by 8 percent whereas in trade this reduction amounted to 6 percent. In contrast, employment in manufacturing remained broadly unchanged. In addition, an important contrast is also visible between exporting and non-exporting firms. Whereas in the latter the number of workers fell by 5 percent, in the former the number of workers declined less than 1 percent.

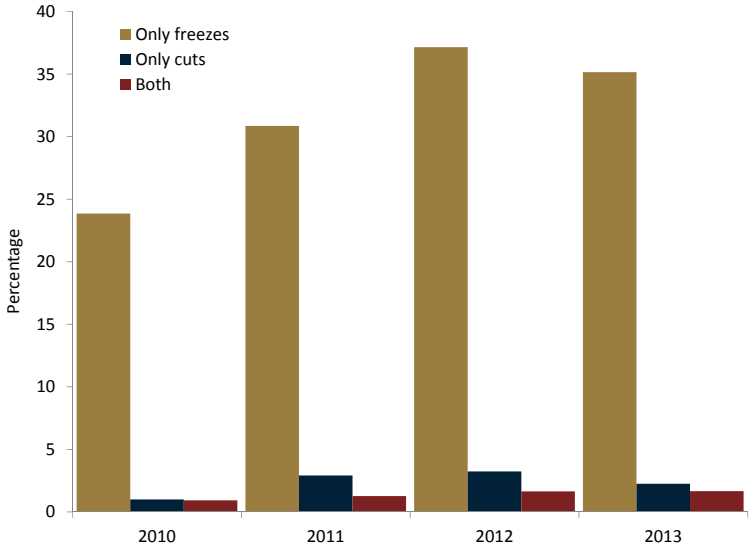

FIGURE 15: Share of firms that froze and/or cut base wages (in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

Adjusting wages

In the face of negative labour demand or supply shocks, firms can also reduce their labour costs by adjusting wages. However, wage adjustments may be hampered by the institutional and structural constraints of the economy, including the presence of downward nominal wage rigidity. As regards nominal wage rigidity, many studies place the Portuguese labour market among the most rigid countries in Europe. Such rigidity stems above all from the fact that labour legislation forbids nominal base wage cuts. This is consistent with the evidence shown before that only a very small proportion of firms reduced the average base wage between 2010 and 2013.

This issue was further explored in the context of the survey. In particular, firms were asked if they cut or froze their base wages between 2010 and 2013. If they responded affirmatively, they were also asked to mention the particular year(s) when that cuts/freezes occurred as well as the share of workers that were affected. Figure 15 shows that the share of firms that froze their base wages increased from 25 percent in 2010 to almost 40 percent in 2013. The increase in the share of firms with zero base wage changes may indicate that downward nominal wage rigidity has become an important active restriction during the crisis. As expected, the share of firms reporting base wage cuts was rather low, although this percentage increased from 1.9 percent in 2010 to 3.9 percent in 2013.

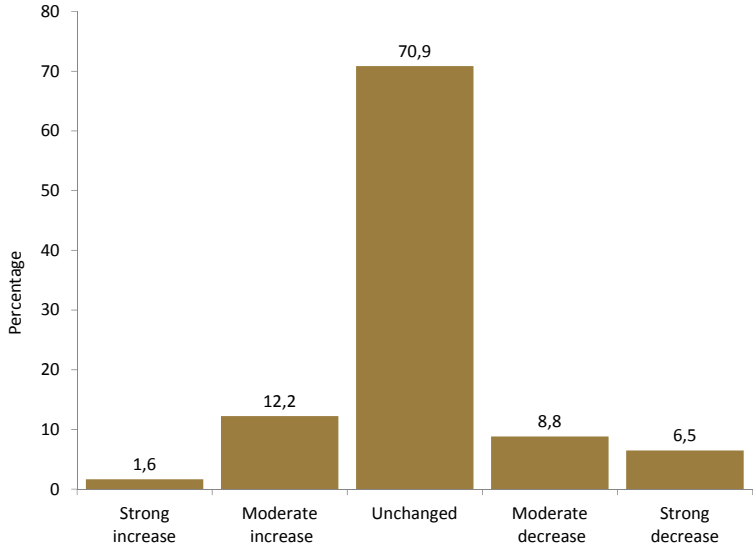

FIGURE 16: Firms' perception about the ability to reduce wages (share of firms in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

It is also important to highlight that when asked if their ability to cut wages has increased since 2010, most firms (70 percent) responded that this capacity was largely unchanged (Figure 16).

A similar question was also asked regarding other margins of firms' adjustment (collective and individual dismissals, temporary layoffs, change working hours, move workers to different positions or locations and hire workers). Even though most firms still answered that the ability to use each of these strategies has become mostly unchanged, a non-negligible fraction responded that in particular the ability to make adjustments in working hours or to move workers to different positions inside the firms has become less difficult (Figure 17).

Conclusions

This article examined the reaction of the Portuguese firms to changes in economic conditions between 2010 and 2013, when the crisis was more severe, and identifies the patterns of labour market adjustment. The results are based on a survey of firms conducted by the Banco de Portugal in 2014-2015.

