Gabinete de Estratégia e Estudos

REPÚBLICA PORTUGUESA
ECONOMIA E MAR

**GEE Paper**

**169**

**Setembro de 2022**

# Firm adaptation in COVID-19 times: The case of Portuguese exporting firms

**João Capella-Ramos | Romina Guri**

**Gabinete de Estratégia e Estudos da Economia e do Mar**
*Office for Strategy and Studies of Economy and Maritime Affairs*
Avenida da República, n.º 79 - 1069-218 Lisboa, Portugal
**www.gee.gov.pt**
ISSN (online): 1647-6212

# Firm adaptation in COVID-19 times: The case of Portuguese exporting firms [1]

João Capella-Ramos [2], Romina Guri [3]

**Abstract**

The COVID-19 crisis has severely impacted firms across the world, with some showing greater resilience than others. Engaging in international markets, in particular, increases firms' exposure to such a global adverse shock, while also providing firms with opportunities for resilience-enhancing responses to the crisis. Operating in a small open economy, Portuguese firms were particularly vulnerable to disruptions in international trade and global value chains. In this paper we investigate how Portuguese exporting firms have adapted their business activities on the back of the COVID-19 crisis, and whether these adaptations depended on their intrinsic characteristics, notably firm size. Furthermore, we analyse the role of government support measures taken in response to the COVID-19 crisis in the adaptation processes of both exporting and domestic firms. We use the recently available Fast and Exceptional Enterprise Survey – COVID-19 ('*Inquérito Rápido e Excecional às Empresas*', COVID-IREE) and complement it with balance sheet data from the Integrated Corporate Accounts System ('*Sistema de Contas Integradas das Empresas*', SCIE), covering a sample of approximately 7,000 Portuguese firms. The results suggest that exporting firms were more likely to adapt their business activities in the face of the COVID-19 crisis. We also found evidence that the adaptation processes of exporting firms tended to be multi-dimensional, operating through different adaptation mechanisms, and contingent upon firm size. The results also suggest that government support measures have enhanced the likelihood of both exporting and domestic firms to adapt, providing evidence of their effectiveness and highlighting the importance of firm-oriented policies that promote economic resilience.

**JEL Classification:** H53, H72, O47, O52

**Keywords:** COVID-19, firm adaptation, exporting firms, internationalisation, digitalisation

**Note: This article is sole responsibility of the authors and do not necessarily reflect the positions of GEE, the Portuguese Ministry of Economy and Maritime Affairs, the European Commission or the University of Groningen.**

---

[1] Award-winning work by the Call for Papers on "Internationalization of the Portuguese Economy in post-Covid-19: Opportunities and Challenges", a partnership between the Office for Strategy and Studies of the Ministry of Economy and Maritime Affairs (GEE) and the Portuguese Investment and Foreign Trade Agency (AICEP).

[2] Directorate-General for Economic and Financial Affairs, European Commission;
email: joao.capella-ramos@ec.europa.eu.

[3] Faculty of Economics and Business, University of Groningen;
email: r.guri@rug.nl.

## 1. Introduction

The COVID-19 pandemic has unleashed multi-dimensional economic effects, hampering economic activity around the world and disrupting international trade. Yet, these effects were not homogeneous. At the macro-economic level, they varied across countries, depending on pre-existing vulnerabilities and the gravity of pre-crisis macroeconomic imbalances, the severity and timing of pandemic outbreaks, as well as the policy responses that followed. Zooming in on the micro-economic level, they also varied across economic agents, notably firms, with some showing greater resilience than others, depending on the intensity of their global connections and other intrinsic characteristics, such as firm size. Indeed, it has been argued that firms that engage in international trade are more exposed to global negative shocks than firms that only operate domestically (Borino et al., 2021). At the same time, being globally connected through exports and supply chains allows firms to make more flexible decisions about production and market management (Hyun et al., 2020), thereby helping them to cushion adverse domestic shocks and strengthening firms' resilience. Furthermore, while larger exporters may have a wider pool of suppliers and consumers they can target and more resources they can use to adapt to the crisis, there is evidence that smaller exporters may be more prone to adapt when exogenous opportunities arise (Eggers, 2020).

In the light of the COVID-19 pandemic, the Portuguese economy faced several macro- and micro-economic challenges, which exacerbated pre-existing vulnerabilities. As a small open economy, Portugal was particularly vulnerable to disruptions in international trade and global value chains (Naude and Cameron, 2020). Also, and despite their clear health-related benefits, the containment measures adopted in response to the COVID-19 pandemic triggered spill-over effects on the supply and demand side of the economy, thereby significantly affecting firms' business activities and trade flows (Amador et al., 2021). At the same time, the support measures taken by the Portuguese government contributed to mitigating the economic consequences of the COVID-19 crisis for firms and households.

Against this background, gaining a deeper understanding of the resilience of Portuguese firms – and in particular of exporters – is crucial for policy design purposes. In a context of prevailing disparities across Portuguese firms, little is known about which firms were more likely to adapt to become more resilient, and whether crisis mitigation measures have played a role in this regard. The findings of this study address this gap by providing further insight into firms' ability to adapt to the changing market environment, including through making the most out of the opportunities offered by international trade. This study is framed by the ongoing debate on policy options to strengthen Portugal's economic resilience, including by spurring an export-led recovery and speeding up economic convergence (Naude and Cameron, 2020). If exporting firms show greater resilience than domestic firms, notably by adapting their activities and ensuring their continuity, then policies can be designed to place greater emphasis on increasing opportunities for firms to expand their activities internationally (Eurofound, 2012).

In this sense, the aim of this study is threefold, with exporting firms as its main focus. Firstly, we intend to understand whether exporting firms have adapted their business activities in the face of the COVID-19 pandemic through various adaptation mechanisms. Secondly, we investigate the

heterogeneity in terms of size among exporting firms in the way they have dealt with this crisis. Thirdly, we examine the role of support measures taken by the Portuguese government in the adaptation processes of exporting firms, taking into account differences in firm size. We use the recently released Fast and Exceptional Enterprise Survey – COVID-19 ('*Inquérito Rápido e Excecional às Empresas – COVID-19*', COVID-IREE), which was designed by Statistics Portugal (*Instituto Nacional de Estatística*, INE) and *Banco de Portugal*, and complement it with balance sheet data from INE's Integrated Corporate Accounts System ('*Sistema de Contas Integradas das Empresas*', SCIE) for 2019. Our final sample contains approximately 7,000 Portuguese firms. We model the relationship between exporting and the likelihood of adapting business activities by estimating a Probit model regression.

Our results suggest that exporting firms were more likely to adapt their business activities in the face of the COVID-19 crisis. In addition, we also found evidence that the adaptation processes of exporting firms tended to be multi-dimensional, operating through different adaptation mechanisms and depending on firm size. Crucially, heterogeneity was present among firms of different sizes, with smaller exporting firms adapting their business activities through various mechanisms and larger exporting firms following a more parsimonious approach. In particular, exporting micro-, small- and medium-sized enterprises (MSMEs) were more likely to adapt by investing in information technologies (IT) or making greater use of teleworking, redirecting their target markets, increasing their stocks, and changing their product range and supply chains. In turn, large exporting firms were more likely to adapt by reducing their stocks. Furthermore, there is evidence that the support measures implemented by the Portuguese government in response to the COVID-19 crisis have been effective in supporting firms' adaptation processes.

This paper is structured as follows. Section 2 provides an overview of the macro-economic context of Portugal and related literature on firm adaptation during the COVID-19 crisis. Section 3 describes the data and the empirical framework. Section 4 presents and discusses our results. Section 5 concludes and presents policy implications.

