On the measurement of Portuguese firms' fixed operating costs

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Abstract
A firm's fixed operating cost is usually defined as a cost that does not change with its sales. These costs affect the firms' capacity to weather adverse shocks. However, a firm may have substantial fixed costs and still have the flexibility to reduce them at a low cost and in a relatively short time period. In this article we take the firms' flexibility into account and estimate fixed operating costs as the expected operating costs next year if sales were zero. We estimate fixed operating costs at the firm level for the period between 2006 and 2018, exploring the heterogeneity by firm size and sector of economic activity. The estimates show that on average fixed operating costs of Portuguese firms account for approximately 15% of their sales. We document two main findings. First, the fixed operating costs to sales ratio of smaller firms is higher than that of larger firms. Second, this ratio is higher in sectors of economic activity related to services. These results are linked to the operating costs structure of firms, namely the share of employee expenses, costs of goods sold, and supplies and external services on total operating costs. (JEL: D22, D25, G32)

1. Introduction

From a theoretical perspective, the notion of a firm's fixed cost is apparently straightforward. At a first glance, a fixed cost is a cost that does not change with the amount of goods or services produced or sold by the firm. Intuitively, it corresponds to the intercept of the firm's cost function. The examples of fixed costs in textbooks typically include salaries, insurance contracts, property taxes, rents, and interest payments. The first four examples are usually referred to as fixed operating costs, while the latter is a financial fixed cost. Implicit in this definition of a fixed cost is the idea that firms are not able to adjust their output capacity to respond to adverse shocks. However, a firm may have substantial fixed costs and still have the flexibility to reduce them at a low cost and in a relatively short time period. This dimension of

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flexibility implies that from a risk management perspective, a cost is only fixed if it is too costly to avoid it (see, for example, Gu *et al.* 2018; Reinartz and Schmid 2016). Throughout the analysis in this article we take the risk management perspective of a fixed cost.

Fixed costs play a crucial role in corporate risk management. Similarly to households, who know that their fixed monthly expenditures reduce their capacity to adjust to adverse shocks (for example, unemployment), corporate managers know that fixed costs, either operating or financial, reduce their capacity to weather negative economic shocks. This likely hampers the firm's investment decisions, market share and funding costs, precluding the firm from making profit maximizing choices (see, for example, Mauer and Triantis 1994). Ultimately, very high fixed costs may reduce the firm's chances of survival. Indeed, it is widely documented in the asset pricing literature that fixed costs amplify the effect of output shocks on profitability, a mechanism that is termed leverage in the literature (see, for example, Lev 1974; Mandelker and Rhee 1984). In this framework, financial and fixed operating costs are associated with financial and operating leverage, respectively. All else equal, the higher the operating or financial leverage of a firm, the higher the risk premium.

The importance of financial fixed costs to firms' performance is well established in the literature. A large class of corporate finance and credit risk theoretical models builds on the firm's fixed interest expenses to determine its default boundary, which is the level of assets or earnings below which the firm closes (Leland 1994; Goldstein *et al.* 2001). Empirical models of firm's default prediction usually include interest coverage or a similar variable as a determinant. Given the macroeconomic importance of firms' financial leverage, corporate fixed interest expenditures are permanently monitored by international institutions, namely by the International Monetary Fund (IMF).

Conversely, despite the importance of fixed operating costs for corporate risk management, they have received relatively little attention in the theoretical and empirical credit risk literature. This may be due both to conceptual and measurement challenges. In contrast to interest expenses, that are clearly stated in the firm's income statement and not flexible by definition, fixed operating costs are not grouped into a specific account and are rarely provided in the firm's financial reports.[1] A common popular way to proxy for fixed operating costs is to use the accounting item termed selling, general, and administrative costs (SG&A), which include those costs that are not directly related with the production/service process.[2] This choice is based on empirical studies that show that SG&A are relatively sticky (i.e. they increase more with the

1. Note that in the case of a firm's interest expenses, the firm does not have the capacity to unilaterally reduce its fixed financial costs, unless it reduces its external debt. However, reducing debt can only be achieved by selling assets, which is often associated with fire sale losses, or by raising external capital.