The evidence provided was organised in two main dimensions: i) the impact of changes in economic conditions between 2010 and 2013 on the Portuguese firms; and ii) the way firms responded to these changes by

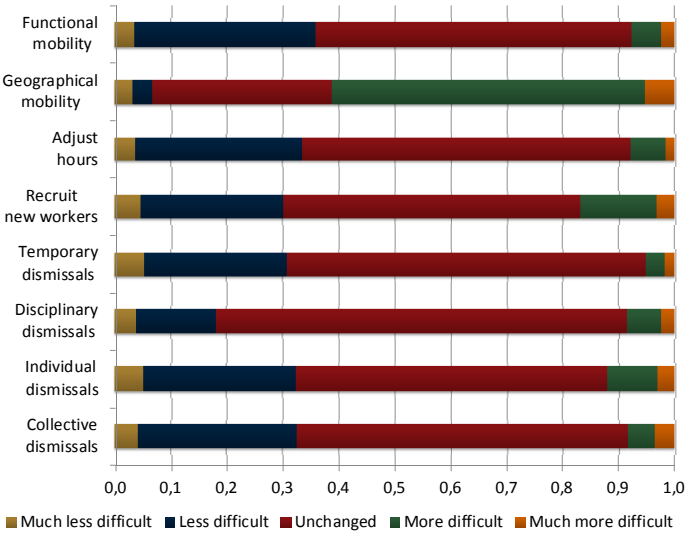

FIGURE 17: Firms' perception about the difficulty in making adjustments in the labour force between 2010 and 2013 (share of firms in percentage)

Source: Survey on firms' adjustment over the period 2010-2013.

adjusting employment, wages and prices. Firms' difficulties in being repaid by their customers and the decline of demand were reported as the two most important factors affecting firms negatively during the crisis. The impact of these two shocks was particularly felt in very small firms, in sectors such as construction, energy or trade and in firms that sell mostly to domestic markets. The access to external financing through the usual financial channels was also an important constraint in particular in construction and energy and for very small firms and firms that sell to foreigner markets.

Reducing employment was the main instrument to accommodate negative shocks, in particular through the freeze or reduction of new hires, non-renewal of temporary contracts at expiration or individual dismissals. Although the reduction in employment affected particularly those workers with temporary contracts, firms that were more seriously hit by the adverse economic conditions also reduced their number of permanent workers. In addition, an increasing number of firms (from 25 percent in 2010 to almost 40 percent in 2013) froze the base wages of their workers. Besides reducing their labour costs, many firms also adopted a more flexible price setting behaviour. Besides the exceptionally large number of firms that follow state-dependent price reviewing strategies, a significant share also reported decreases in prices, in particular in the domestic market, and an increase in the frequency of price reviews over the period.

Finally, according to firms' perception their ability to make changes in their labour costs by adjusting the employment level or cutting wages was virtually unchanged. This fact is particularly relevant taking into account the significant number of labour market reforms introduced during the crisis. Nonetheless, a non-negligible fraction of firms responded that in particular the ability to make adjustments in working hours or to move workers to different positions inside the firms has become less difficult.

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Appendix

Industry groups	2-digit NACE sectors	Targeted sample: breakdown by # of employees						Response rate: breakdown by # of employees					
		10-19	20-49	50-99	100-249	>249	Total	10-19	20-49	50-99	100-249	>249	Total
1	10-11	46	58	37	57	32	230	26.1	32.8	21.6	36.8	28.1	30.0
2	13	13	21	22	27	26	109	15.4	28.6	22.7	33.3	19.2	24.8
3	14	37	69	52	51	15	224	27.0	14.5	30.8	15.7	40.0	22.3
4	15	19	39	38	26	9	131	5.3	30.8	18.4	42.3	33.3	26.0
5	16	14	17	11	9	7	58	28.6	11.8	36.4	55.6	14.3	27.6
6	17-18	12	14	12	15	9	62	16.7	42.9	25.0	13.3	44.4	27.4
7	19-20	4	9	7	11	6	37	25.0	55.6	42.9	27.3	50.0	40.5
8	21	1	1	4	9	4	19	100.0	100.0	25.0	22.2	75.0	42.1
9	22-23	23	36	29	40	31	159	13.0	27.8	51.7	30.0	32.3	31.4
10	24-25	38	59	42	37	21	197	18.4	27.1	52.4	32.4	38.1	33.0
11	26-28	13	23	19	22	32	109	7.7	13.0	36.8	31.8	21.9	22.9
12	29-30	3	7	9	15	31	65	66.7	28.6	44.4	40.0	35.5	38.5
13	31-33	26	33	23	16	15	113	15.4	15.2	34.8	37.5	53.3	27.4
14	35-39	5	12	12	24	16	69	20.0	25.0	50.0	54.2	68.8	49.3
15	41	73	59	31	18	10	191	19.2	22.0	29.0	27.8	20.0	22.5
16	42	13	23	19	25	20	100	15.4	34.8	36.8	44.0	45.0	37.0
17	43	47	46	17	20	13	143	8.5	30.4	11.8	55.0	38.5	25.2
18	45	34	31	24	24	9	122	14.7	35.5	25.0	25.0	33.3	25.4
19	46	106	118	58	62	21	365	19.8	28.8	31.0	29.0	52.4	27.9
20	47	94	88	48	45	62	337	14.9	17.0	25.0	26.7	14.5	18.4
21	49-53	37	56	36	45	57	231	10.8	26.8	22.2	44.4	49.1	32.5
22	55	19	32	31	33	17	132	10.5	25.0	12.9	30.3	29.4	22.0
23	56	74	59	21	10	21	185	9.5	25.4	23.8	20.0	23.8	18.4
24	58-63	19	24	22	35	40	140	26.3	8.3	22.7	28.6	32.5	25.0
25	64-66	8	18	19	20	31	96	75.0	38.9	42.1	55.0	77.4	58.3
26	68-84	85	107	73	108	140	513	24.7	25.2	30.1	35.2	36.4	31.0
27	85-88	87	183	148	158	99	675	8.0	21.3	26.4	29.7	39.4	25.3
28	90-99	38	54	33	44	19	188	13.2	20.4	36.4	22.7	47.4	25.0
	Total	988	1296	897	1006	813	5000	17.0	24.6	29.7	32.6	37.1	27.7

TABLE A1: Targeted sample and response rate