# 2. Firm adaptation during the COVID-19 crisis

## 2.1 Macro-economic context and policy responses

Portugal's economic outlook was significantly hampered by the COVID-19 pandemic, which translated into a steep contraction of GDP by 8.4% year-on-year in 2020. The Portuguese economy started to recover in 2021, when GDP grew by 4.9% year-on-year. According to the European Commission 2022 summer (interim) forecast (European Commission, 2022a), GDP is projected to expand by 6.5% in 2022, as the services sector – particularly foreign tourism – is set to rebound strongly from a low base. At the same time, there are challenges related to commodity prices, global supply chains, and higher uncertainty in external demand, also in view of Russia's war of aggression against Ukraine. Furthermore, Portugal's external position worsened on the back the COVID-19 crisis. The current account balance deteriorated from a small surplus in 2019 to a deficit of 1.2% of GDP in 2020 and of 1.1% in 2021. It is expected to deteriorate further in 2022, due to the increased prices of energy imports.

The COVID-19 crisis caused Portugal's public and private debt levels to rise further, thereby aggravating pre-existing vulnerabilities. After a steady decline over the period of 2012-2019, the private debt-to-GDP ratio increased substantially to around 160% at the end of 2020, mainly due to the GDP contraction. Public debt increased in 2020, owing to the combined effect of the GDP contraction and the budgetary cost of measures taken to address the impact of the COVID-19 pandemic and sustain the economy. The public debt-to-GDP ratio increased from 116.6% at the end of 2019 to 135.2% at the end of 2020, after several years of a steady decline. Although private and public debt-to-GDP ratios resumed a downward trajectory in 2021 on the back of the gradual economic recovery, they remained above their pre-pandemic levels (European Commission, 2022b).

The support measures taken by the Portuguese government in response to the COVID-19 pandemic have helped to mitigate the effects of the crisis, in a context of high uncertainty. The package of crisis mitigation measures implemented as of March 2020 was multi-dimensional and gradually adjusted as the health and economic situation evolved.[4] Firstly, measures were taken to strengthen the response capacity of the National Health Service, including overtime work and additional hiring of health care professionals. Secondly, and making up the bulk of the overall support package, measures were taken to protect jobs and livelihoods, provide adequate social support, and safeguard firms' business continuity. One of the most important measures to protect jobs and livelihoods was a tailor-made short-time work scheme (called 'simplified lay-off' in Portugal), as well as a set of related subsequent schemes that allowed for the temporary interruption of work or the reduction of normal working time, combined with exemption from employer social security contributions. Subsequently, additional measures were aimed at helping firms get back into business. These included lifting the obligation of firms to make advanced payments during the year of their corporate income tax liability.

[4] Compared with other EU Member States, it has led to a relatively modest deficit-increasing impact of about 3% of GDP in 2020 (European Commission, 2021).

Portugal also supported firms through liquidity measures. Several publicly guaranteed credit lines for firms were launched, focusing on different target groups of firms (such as small and mid-caps, medium-sized firms, firms providing accommodation and food service activities, or travel agencies). Most of these credit lines were under the umbrella of a publicly guaranteed scheme for investment and working capital loans to be operated through commercial banks. The actual take-up of public guarantees was estimated at close to 4% of GDP on 14 April 2022 (Portuguese government, 2022). Moreover, debt moratoria were introduced at the onset of the COVID-19 crisis – with more than 29% of loans to non-financial corporations under moratoria in July 2021 (European Commission, 2021) – but most of them expired at the end of September 2021.

### 2.2 Firm adaptation during the COVID-19 crisis

The COVID-19 pandemic substantially impacted the corporate sector. In the face of declining global demand and pandemic-related restrictions – particularly impacting contact-intensive services – firms across the world experienced a sharp decline in turnover, resulting in massive layoffs or furloughs, business closures, and liquidity constraints (Adams-Prassl et al., 2020; Fairlie, 2020; Dai et al., 2021). Importantly, the COVID-19 crisis has changed the economic landscape for many firms, highlighting the importance of being able to respond, adapt, and set up crisis management processes in order to survive. These adaptation processes are expected to build up firms' resilience for post-COVID-19 times.

Evidence of the impact of the COVID-19 crisis on business activities is becoming increasingly available, as more surveys across countries are being conducted to help quantify these effects. There seems to be great heterogeneity across firms in the way they were impacted by the crisis (Apedo-Amah et al., 2020). Small- and medium-sized enterprises (SMEs) – which are financially fragile but also prevalent in the most affected sectors – were notably exposed to major challenges such as labour mobility restrictions, declining demand, and disruptions in logistics (Bartik et al., 2020; ITC, 2020; Dai et al., 2021). In particular, exporting firms faced declining global demand and experienced difficulties in terms of material shortages, supply-chain problems, as well as logistic disruptions. Adaptation processes were therefore of particular importance to exporting firms, especially as they potentially made them more resilient to adverse shocks.

The adaptation processes across firms spurred by the COVID-19 crisis were multi-dimensional. As an immediate response, unprecedented high levels of uncertainty related to the pandemic have prompted firms to react by cutting spending on innovation, training, and management improvements (Baker et al., 2020). While some firms laid off workers, sold their assets, or took on new debts, others followed a more resilience-oriented strategy, adapting the way they organise their business activities in various aspects (Almeida et al., 2020). In particular, firms were under pressure to change, in a short time, the way they organise their work structure and to find new ways to offer their products. Interestingly, a common response by firms to the COVID-19 crisis was the adoption of digital solutions, learning how to telework or shifting sales to online channels, in some cases in search of new supply chains and international market-places. The various ways in which firms adapted to the crisis seem to depend on their size. While large firms showed great resilience to the crisis, small firms were more likely adopt agile responses (ITC, 2020).

At the same time, firms' digital responses to the COVID-19 crisis appear to have differed across countries, sectors, and other firm characteristics (Apedo-Amah et al., 2020). For example, evidence from several countries shows that the use of digital technologies and the probability of investing in digital solutions were increasing with firm size. The adoption of digital solutions was higher in larger firms than smaller firms, and the COVID-19 crisis may have exacerbated the existing technological divide. In practice, this suggests that some digital firms have expanded their market share and profits, while the most traditional ones have struggled (D'Adamo et al., 2021). Available evidence suggests that there were also differences in the type of digital solutions adopted, with smaller firms being more likely to adopt e-commerce during the COVID-19 outbreak, and larger and more productive firms to adopt sophisticated technologies (DeStefano and Timmis, 2021).

### 2.3 Adaptation of exporting firms during the COVID-19 crisis

Research has recently paid more attention to the characteristics of firms that are critical for their resilience in times of crisis and, in turn, for their survival (Hyun et al., 2020; Ramelli and Wagner, 2020; Borino et al., 2021; Espitia et al., 2021). These studies have pointed to the importance of connectedness in terms of global value chains and exports, arguing that while being globally connected exposes firms to more vulnerabilities, it also enables them to become more resilient to adverse shocks. These arguments are grounded in the strategic management literature that emphasises the importance of global diversification for financial performance (Hyun et al., 2020).

Firms operating in international markets are more exposed to shocks than firms operating only domestically (Borino et al., 2021). In the context of the COVID-19 crisis, exporting firms were exposed to domestic and foreign shocks and, therefore, were more heavily affected (Ramelli and Wagner, 2002; Amador et al., 2021). Furthermore, exporting firms were more vulnerable to disruptions in international production networks as they rely on air and sea freights, which were more negatively impacted than land freight used by domestic firms (Miroudot, 2020).

At the same time, available evidence suggests that exporting firms tend to respond to crises more resiliently (Todo et al., 2015; Eppinger et al., 2018, Borino et al., 2021). In particular, exporting firms tend to save more jobs, remain productive, and be more likely to survive. The reason for this is twofold. First, exporting firms tend to be more productive, innovative, skill- and capital-intensive intensive, and larger than domestic firms (Melitz, 2003; Wagner, 2007). This allows them to better adapt in times of crisis by, for example introducing new products, adjusting their marketing, or switching to online sales. Second, exporting firms also have a wide(r) range of connections with foreign parties, which gives them the opportunity to make more flexible decisions in terms of production or market management (Hyun et al., 2020). In other words, being globally connected is important for firms' resilience in times of crisis (Borino et al., 2021).