2. The balance-sheet dataset we use in this article does not allow us to calculate the SG&A for Portuguese firms. This is mainly because, in contrast to the U.S. GAAP, labor costs incurred in the production of goods are not part of the cost of goods sold in the Portuguese accounting system.

firm's expansions than they decrease with the firm's contractions).[3] Be that as it may, it is not unequivocal that SG&A fully capture the firm's flexibility in cost adjustment, most probably leading to an overestimation of the fixed operating costs. For example, SG&A do not differentiate firms that use more extensively permanent or fixed-term contracts, which is an important determinant of corporate flexibility (Donangelo *et al.* 2019). This emphasizes the importance of the firm's flexibility in determining whether fixed operating costs are associated with additional risk (Gu *et al.* 2018).

The current Covid-19 pandemic outbreak has severely affected firms across the globe. Kozeniauskas *et al.* (2020) document that the shocks to sales and employment of Portuguese firms were large on average, but heterogeneous across firms. Bartik *et al.* (2020) study the impact of the pandemic on small businesses and show that many small U.S. businesses were deeply affected by the current crisis. Their studies emphasize the financial fragility of many businesses, which will have to substantially reduce expenses, take on additional debt, and raise shareholders' capital to weather the economic disruptions caused by this unprecedented crisis. Ultimately, firms may have to declare bankruptcy due to the cash flow gap caused by the substantial decline in sales and the difficulty in adjusting their cost structure abruptly. The longer the pandemic will last, the more difficult will be for firms to weather the shock without major changes in their cost structure. In this context, the measurement of fixed operating costs has gained particular relevance. The fixed operating costs of firms affect their capacity to respond to the crisis and the willingness of their shareholders to provide financial assistance in case of distress, ultimately affecting corporate solvency.

In this article, we capitalize on a rich dataset that includes balance sheet and income statement information for virtually all Portuguese firms to estimate fixed operating costs at the firm level. We also explore the heterogeneity of these estimates by firm's size and sector of economic activity. Importantly, we take the risk management view of a fixed cost and consider that a cost is only fixed if the firm is not able to avoid it or reduce it in a relatively short time span and at a reasonable cost. In this sense, we closely follow Gu *et al.* (2018) and estimate the firm's fixed operating costs as those costs that do not scale with the contemporaneous sales. Therefore, we depart from the traditional definition of a fixed cost to take the firm's management options into account.

2. A brief literature review

Fixed operating costs amplify the effect of output shocks on firms' profitability, a mechanism that is termed *operating leverage* in the literature. We summarize the literature on fixed operating costs and operating leverage along three lines of research. The first strand of literature studies the links between operating leverage and the equity risk premium and finds that operating leverage is positively associated with systematic risk

3. Anderson *et al.* (2003) find that SG&A increase on average 0.55% per 1% increase in sales but decrease only 0.35% per 1% decrease in sales. In a similar vein, Chen *et al.* (2019) find that, on average, firms adjust their costs of goods sold (COGS) by 0.86% and their SG&A by 0.41% in response to a 1% decrease in sales revenue.

and equity returns (Lev 1974; Mandelker and Rhee 1984; García-Feijóo and Jorgensen 2010). Another strand of the literature documents a trade-off between operating and financial leverage (Kahl *et al.* 2019; Chen *et al.* 2019). Chen *et al.* (2019) consider that a firm's operating leverage is largely exogenous as it is determined by the production technology in its industry. A firm's financial leverage is then endogeneously set, such that a certain overall leverage level is attained. Finally, a third strand of literature studies the relationship between labor market frictions and the firms' degree of operating leverage. The work by Chen *et al.* (2011) shows that unionization is negatively related to operating flexibility in both labor and nonlabor production inputs, and that labor unions increase firms' costs of equity by decreasing firms' operating flexibility. Acabbi *et al.* (2019) document how the responsivess of firms to credit shocks is determined by their ability to adjust their labor costs. This labor (in)flexibility can amplify the effect of credit shocks and expose the firm to a higher liquidity risk, namely due to the presence of hiring, search, and firing costs and compensation rigidities. Finally, Donangelo *et al.* (2019) show that high labor share (*labor leverage*) firms have operating profits that are more sensitive to economic shocks and have higher expected returns.