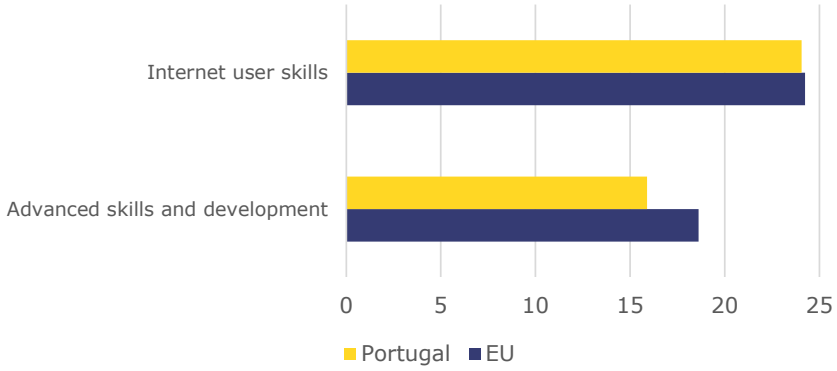
Against this background, and given the need for Portugal to improve the resilience of its economy, it is important to understand how exporters responded to the crisis by adapting their business activities, namely in sectors dominated by SMEs , and whether the crisis mitigation measures taken by the Portuguese government played a role in this regard.

## 2.4 Firm adaptation processes in Portugal – the digital angle

Portugal's economy remains anchored in traditional low- and medium-low technology sectors. The tourism sector is particularly prominent, while digital-intensive sectors account for only a small portion of the economy. Overall, Portugal's corporate sector is characterised by a high concentration of SMEs and few large firms. Since the previous financial and debt crisis, the evolution of the average size of firms has changed and there is an upward trend, with larger firms increasing their employment share, while micro firms have experienced a decline in their share (*Banco de Portugal*, 2021). Yet, at the outset of the COVID-19 pandemic, even though the economy had been on a recovery path for several years, low productivity growth, relatively high unemployment, high levels of public and private debt, and a relatively low degree of digital skills (see Chart 1) were still prominent challenges.

**Chart 1**

*Digital economy and society index – sub-dimensions of human capital, 2019*



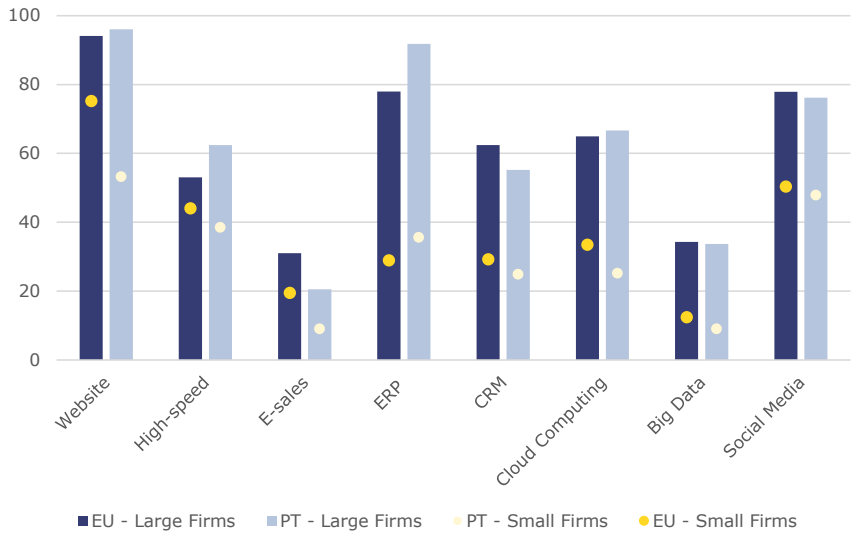

**Source**: Digital Economy and Society Index (DESI) (European Commission, 2022c).
**Notes**: The unit of measure is the weighted score (0 to 100) of the relevant DESI sub-dimension.

At the same time, the COVID-19 crisis has accelerated firms' adaptation processes. The declining in global demand severely impacted exports, especially in the services sector (notably, in contact-intensive services). Faced with an economic shock of this magnitude, Portugal's corporate sector – characterised by a prevalence of SMEs, many of which with a fragile financial situation – was exposed to increased challenges. In this context, firms across all sectors of the economy – particularly in the services sector – experienced a sharp decline in sales and employment levels. At the same time, the adoption of digital tools became particularly useful, as Portuguese firms were dealing with containment measures and consumers increased their use of the internet and e-commerce (INE, 2020). Specifically, firms adapted to the COVID-19 pandemic by modifying their production methods and distribution channels. Most notably, firms switched to teleworking and e-commerce. In parallel, the Portuguese government adopted various policy measures to mitigate – as far as possible – the adverse effects of the crisis and ensure that economic activity could resume with minimal disruption. These measures were important to help firms to continue their business activities (*Banco de Portugal*, 2021).

While firms have shown flexibility in terms of adopting to telework and e-commerce, there appears to be great heterogeneity across firms. These differences may be also reflected in the way firms have responded to the COVID-19 crisis. Moreover, in the case of Portugal, crisis adaptation processes may have been conditioned by size differences (see Section 4), as there are large disparities in the use of digital technologies across firms, with smaller firms lagging behind larger ones (see Chart 2).

**Chart 2**

*Proportion of firms using digital technologies*




**Source**: OECD (2021), ICT Access and Usage by Businesses database.

**Notes**: CRM refers to 'Customer Relationship Management' software, and ERP to 'Enterprise Resource Planning' software; Large firms (more than 250 employees), small firms (10-49 employees).

# 3. Data and empirical framework

## 3.1 Data

In this study, we use the results of the recently available COVID-IREE dataset. This survey was designed by INE and *Banco de Portugal* with the aim of evaluating the main effects of the COVID-19 pandemic on the activity of firms (notably, on their turnover, workforce, prices, financing conditions, and recourse to government support measures). The COVID-IREE is an electronic survey that covers a representative sample of about 8,800 non-financial corporations operating in Portugal. Starting in April 2020, data were initially collected weekly, and then biweekly as of May until mid-July 2020, followed by additional editions in November 2020, February 2021 and May 2022. We employ several editions carried out during 2020 in our study. The dataset provides information on firms' intentions or plans to adapt across various dimensions of their business activities and across several firm characteristics (such as their size, export profile, and activity sector). Furthermore, firms are asked whether they have resorted to government support measures (such as debt moratoria, publicly guaranteed credit lines, deferred tax payments, and short-time work schemes).

We complement the COVID-IREE dataset with balance sheet data from INE's SCIE. This rich dataset covers all non-financial corporations operating in Portugal and includes financial ratios and other variables with significant relevance for the corporate sector (such as, investments, workforce, age, location, and whether a given firm can be classified as a multinational enterprise). As a result, SCIE is particularly instrumental in assessing firms' economic and financial developments, as well as business dynamics. The full dataset resulting from the merge of COVID-IREE and SCIE contains about 8,000 non-financial corporations, and we analyse a final sample of about 7,000 firms.

### 3.2 Empirical framework

First, we are interested in understanding how likely exporting firms were to adapt their business activities in the face of the COVID-19 pandemic across various dimensions. To this end, we estimate several regressions with a binary dependent variable to analyse whether or not firms adapted through the various adaptation strategies, including through making greater use of teleworking, changing supply chains, redirecting target markets, increasing or decreasing their stock of products, diversifying their range of products and/or services, changing their distribution channels, investing in IT, changing their main activity, using flexible working hours, and reorganising their work teams (see Table 2 in Section 4.1 for additional details). In particular, we estimate a Probit regression model and calculate the ensuing average marginal effects (AME) to interpret our results. We also model the degree to which firms have adapted – measured by the number of adaptation mechanisms they have employed – by estimating a negative binomial regression model, which takes into consideration the count nature of the dependent variable.

Second, we are interested in exploring the extent to which there may have been differences among exporting firms in the way they responded to the COVID-19 crisis. Indeed, while exporting firms are more likely to take resilient actions in response to the COVID-19 crisis than domestic firms, exporting firms can be expected to have adapted in heterogeneous ways rather than employing single-coping mechanisms. Therefore, we differentiate across exporting firms of different sizes to better understand their multi-faceted responses to the crisis. In detail, to account for this possible source of heterogeneity, we divide the sample into two, classifying exporting firms according to size, into: (i) MSMEs, and (ii) large firms.

Third, we complement the empirical analysis by examining the possible role of the various support measures implemented by the Portuguese government in response to the COVID-19 pandemic, in the adaptation processes of exporting firms. By taking into account size variations across exporting firms, it is possible to better understand the needs of different firms and how government support measures can be targeted more effectively. Therefore, we test interaction effects between being an exporting firm and having reported willingness to resort to each of the main four types of government support measures (that is, tax payment deferrals, short-time work schemes, publicly guaranteed credit lines, and debt moratoria). Since interaction terms are difficult to interpret in non-linear models, we calculate the AME at two different moderation values to obtain an indication of the direction and significance of the estimated interaction effect.

# 4. Empirical analysis

## 4.1 Descriptive statistics

In our sample, the participation of firms in international trade is relatively low. Table 1 presents some summary statistics from our sample (namely, the number of observations, mean and standard deviation). Not surprisingly, most firms in the sample are SMEs, thus mimicking the overall structure of Portugal's corporate sector. Furthermore, only 34% of firms are involved in some sort of exporting activity, and only 14% can be classified as multinational enterprises. In addition, about 30% of firms operate in the manufacturing sector (which has a greater propensity to export). Corporate investment levels appear to be subdued and the proportion of highly skilled employees is notoriously low, with less than 1% of total employees carrying out research and development (R&D) activities.

Most firms in the sample have adapted in some way to deal with the COVID-19 crisis. Table 2 shows that adaptation processes have operated through multi-pronged mechanisms. For illustration purposes, we have grouped these adaptation processes into three groups: digital, labour and production adaptation strategies. Specifically, around 64% of firms in the sample report having adapted the way they organise their business activities in response to the COVID-19 crisis. Focusing on digital adaptation, the greater use of teleworking appears to have been particularly prominent. Turning to labour adaptation, firms appear to have usefully combined the benefits of reorganising work teams and greater flexibility in terms of working hours. Finally, production adaptation has mainly spurred through the diversification of production, redirecting target markets, and reinforcing distribution channels, against the background of logistic concerns taking centre-stage during the COVID-19 pandemic.

Firms have made abundant use of the support measures taken by the Portuguese government in response to the COVID-19 pandemic. Table 3 provides evidence on the reported use (or intended future use) by firms of government support measures, focusing on their four main types: (i) tax payment deferrals (also including the payment of social contributions); (ii) short-time work schemes (notably, Portugal's 'simplified lay-off' scheme); (iii) publicly guaranteed credit lines; and, (iv) debt moratoria. Among the support measures implemented by the Portuguese government, around 63% of the firms in the sample benefited from at least one of them. Overall, firms' preferences among the government support measures appear to have been (almost) evenly distributed.

## Table 1

*Overview of firm characteristics in the sample*

| *Variable* | Description | Number of observations | Mean | Standard deviation |
|---|---|---|---|---|
| ***Firmographic variables*** | | | | |
| *Age* | = 1 – 'New firms' – Age ≤ 2 years<br>= 2 – 'Junior firms' – Age > 3 years and ≤ 9 years<br>= 3 – 'Mature firms' – Age ≥ 10 years | 7 127 | 2.88 | 0.34 |
| *Size* | = 1 – 'Micro-enterprise' – Number of employees < 10 and turnover ≤ EUR 2 million<br>= 2 – 'Small enterprise' – Number of employees < 50 and turnover ≤ EUR 10 million<br>= 3 – 'Medium-sized enterprise' – Number of employees < 250 and turnover ≤ EUR 50 million<br>= 4 – 'Large enterprise' – Number of employees ≥ 250 and turnover > EUR 50 million | 7 127 | 2.38 | 0.95 |
| *Lisbon* | = 1 if firm is headquartered in NUTS II[5] 'Lisbon metropolitan area'<br>= 0 if otherwise | 7 127 | 0.35 | 0.47 |
| *Highly skilled employees* | Ratio of employees working in R&D over total number of employees | 7 127 | 0.01 | 0.05 |
| ***Economic activity variables*** | | | | |
| *Economic activity sector* | = 2 – 'Manufacturing and energy' - CAE-Rev. 3 B, C, D, E<br>= 3 – 'Construction and real estate' – CAE-Rev. 3 F, L<br>= 4 – 'Distributive trade' – CAE-Rev. 3 G<br>= 5 – 'Transportation and storage' – CAE-Rev. 3 H<br>= 6 – 'Accommodation and food services' – CAE-Rev. 3 I<br>= 7 – 'Information and communication' – CAE-Rev. 3 J<br>= 8 – 'Other services' – CAE-Rev. 3 M, N, P, Q, R, S | 7 127 | 0.28<br>0.11<br>0.29<br>0.03<br>0.06<br>0.03<br>0.16 | 0.45<br>0.31<br>0.45<br>0.18<br>0.24<br>0.19<br>0.36 |
| ***International trade variables*** | | | | |
| *Exporter* | = 1 if total sales in either the EU or extra-EU markets > 0<br>= 0 if otherwise | 7 127 | 0.37 | 0.48 |
| *Multinational enterprise* | = 1 if the allocated gains/losses of subsidiaries, associates and joint ventures ≠ 0<br>= 0 if otherwise | 7 127 | 0.18 | 0.38 |
| ***Financial variables*** | | | | |
| *Debt-to-equity* | = 1 if debt to equity ratio > 7.5<br>= 0 if debt to equity ratio ≤ 7.5<br>Ratio of the firm's total liabilities over its total equity | 7 127 | 0.94 | 0.22 |
| *Investment* | Average total investment – in intangible, tangible, and biological assets, as well as investment properties – in the period 2015-2019 (in EUR) | 7 127 | 10.7 | 3.46 |

**Source**: COVID-IREE and SCIE, INE; authors' calculations

[5] NUTS is Eurostat's acronym of '*Nomenclature des Unités Territoriales Statistiques*'. Eurostat distinguishes between three sub-national regional aggregates: NUTS 1 (large regions with a population of 3-7 million inhabitants), NUTS 2 (groups of regions and unitary authorities with a population of 0.8-3 million inhabitants), and NUTS 3 regions (with a population of 150-800 thousand inhabitants).

## Table 2

*Overview of firms' adaptation processes in the sample*

| Variable | Description | Number of observations | Mean | Standard deviation |
|---|---|---|---|---|
| *Adapt* | = 1 if firm adapted or intends to adapt<br>= 0 if otherwise | 7 127 | 0.69 | 0.46 |
| *Degree of adaptation* | Total number of adaptation mechanisms firms implemented | 7 127 | 1.95 | 2.03 |
| ***Digital adaptation*** | | | | |
| *Teleworking* | = 1 if firm intends to make greater use of teleworking<br>= 0 if otherwise | 5 703 | 0.27 | 0.44 |
| *Investing in IT* | = 1 if firm intends to reinforce investment in IT<br>= 0 if otherwise | 5 622 | 0.18 | 0.39 |
| ***Labour adaptation*** | | | | |
| *Reorganisation of work teams* | = 1 if firm intends to permanently reorganise work teams<br>= 0 if otherwise | 5 703 | 0.39 | 0.48 |
| *Flexible working hours* | = 1 if firm intends to permanently adopt more flexible working hours<br>= 0 if otherwise | 5 703 | 0.31 | 0.46 |
| ***Production adaptation*** | | | | |
| *Diversification of production* | = 1 if firm has diversified/modified or intends to diversify/modify its production<br>= 0 if otherwise | 5 739 | 0.27 | 0.44 |
| *Redirection of target markets* | = 1 if firm intends to redirect its target markets<br>= 0 if otherwise | 5 703 | 0.20 | 0.40 |
| *Change in distribution channels* | = 1 if firm has changed/reinforced or intends to change/reinforce its distribution channels<br>= 0 if otherwise | 5 739 | 0.20 | 0.40 |
| *Change in product range* | = 1 if firm intends to to change the range of products sold or services provided<br>= 0 if otherwise | 5 703 | 0.17 | 0.37 |
| *Stock decrease* | = 1 if firm has decreased or intends to decrease the stocks of products needed for its activity<br>= 0 if otherwise | 5 703 | 0.16 | 0.37 |
| *Stock increase* | = 1 if firm has increased or intends to increase the stocks of products needed for its activity<br>= 0 if otherwise | 5 703 | 0.13 | 0.33 |
| *Change in supply chains* | = 1 if firm intends to change its supply chains<br>= 0 if otherwise | 5 703 | 0.11 | 0.32 |
| *Change in activity* | = 1 if firm intends to permanently change its main economic activity<br>= 0 if otherwise | 5 622 | 0.01 | 0.07 |