Surprisingly, the literature on the impact of the firm's operating leverage on credit risk and the pricing of credit-related instruments is more scarce. A notable exception is the work of Favilukis *et al.* (2020) that builds on the idea that when wages are rigid, a negative economic shock leads to a rise in labor-induced operating leverage, as wages adjust too slowly and the labor share rises. This labor leverage effect increases firms' credit risk because precommitted wage payments make interest payments riskier. Two other exceptions include the studies of Chou *et al.* (2019) and Ayres and Blank (2017). Chou *et al.* (2019) posit that credit spreads are positively correlated with operating leverage only when fixed costs related to non-cash items, such as depreciations, are excluded. Ayres and Blank (2017) document that firms with higher operating leverage have significantly lower credit ratings. However, despite the importance of the firm's operating leverage for risk management, to the best of our knowledge, it is not commonly explicitly accounted for in default prediction models. An important result highlighted by Chen *et al.* (2019) is that both the probability of default from the Merton's model and the Ohlson's O-score are significantly positively correlated with operating leverage.

Embedded in this literature is the question of how to measure firms' operating leverage and the firms' amount of fixed operating costs. Four approaches take front stage to measure operating leverage. First, a prominent measure in the literature is the degree of operating leverage (DOL), which can be estimated in different ways. The most well-known method was suggested by Mandelker and Rhee (1984) and consists of a regression of the logarithm of the firm's earnings before interest and taxes (EBIT) on the logarithm of the firm's sales.[4] Second, an alternative point-in-time measure of operating leverage is the ratio of fixed assets to total assets (Ferri and Jones 1979). Third, more

4. This method was subsequently extended by O'Brien and Vanderheiden (1987) to account for the growth of the firm's EBIT to sales ratio and by García-Feijóo and Jorgensen (2010) to address the possibility of negative earnings.

recently, Kahl *et al.* (2019) propose computing the sensitivity of innovations in the growth rate of the firm's operating costs to innovations in the growth rate of the firm's sales. Finally, an alternative approach is to measure a firm's inflexibility as the historical range (maximum minus minimum) of its operating costs to sales ratio, scaled by the volatility of the firm's sales growth. Therefore, a smaller range suggests that the firm can adjust more easily its operating costs structure in response to changes in its profitability (Gu *et al.* 2018).

In what concerns the measurement of the amount of firms' fixed operating costs, setting these equal to SG&A is the most popular method because it is simple, transparent, and provides point-in-time estimates. However, as explained above, SG&A may not fully take into account the firm's management flexibility to respond to adverse shocks. Lev (1974) suggests that one way to take this flexibility into account is to estimate a regression of the firm's operating costs on sales. The estimated regression intercept would then be interpreted as the firm's fixed operating cost. More recently, Gu *et al.* (2018) estimate fixed costs as the next period's expected costs if sales were zero. In this article, we closely follow Gu *et al.* (2018) to estimate the fixed operating costs of Portuguese firms.

3. The structure of operating costs of Portuguese firms

We use the Central Balance Sheet (CBS) Database, which is a comprehensive dataset that covers the population of virtually all Portuguese nonfinancial corporations.[5] Firms report detailed balance-sheet and income statement information as well as information on several important variables. CBS data are available from 2006 to 2018.

In this section, we analyze the structure of firms' operating costs without distinguishing variable from fixed operating costs. From an accounting perspective, the firm's operating costs are mainly comprised of material consumed and costs of goods sold (COGS), supplies and external services, employee expenses and expenses of depreciations and amortizations. These accounting items are very different in terms of management flexibility. For example, while COGS tend to vary with output, employee expenses tend to be very costly to change in the short term. Supplies and external services is a very broad category that includes both rigid (for example, rents and long-term IT contracts) and flexible items (for example, energy and publicity). Depreciations and amortizations is a non-cashflow item that measures the cost of the deterioration of capital investment.

Figure 1 shows the importance of the four aforementioned operating cost categories in total operating costs by sector of economic activity. According to this decomposition, the cost structure of firms across sectors of economic activity is very heterogeneous. In general, the most important accounting items are either COGS or supplies and external

5. This database covers mandatory financial statements reported under the fulfillment of the Simplified Corporate Information - IES (Informação Empresarial Simplificada) - that consists of a system to collect firm non-consolidated mandatory annual economic, financial, and accounting information for a single moment and a single entity.

services, even though the relative importance of these items differs considerably across sectors of economic activity. On average, these items represent 34% and 37% of total operating costs, respectively. Employee expenses account for approximately 20% of total operating costs. Finally, even though depreciations represent only a small share of operating costs in most sectors, they represent a very important share of total costs of high capital-intensive firms.