**Source**: COVID-IREE and SCIE, INE; authors' calculations

**Table 3**

*Overview of firms' recourse to government support measures*

| *Variable* | Description | Number of observations | Mean | Standard deviation |
|---|---|---|---|---|
| *Tax payment deferrals* | = 1 if firm has benefited or is expecting to benefit from deferred payment of taxes and social contributions<br>= 0 if otherwise | 6 952 | 0.45 | 0.49 |
| *Short-time work schemes* | = 1 if firm has resorted to the 'simplified lay-off' scheme<br>= 0 if otherwise | 4 603 | 0.34 | 0.47 |
| *Publicly guaranteed credit lines* | = 1 if firm has benefited or is expecting to benefit from credit lines associated with subsidised interest or public guarantees<br>= 0 if otherwise | 6 952 | 0.36 | 0.48 |
| *Debt moratoria* | = 1 if firm has benefited or is expecting to benefit from moratoria on the payment of principal or interest on existing loans<br>= 0 if otherwise | 6 952 | 0.32 | 0.46 |

**Source**: COVID-IREE and SCIE, INE; authors' calculations

### 4.2 Empirical results

We find evidence that exporting firms were more likely to adapt in response to the COVID-19 crisis than domestic firms. Chart 3 provides the results of our Probit regression analysis. Compared with a domestic firm, the results indicate that being an exporting firm increases the probability of a firm having adapted in response to the COVID-19 crisis by 2.7 percentage points, *caeteris paribus* (see Table A.1. in the Annex for additional details). Related, we also find evidence that multinational enterprises had a greater probability to adapt by up to 3.4 percentage points, *ceteris paribus*, when compared with non-multinational enterprises. Finally, we also find evidence that firms operating in sectors with greater R&D intensity – notably, in 'information and communication' – also present greater propensity to adapt. There is, therefore, scope for a mutually reinforcing positive association between exports on the one hand, and productivity and innovation on the other, chiefly operating through market size and learning-by-doing effects. Based on an alternative model specification (see model (2) of Table A.1. in the Annex), we also find evidence that, not only exporting firms (as well as multinational enterprises) are more likely to adapt, but they are likely to do so to a higher degree (notably, by deploying a wider range of adaptation mechanisms).

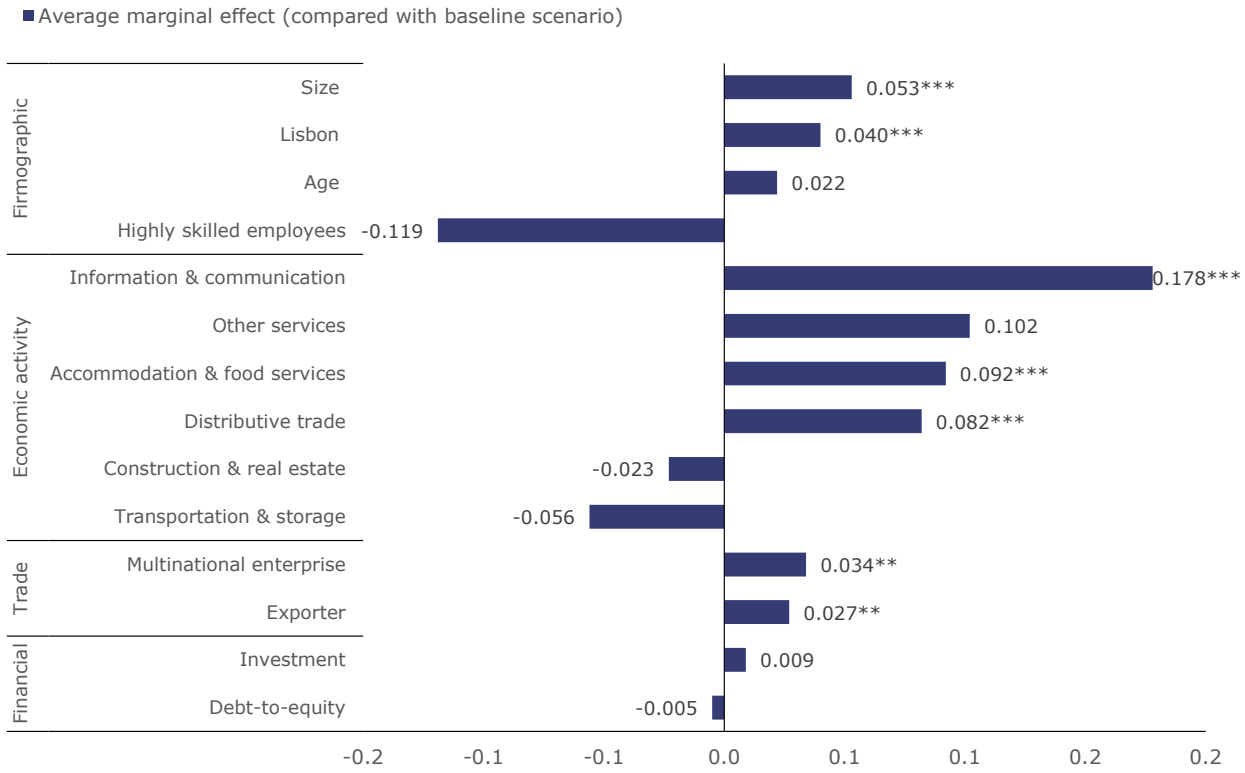
Although exporting firms are more likely to adapt than domestic firms, there is heterogeneity among exporters as to the adaptation mechanisms they tend to employ. Chart 4 summarises our key findings on how exporting firms of different sizes tended (or intended) to adapt in the face of the COVID-19 crisis (see Table A.2. in the Annex for additional details). Crucially, smaller exporting firms tended to adapt their business activities through various mechanisms, while larger exporting firms appear to have followed a more parsimonious approach. In detail, exporting MSMEs were more likely to adapt by pursuing digital strategies, namely through investing in IT or making greater use of teleworking. For instance, they are associated with a 3.9 percentage point greater probability of investing in IT than domestic firms, *caeteris paribus*; in the same vein, we estimate that they were 3.5 percentage points more likely to increase their use of teleworking mechanisms. In addition, these

firms were also more likely to adapt by redirecting their target markets, increasing their stocks, and changing their product range or supply chains. On the other hand, large exporting firms are more likely to adapt by decreasing their stocks. Specifically, we estimate that large exporting firms are associated with a 5.9 percentage point higher probability of decreasing their stocks than domestic firms, *caeteris paribus*. These results show how the capacity of exporting firms to resort to various, often mutually reinforcing, adaptation mechanisms, contributed to strengthening their resilience to the shock exerted by the COVID-19 crisis. This should contribute to an export-led recovery.

Furthermore, there is evidence that the support measures implemented by Portuguese government in response to the COVID-19 crisis have been effective in supporting firms' adaptation processes. Focusing on exporting firms, we find that government support measures have increased the likelihood that these firms would adapt, including through adaptation mechanisms that they likely would not have deployed on their own (see Table A.3. in the Annex for the full set of results). Focusing on exporting MSMEs, there are, for instance, positive interactions between (most or all) government support measures and IT investments, redirection of target markets, stock increase, and change in product range and supply chains, which appeared to be the most prominent adaptation mechanisms for this sub-set of firms. In turn, focusing on large exporting firms, we find positive interactions not only with stock decreases – which seemed to be a particularly relevant adaptation mechanism for these firms – but also with other less prominent adaptation mechanisms, such as redirection of target markets, change in product range and supply chains. Crucially, government support measures appear to have been particularly useful in spurring the adaptation process of Portuguese domestic MSMEs, for which we also estimate significantly positive interaction terms. All evidence considered, this points to the effectiveness of government support measures in Portugal, whose calibration appears to have created positive incentives for firms' to adapt to the challenges emerging from the COVID-19 crisis.

## Chart 3

*Adaptation | Probit model regression – marginal effects (additional probability vs. baseline scenario)*

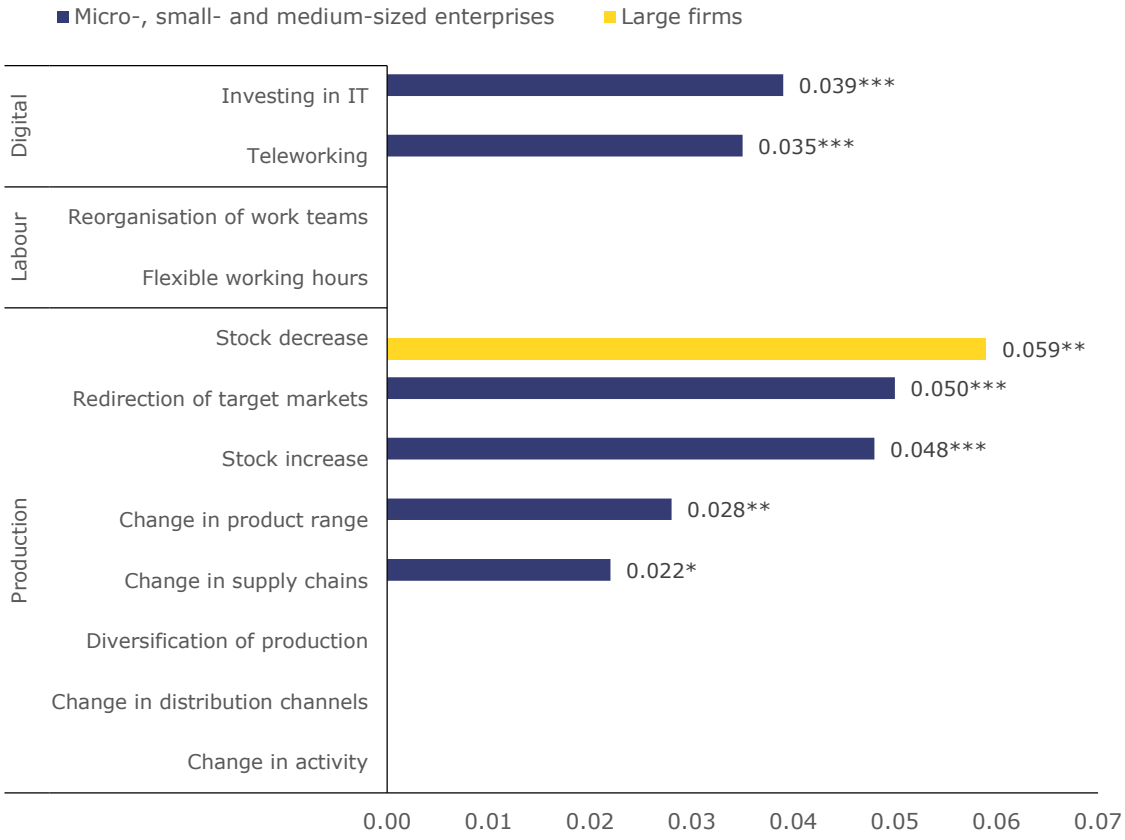



**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: The dependent variable is a binary variable: = 1 if the firm has adapted by deploying at least one of the 12 adaptation mechanisms listed in Table 2 (that is, (i) teleworking; (ii) investing in IT; (iii) reorganisation of work teams; (iv) flexible working hours; (v) diversification of production; (vi) redirection of target markets; (vii) change in distribution channels; (viii) change in product range; (ix) stock decrease; (x) stock increase; (xi) change in supply chains; or, (xii) change in activity). 'Manufacturing and energy' (CAE-Rev. 3 B, C, D, E) is used as the reference economic activity sector. Significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

## Chart 4

*Adaptation mechanisms | Probit model regression – marginal effects*




**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: The dependent variables are binary variables: = 1 if the firm has adapted by deploying each one of the 12 adaptation mechanisms listed in Table 2 (that is, (i) teleworking; (ii) investing in IT; (iii) reorganisation of work teams; (iv) flexible working hours; (v) diversification of production; (vi) redirection of target markets; (vii) change in distribution channels; (viii) change in product range; (ix) stock decrease; (x) stock increase; (xi) change in supply chains; or, (xii) change in activity). Significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$. Regression coefficient that do not respect (at least) the 10% significance level are excluded from the chart.

## 5. Conclusion

This study contributes to the growing body of research on the impact of the COVID-19 crisis on firm performance and resilience, providing more insights into how Portuguese exporting firms have adapted during the crisis (Apedo-Amah et al., 2020; Hyun et al., 2020; Borino et al., 2021; Espitia et al., 2021). Our findings show that exporting firms were better able to adapt to the COVID-19 crisis than domestic firms, highlighting the importance of operating in international markets as a means of boosting resilience. Moreover, we find evidence that differences in firm size among exporting firms play an important role with regard to the adaptation mechanisms they use. The results also provide an overview of the effectiveness of the support measures taken by the Portuguese government in response to the COVID-19 pandemic in the adaptation processes deployed by both exporting and domestic firms of different sizes.

We use the recently released COVID-IREE survey, and complement it with balance sheet data from SCIE, covering a sample of 7,000 Portuguese firms, to study the relationship between exporting and the adaptation of business activities in the face of the COVID-19 crisis.

Firstly, we study the likelihood of exporting firms adapting their business activities in the face of the COVID-19 pandemic through various adaptation mechanisms. Our findings indicate that exporting firms were more likely to adapt to the COVID-19 crisis. Compared with a domestic firm, the results indicate that being an exporter increases the probability that a firm has adapted in response to the COVID-19 crisis by 2.7 percentage points, *caeteris paribus*.

Secondly, we investigate the heterogeneity among exporting firms in the way they have dealt with the COVID-19 crisis. Crucially, our findings confirm that heterogeneity is at play, with smaller exporting firms adapting their business activities through various mechanisms and larger exporting firms following a more parsimonious approach. In particular, exporting MSMEs were more likely to adapt by pursuing digital strategies, namely through investing in IT or making greater use of teleworking. In addition, those firms were also more likely to redirect their target markets, increase their stocks, and change their product range and supply chains. On the other hand, large exporting firms were more likely to adapt by reducing their stocks.

Thirdly, when examining the role of support measures taken by the Portuguese government in the adaptation processes of both exporting and domestic firms, we find that such government support measures have enhanced the probability that exporting firms would adapt, including through adaptation mechanisms that they likely would not have deployed on their own. Moreover, we also find that government support measures have been particularly useful in spurring the adaptation processes of domestic MSMEs, for which we estimate positive interaction terms. This is in line with recent research examining the effectiveness of policy support measures and finding that firms that benefit from these measures were more optimistic in their investment plans with regard to digital technologies.

This study is particularly relevant for the design of policy measures aimed at stimulating an export-led recovery in Portugal and speeding up economic convergence. Its conclusions allow to draw lessons to properly target policy measures and prompt firms' inner adaptation processes towards the digital transition and internalisation, especially for firms that are lagging behind.

This study has some limitations, however, which may offer avenues for future research. Although we found evidence of firms adapting, it is worth noting that – due to the nature of the survey's design – we were unable to differentiate, for all dimensions, between the firms that effectively adapted and those that were simply asked and expressed the intention to do so. Notwithstanding, such intentions are informative insofar as they show how firms planned to deal with the COVID-19 crisis. Moreover, our sample contains a relatively small number of large firms, which may limit the validity of extrapolations based on the empirical results regarding their adaptation processes. In addition, while we account for firm-specific characteristics that might affect firms' adaptation processes, we do not have information about firms' innovation activities, which might play a role in this regard. Furthermore, our analysis is cross-sectional and does not allow us to explore whether exporting firms are more likely to learn and, therefore, build up resilience for the medium- to longer-term. Although we find evidence of the role of government support measures in firm's adaptation processes, it is less clear-cut why this association appears to be stronger between specific measures and specific adaptation mechanisms. Future research might explore these dimensions, including by drawing on our work to provide a more comprehensive overview of firms' adaptation processes and learning abilities in the light of the COVID-19 crisis.