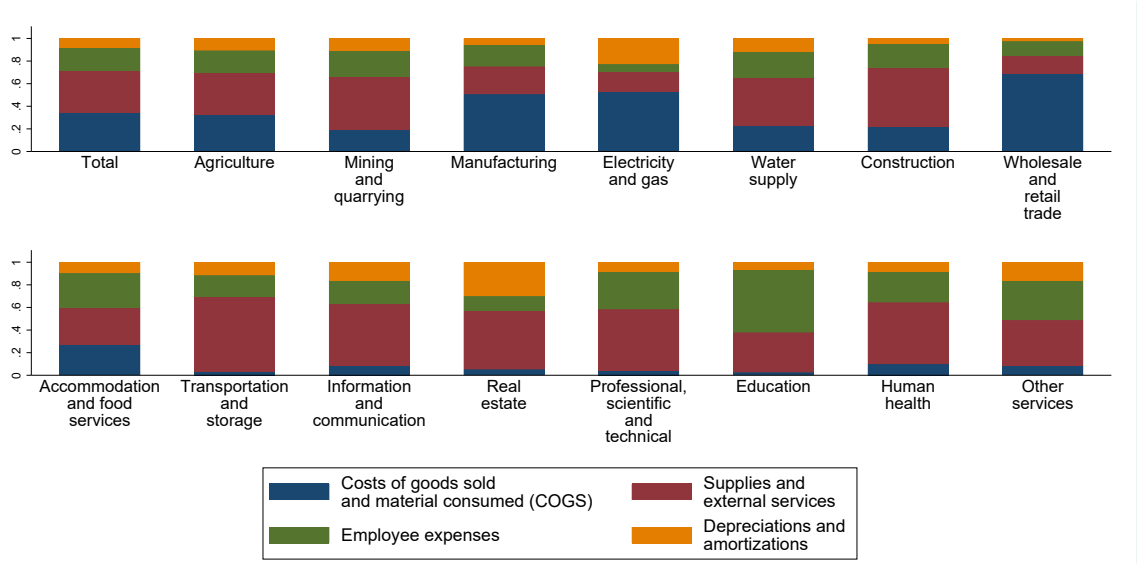

FIGURE 1: Operating costs decomposition.

Notes: The shares of each type of cost are computed at the firm level and then agregated at the sector level using the gross profit as weights.

A more thorough analysis of Figure 1 shows that COGS tend to represent a substantially higher share of operating costs in the case of wholesale and retail trade (69%) and manufacturing (51%). Interestingly, COGS are also very relevant in the case of the electricity and gas sector (53%). This result is mostly explained by the high weight in total operating costs of firms operating in the energy/gas trading and distribution businesses. Conversely, in the case of education and transportation and storage, COGS represent a very small share of total operating expenses (3%).

The supplies and external services item is the most important expense in the case of transportation and storage (66%), human health (55%), information and communication (54%), professional, scientific and technical activities (54%), construction (52%), and real estate (52%). In the case of transportation and storage, this may be partly related to fuel costs. In the five other sectors, a natural guess is that firms operating in these sectors rely more heavily on outsourcing.

Employee expenses represent an important share of total operating costs in the case of education (56%), other services (35%), professional, scientific and technical activities (33%), accommodation and food services (30%), and human health (27%). Furthermore, employee expenses represent only 19% of total operating expenses in the manufacturing sector, being less relevant than supplies and external services. Electricity

and gas and wholesale and retail trade are the sectors in which employee expenses have less importance in terms of total operating costs.

Finally, the depreciations share on total operating costs varies from about 2% in the case of the wholesale and retail trade to approximately 30% in the case of real estate. The weight of depreciations in total operating costs in the electricity and gas is 23% and in the information and communication, and other services is approximately 16%. Interestingly, depreciations are more relevant in the professional, scientific and technical activities, and accommodation and food services sectors than in the manufacturing sector.