## References

Adams-Prassl, A., Boneva, T., Golin, M., Rauh, C. (2020); 'Inequality in the impact of the coronavirus shock: evidence from real time surveys'; IZA; Discussion Paper Series; No. 13183; April 2020.

Aghion, P., Bergeaud, A., Lequien, M., and Melitz, M. J. (2018); 'The impact of exports on innovation: theory and evidence'; Banque de France; Working Paper 678; April 2018.

Alexandre, F., Costa, H., Portela, M., and Rodrigues, M. (2021); 'Asymmetric regional dynamics in the Portuguese economy: debt, openness and local revenues'; Regional Studies; Volume 55; No. 2; pp. 322-332.

Almeida, F., Duarte Santos, J. and Monteiro, J. A. (2020); 'The challenges and opportunities in the digitalisation of companies in a post-COVID-19 world'; IEEE Engineering Management Review; Volume 48; No. 3; pp. 97-103; September 2020.

Amador, J., Melo Gouveia, C., Pimenta, A. C. (2021); 'COVID-19, lockdowns and international trade: evidence from firm-level data'; Working Papers 2021; No 14; Banco de Portugal; October 2021.

Apedo-Amah, M. C., Avdiu, B., Cirera, X., Cruz, M., Davies, E., Grover, A., Iacovone, L., Kilinc, U., Medvedev, D., Maduko, F. O., Poupakis, S., Torres, J. and Tran, T. T. (2020); 'Unmasking the impact of COVID-19 on businesses'; World Bank Group; Policy Research Working Paper 9434.

Atkin, D., Khandelwal, A. K., and Osman, A. (2017); 'Exporting and firm performance: evidence from a randomised experiment'; The Quarterly Journal of Economics; Volume 132; Issue 2; pp. 551-615; May 2017.

Baker, S. R., Bloom, N., Davis, S. J. and Terry, S. J. (2020); 'COVID-induced economic uncertainty'; National Bureau of Economic Research; NBER Working Paper Series; No. 26983; April 2020.

Bartik, A. W, Bertrand, M., Cullen, Z., Glaeser, E. L., Luca, M., Stanton, C. (2020); 'The impact of COVID-19 on small business outcomes and expectations'; Proceedings of the National Academy of Sciences 117; No. 30; 28 July 2020.

Banco de Portugal (2021); Economic Bulletin; March 2021.

Borino, F., Carlson, E., Rollo, V., Solleder, O. (2021); 'International firms and COVID-19: evidence from a global survey'; CEPR Press; Issue 75; 7 April 2021.

Correia, A. L. and Gouveia, A. F. (2016); 'What determines firm-level export capacity? Evidence from Portuguese firms'; GEE Papers; No. 57; April 2016.

D'Adamo, G., Bianchi, M., and Granelli, L. (2021); 'Digitalisation & beyond: The COVID-19 pandemic & productivity growth in G20 countries'; European Commission; European Economy – Economic Brief 067; July 2021.

Dai, R., Feng, H., Hu, J., Jin, Q., Li, H., Wang, R., Wang, R., Xu, L. and Zhang, X. (2021); 'The impact of COVID-19 on small and medium-sized enterprises: evidence from two-wave phone surveys in China'; China Economic Review; Volume 27; June 2021.

DeStefano, T. and Timmis, J. (2021); 'Firm digital adoption during COVID'; ZEW Research Seminar; 12 July 2021.

Eggers, F. (2020); 'Masters of disasters? Challenges and opportunities for SMEs in times of crisis'; Journal of Business Research; Volume 116; pp. 199-208; August 2020.

Eppinger, P. S., Meythaler, N., Sindlinger, M.-M., Smolka, M.; 'The great trade collapse and the Spanish export miracle: Firm-level evidence from the crisis'; The World Economy; Volume 41; Issue 2; pp. 457-493; February 2018.

Espitia, A., Mattoo, A., Rocha, N., Ruta, M., Winkler, D. (2021); 'Pandemic trade: COVID-19, remote work and value chains'; World Bank Group; Policy Research Working Paper 9508; January 2021.

Eurofound (2012); 'Born global: the potential of job creation in new international businesses'; Publications Office of the European Union; Luxembourg; 2012.

European Commission (2021); 'Post-programme surveillance report – Portugal, Autumn 2021'; Institutional paper 165; 24 November 2021.

European Commission (2022a); 'European Economic Forecast – Summer 2022'; Institutional paper 183; July 2022.

European Commission (2022b); 'Commission Staff Working Document – In-depth Review for Portugal in accordance with Article 5 of Regulation (EU) No 2011/1176 on the prevention and correction of macroeconomic imbalances'; SWD(2022) 637 final; 23 May 2022.

European Commission (2022c); 'The Digital Economy and Society Index (DESI)'; 2022.

Fairlie, R. (2020); 'The impact of COVID-19 on small business owners: evidence from the first three months after widespread social-distancing restrictions'; Journal of Economics and Management Strategy; 10.1111/jems.12400; August 2020.

Hyun, J., Kim, D., Shin, S.-R. (2020); 'The role of global connectedness and market power in crises: firm-level evidence from the COVID-19 pandemic'; 30 December 2020.

INE (2020); 'Information and knowledge society – household survey'.

International Monetary Fund (IMF, 2022): 'How could the COVID-19 pandemic affect firm productivity and the speed of the recovery?'; Portugal – Selected Issues; IMF Country Report No. 22/204; Washington D.C.; 7 June 2022.

International Trade Centre (ITC, 2020); 'COVID-19: The great lockdown and its impact on small business'; SME Competitiveness Outlook.

Melitz, M. J.; 'The impact of trade on intra-industry reallocations and aggregate industry productivity'; Econometrica; Volume 71; No. 6; pp. 1695-1725; November 2003.

Miroudot, S. (2020); 'Reshaping the policy debate on the implications of COVID-19 for global supply chains'; Journal of International Business Policy; Issue 3; pp. 430-442; October 2020.

Naude, W. and Cameron, M. (2020); 'Export-led growth after COVID-19: the case of Portugal'; IZA; DP No. 13875; November 2020.

OECD (2021); 'ICT Access and Usage by Businesses' database.

Todo, Y., Nakajima, K., Matous, P. (2015); 'How do supply chain networks affects the resilience of firms to natural disasters? Evidence from the great East Japan earthquake'; Journal of Regional Science; Volume 55; No. 2; pp. 209-229; 2015.

Petrakos, G. and Psycharis, Y. (2016); 'The spatial aspects of economic crisis in Greece'; Cambridge Journal of Regions, Economy and Society; Volume 9; No. 1; pp. 137-152; March 2016.

Portugal, P. and Blanchard, O. (2017); 'Boom, slump, sudden stops, recovery, and policy options – Portugal and the Euro'; Portuguese Economic Journal; Volume 16; pp. 149-168; 20 November 2017.

Portuguese government (2022); 'Draft Budgetary Plan 2022'; April 2022.

Ramelli, S. and Wagner, A. F. (2020); 'Feverish stock price reactions to COVID-19'; The Review of Corporate Finance Studies; Volume 9; Issue 3; pp. 622–655; November 2020.

Wagner, J. (2007); 'Exports and productivity: A survey of the evidence from firm-level data'; The World Economy; Volume 30; Issue 1; pp. 60-82; January 2007.