4. Firms' fixed operating costs: an econometric approach

In this article, we aim at measuring the fixed operating costs at the firm level. We take the risk management view of a fixed cost and consider that a cost is only fixed if the firm is not able to avoid it or reduce it in a relatively short time span and at a reasonable cost.

We measure fixed operating costs using the regression-based methodology proposed by Gu *et al.* (2018). Intuitively, in their framework, fixed operating costs are those costs that do not scale with the firm's contemporaneous sales. In contrast to using accounting items to proxy for fixed operating costs, this methodology takes firms' flexibility into account. This dimension of flexibility of a fixed cost has led the authors to use the terminology quasi-fixed costs (QFC). In what follows next, the expressions fixed operating costs and quasi-fixed operating costs are used interchangeably.

The baseline empirical specification to be estimated can be written as:

$$OpCost_{i,t} = a_i + b_j OpCost_{i,t-1} + c_j Sales_{i,t} + d_j Sales_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where the dependent variable $OpCost_{i,t}$ is the operating cost of firm i in year t. The independent variables are the one-period lagged firm's operating cost, the firm's contemporaneous and one-period lagged sales. The term a_i is a firm fixed effect and $\varepsilon_{i,t}$ is a disturbance term. The intercept is estimated at the firm level and the slope coefficients b_j, c_j, and d_j are estimated at the sector level j using a linear regression model with one-interacted high dimensional fixed effect (Guimarães and Portugal 2010). The high dimensional fixed effect considered to estimate the slope coefficients is the 5-digit classification of economic activities (*j*) for identification purposes. This empirical specification separates the impact of contemporaneous and one-year lagged sales on operating costs. Therefore, it allows us to estimate the impact of shocks in sales on firms' operating costs.[6]

6. We restrict the sample to firms with at least 5 years of observations and require that the absolute value of yearly growth rates of firm's operating costs, sales, and assets are no more than 75%. We also restrict the sample to 5-digit sectors of economic activity with at least 50 observations. We trim at the first and 99 percentiles the estimated 5-digit sector specific slopes and QFC to sales ratio in order to avoid too much sampling error. We end up with a sample comprised of about 620 different 5-digit sectors.

Specifically, the predicted fixed costs next period is the regression intercept plus the contribution of the lagged variables. Then, the predicted quasi-fixed costs in year t can be computed through the following expression:

$$QFC_{i,t} = a_i + b_j OpCost_{i,t-1} + d_j Sales_{i,t-1} \tag{2}$$

According to equation (2), QFC are the expected operating costs next period in case contemporaneous sales were zero. The distribution of the firm's QFC scaled by (one-period lagged) sales is depicted in Figure 2.[7] The main summary statistics are reported in Table 1. Figure 2 shows that the QFC of firms are substantially heterogeneous. The distribution is skewed to the right, with mean values roughly 5 percentage points above the median values.

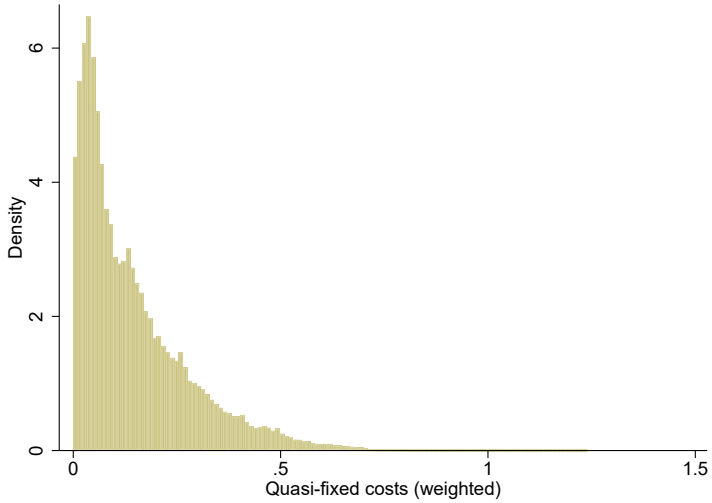

FIGURE 2: Distribution of firm estimated QFC scaled by one-year lagged sales (weighted by the firm's gross profit).

Notes: We restrict the sample to observations with non-negative estimated QFC to sales ratio.

The results reported in Table 1 show that, on average, fixed operating costs are approximately 15% of the firm's sales. This estimate is virtually the same if we instead scale the QFC by the firm's total operating costs. Using the same econometric approach, Gu *et al.* (2018) rely on Compustat data, which is mostly comprised of large firms, and estimate that fixed operating costs account for 17% of sales of U.S. firms.

Next, we explore the distribution of the estimated firm quasi-fixed costs by firm size and sector of economic activity. These results are shown in Tables 2 and 3, respectively. We show that on average smaller firms have a higher QFC to sales ratio. In particular, on average, the fixed operating costs of very small firms account for 18% of their sales while fixed operating costs of larger firms account for 13% of their sales. This finding may be

7. The histograms of the estimates $\widehat{a}_i, \widehat{b}_j, \widehat{c}_j$, and $\widehat{d}_j$ are available upon request. We restrict the histogram to non-negative estimates of the QFC to sales ratio. The negative estimates account for roughly 10% of the observations and may be due to measurement error.

	Count	Mean	St. dev.	Q1	Q2	Q3
$QFC_t/Sales_{t-1}$	1,125,600	0.15	0.14	0.04	0.10	0.21

TABLE 1. Main summary statistics: QFC to sales ratio

Notes: Estimated QFC scaled by one-period lagged sales, weighted by the firm's gross profit. The sampling period goes from 2006 to 2018. We restrict the sample to observations with non-negative estimated QFC to sales ratio. N denotes the number of observations, Q1 and Q3 correspond to the first and third quartiles, respectively, and Q2 corresponds to the median.

partly explained by economies of scale (i.e. an increase in the production scale leads to a reduction in the average cost per unit), which occur due to the dilution of fixed costs. Therefore, smaller firms may have a higher fixed operating costs to sales ratio because they benefit less from economies of scale. This result is in line with the predictions of Glover *et al.* (2011)'s model, in which a decrease in the optimal firm size leads to higher operating leverage due to the presence of fixed costs. A concurrent reason may be that larger firms outsource a larger part of their costs, which gives them more flexibility to adjust. Moon and Phillips (2020) analyse a database of purchase contracts in the U.S. and find that larger firms tend to resort more to outsourcing than smaller firms.

Firm's size	N	Mean	St. dev.	Q1	Q2	Q3
Very small firms	892,911	0.18	0.15	0.07	0.14	0.26
Small firms	197,977	0.14	0.13	0.05	0.11	0.21
Medium firms	31,178	0.14	0.13	0.04	0.10	0.20
Large firms	3,534	0.13	0.13	0.03	0.08	0.18
Total	1,125,600	0.15	0.14	0.04	0.10	0.21

TABLE 2. Main summary statistics by firm size: QFC to sales ratio

Notes: Estimated QFC scaled by one-period lagged sales, weighted by the firm's gross profit. The sampling period goes from 2006 to 2018. We restrict the sample to observations with non-negative estimated QFC to sales ratio. N denotes the number of observations, Q1 and Q3 correspond to the first and third quartiles, respectively, and Q2 corresponds to the median. The size of firms is defined according to the European Commission Recommendation of May 6, 2003.

In Table 3 we report the summary statistics of the estimated firm's fixed operating costs by sector of economic activity. The estimates show that fixed operating costs vary substantially across sectors. This heterogeneity reflects the asymmetry in the firm's management flexibility, which is highly dependent on the production scheme of the firms in each sector. According to the estimates, the sectors with higher QFC to sales ratio are mostly related with services, namely accommodation and food services (31%), human health (28%), and other services (23%). High-capital intensive sectors also present high QFC to sales ratios (e.g. real estate, electricity, and water supply). In turn, the sectors with lower ratios are the wholesale and retail trade (9%) and transportation and storage (10%).[8] Recent evidence shows that the pandemic has severely affected the

8. More detail on the estimates by sector of economic activity and size is available upon request.

firms in the accommodation and food services sector, which is one of the sectors with highest QFC to sales ratio (Manteu *et al.* 2020).

Sector of economic activity	N	Mean	St. dev.	Q1	Q2	Q3
Accommodation and food services	141,566	0.31	0.16	0.20	0.29	0.42
Human health	74,629	0.28	0.13	0.18	0.27	0.37
Real estate	24,773	0.26	0.20	0.12	0.22	0.35
Electricity and gas	240	0.25	0.15	0.13	0.22	0.38
Other services	39,188	0.23	0.15	0.12	0.20	0.30
Water supply	2,172	0.21	0.18	0.06	0.13	0.34
Education	13,654	0.20	0.10	0.13	0.19	0.26
Mining and quarrying	3,672	0.18	0.12	0.09	0.16	0.22
Agriculture	38,237	0.17	0.14	0.05	0.14	0.24
Professional, scientific and technical	117,816	0.17	0.16	0.04	0.13	0.27
Construction	89,199	0.13	0.14	0.03	0.06	0.21
Manufacturing	171,127	0.13	0.11	0.05	0.11	0.17
Information and communication	17,652	0.13	0.11	0.05	0.10	0.19
Transportation and storage	55,825	0.10	0.12	0.03	0.05	0.13
Wholesale and retail trade	335,850	0.09	0.08	0.03	0.07	0.14
Total	1,125,600	0.15	0.14	0.04	0.10	0.21

TABLE 3. Main summary statistics by sector of economic activity: QFC to sales ratio

Notes: Estimated QFC scaled by one-period lagged sales, weighted by the firm's gross profit. The sampling period goes from 2006 to 2018. We restrict the sample to observations with non-negative estimated QFC to sales ratio. N denotes the number of observations, Q1 and Q3 correspond to the first and third quartiles, respectively, and Q2 corresponds to the median.

Interestingly, we find that the sectors with higher QFC also have a higher share of employee expenses in total operating costs. Additionally, the sectors with lower QFC have a higher proportion of COGS in total operating costs. Overall, on average, the correlation between the firm's QFC to sales ratio and the share of COGS, supply and external services, employee expenses, and depreciations is approximately -0.23, 0.09, 0.17, and 0.26, respectively. In general, this pattern is also found when we compute average correlations at the sector level. These results are reassuring in the sense that the COGS is more related to the production process while employee expenses are more sticky.

Finally, we compare our estimates with those obtained using the four measures of operating leverage mentioned in the literature review. We find a positive correlation between our measure of quasi-fixed operating costs and the degree of operating leverage measure suggested by García-Feijóo and Jorgensen (2010), the fixed assets to total assets ratio, and the inflexibility measure constructed by Gu *et al.* (2018). In turn, we find a negative significant correlation between the firm's estimated quasi-fixed costs and the cost structure measure proposed by Kahl *et al.* (2019). All in all, these results are consistent with the idea that firms with a higher estimated quasi-fixed costs to sales ratio have more operating leverage and less operating flexibility.

5. To conclude

The current Covid-19 pandemic outbreak has affected firms across the globe. The abrupt decline in sales and the difficulty in adjusting the cost structure has caused cash-flow distress in many firms. This has emphasized the relevance of the cost structure of firms in their capacity to weather adverse shocks.

In this article we measure fixed operating costs at the firm level using granular balance-sheet data for virtually all Portuguese firms. We consider that fixed operating costs are those costs that do not scale with the firm's contemporaneous sales. The estimates show that on average fixed operating costs of Portuguese firms account for approximately 15% of their sales. We also unveil substantial heterogeneity in the estimated fixed operating costs across firms size and sector of economic activity, and document two main findings. First, the fixed operating costs to sales ratio of smaller firms is higher than that of larger firms. Second, this ratio is higher in sectors of economic activity related to services, some of which are among the most affected by the pandemic.

A comparison of the fixed costs estimated at the firm level and the share of the main accounting items in total operating costs unveils interesting results. First, we find a negative correlation between the share of costs of goods sold and the fixed costs to sales ratio, meaning that the higher the weight of the costs of goods sold in operating costs the lower the fixed costs ratio. Second, we find a positive correlation between the share of employee expenses in total operating costs and the ratio of fixed costs to sales. These results are reassuring in the sense that the cost of goods sold are more related to the production scheme of each firm and sector while employee expenses are more sticky.

These findings have important implications for credit risk models, especially in the context of the pandemic, as firms with a high weight of fixed operating costs in total operating costs are likely more affected by the current shock.

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