# Annex

**Table A.1.**

(1) Probit regression model – marginal effects – additional probability vs. baseline scenario

(2) Negative binomial regression model

| | Adaptation (1) | Degree of adaptation (2) |
|---|---|---|
| ***Firmographic variables*** | | |
| *Age* | 0.022 | 0.045 |
| | (0.015) | (0.038) |
| *Size* | 0.053*** | 0.089*** |
| | (0.007) | (0.017) |
| *Lisbon* | 0.040*** | 0.074*** |
| | (0.012) | (0.028) |
| *Highly skilled employees* | -0.119 | -0.278 |
| | (0.104) | (0.260) |
| ***Economic activity variables*** | | |
| *Construction and real estate* | -0.023 | -0.116** |
| | (0.021) | (0.052) |
| *Distributive trade* | 0.082*** | 0.206*** |
| | (0.015) | (0.036) |
| *Transportation and storage* | -0.056 | 0.050 |
| | (0.034) | (0.077) |
| *Accommodation and food services* | 0.092*** | 0.417*** |
| | (0.025) | (0.059) |
| *Information and communication* | 0.178*** | 0.381*** |
| | (0.026) | (0.070) |
| *Other services* | 0.102*** | 0.324*** |
| | (0.019) | (0.046) |
| ***International trade variables*** | | |
| ***Exporter*** | **0.027**** | **0.066**** |
| | **(0.013)** | **(0.032)** |
| *Multinational enterprise* | 0.034** | 0.120*** |
| | (0.015) | (0.034) |
| ***Financial variables*** | | |
| *Debt-to-equity* | -0.005 | 0.041 |
| | (0.021) | (0.051) |
| *Investment* | 0.009*** | 0.025*** |
| | (0.001) | (0.004) |
| *N* | 7 127 | 7 127 |
| *Pseudo/$R^2$* | 0.035 | 0.012 |

**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: In model (1), the dependent variable is a binary variable: = 1 if the firm has adapted by deploying at least one of the 12 adaptation mechanisms listed in Table 2 (that is, (i) teleworking; (ii) investing in IT; (iii) reorganisation of work teams; (iv) flexible working hours; (v) diversification of production; (vi) redirection of target markets; (vii) change in distribution channels; (viii) change in product range; (ix) stock decrease; (x) stock increase; (xi) change in supply chains; or, (xii) change in activity). In model (2), the dependent variable is the sum of the 12 binary variables indicating if the firm has deployed each of the above-mentioned adaptation mechanisms. 'Manufacturing and energy' (CAE-Rev. 3 B, C, D, E) is used as the reference economic activity sector. Standard errors are shown in parenthesis. Significance levels: *** p < 0.01, ** p < 0.05, and * p < 0.1.

## Table A.2. – panel (a)

*Probit model regressions – marginal effects – additional probability vs. baseline scenario*

| ***Adaptation mechanisms*** | **Teleworking (1)** | | **Investing in IT (2)** | | **Reorganisation of work teams (3)** | | **Flexible working hours (4)** | | **Diversification of production (5)** | | **Redirection of target markets (6)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms |
| ***Firmographic variables*** | | | | | | | | | | | | |
| *Age* | -0.019 | 0.119 | 0.005 | 0.068 | 0.001 | -0.088 | 0.007 | 0.013 | 0.006 | -0.059 | 0.049 | -0.004 |
| | (0.016) | (0.075) | (0.015) | (0.079) | (0.019) | (0.076) | (0.018) | (0.075) | (0.018) | (0.061) | (0.016) | (0.054) |
| *Lisbon* | 0.108*** | 0.126*** | 0.037*** | 0.016 | -0.012 | -0.002 | 0.046*** | 0.052 | -0.016 | 0.014 | 0.022* | -0.064** |
| | (0.011) | (0.036) | (0.011) | (0.033) | (0.015) | (0.038) | (0.014) | (0.037) | (0.014) | (0.032) | (0.012) | (0.029) |
| *Highly skilled employees* | 0.085 | 0.187 | -0.094 | -1.132** | -0.037 | -0.986* | 0.086 | 0.103 | 0.018 | 0.209 | -0.041 | -0.371 |
| | (0.107) | (0.390) | (0.116) | (0.615) | (0.146) | (0.510) | (0.132) | (0.369) | (0.099) | (0.306) | (0.132) | (0.425) |
| ***Economic activity variables*** | | | | | | | | | | | | |
| *Construction & real estate* | 0.046** | -0.018 | 0.021 | 0.095 | -0.015 | -0.071 | -0.039* | -0.088 | 0.076*** | 0.022 | -0.067*** | 0.125* |
| | (0.021) | (0.089) | (0.018) | (0.080) | (0.025) | (0.087) | (0.023) | (0.082) | (0.024) | (0.071) | (0.020) | (0.075) |
| *Distributive trade* | 0.010 | -0.033 | 0.074*** | 0.072* | 0.020 | 0.033 | 0.003 | 0.044 | 0.019 | 0.058 | -0.061 | 0.022 |
| | (0.014) | (0.045) | (0.014) | (0.040) | (0.019) | (0.046) | (0.018) | (0.045) | (0.017) | (0.039) | (0.016) | (0.031) |
| *Transportation & storage* | 0.111*** | 0.118 | 0.087** | 0.079 | 0.047 | 0.156** | 0.082** | 0.064 | -0.069** | 0.078 | -0.000 | 0.180** |
| | (0.039) | (0.076) | (0.035) | (0.068) | (0.044) | (0.076) | (0.043) | (0.078) | (0.035) | (0.070) | (0.038) | (0.071) |
| *Accommodation & food serv.* | -0.080*** | -0.104 | 0.072*** | 0.208** | 0.162*** | 0.007 | 0.109*** | -0.065 | 0.030 | 0.085 | 0.138*** | 0.349 |
| | (0.020) | (0.099) | (0.025) | (0.098) | (0.033) | (0.102) | (0.031) | (0.095) | (0.029) | (0.092) | (0.031) | (0.099) |
| *Information & communication* | 0.337*** | 0.251*** | 0.059** | 0.140 | 0.107*** | 0.072 | 0.191*** | 0.244*** | 0.140*** | 0.173** | -0.033 | -0.027 |
| | (0.038) | (0.083) | (0.029) | (0.085) | (0.039) | (0.091) | (0.039) | (0.088) | (0.038) | (0.087) | (0.031) | (0.056) |
| *Other services* | 0.245*** | 0.097 | 0.119*** | 0.140** | 0.108*** | 0.153*** | 0.128*** | 0.088 | -0.067*** | 0.055 | 0.023 | 0.160*** |
| | (0.022) | (0.062) | (0.019) | (0.057) | (0.025) | (0.061) | (0.024) | (0.062) | (0.023) | (0.051) | (0.021) | (0.055) |
| ***International trade variables*** | | | | | | | | | | | | |
| ***Exporter*** | **0.035**** | **0.050** | **0.039***** | **0.009** | **-0.005** | **0.053** | **-0.017** | **0.013** | **0.010** | **-0.030** | **0.050***** | **0.042** |
| | **(0.143)** | **(0.042)** | **(0.013)** | **(0.038)** | **(0.017)** | **(0.043)** | **(0.016)** | **(0.042)** | **(0.016)** | **(0.037)** | **0.015** | **(0.034)** |
| *Multinational enterprise* | 0.091*** | 0.015 | 0.057*** | 0.030 | 0.044** | 0.016 | 0.049*** | -0.020 | 0.042** | 0.046 | 0.001 | 0.024 |
| | (0.014) | (0.035) | (0.014) | (0.032) | (0.019) | (0.036) | (0.018) | (0.035) | ( 0.018) | (0.030) | (0.016) | (0.027) |
| ***Financial variables*** | | | | | | | | | | | | |
| *Debt-to-equity* | 0.060*** | 0.160 | -0.024 | 0.020 | 0.045 | 0.064 | 0.068 | 0.080 | -0.011 | -0.071 | 0.040 | -0.016 |
| | (0.022) | (0.059) | (0.023) | (0.091) | (0.028) | (0.059) | (0.026) | (0.057) | (0.027) | (0.053) | (0.024) | (0.045) |
| *Investment* | 0.014*** | 0.011* | 0.012*** | 0.015** | 0.017*** | 0.013* | 0.006*** | 0.013** | 0.001 | -0.005 | 0.002 | 0.001 |
| | (0.002) | (0.006) | (0.001) | (0.006) | (0.002) | (0.006) | (0.002) | (0.006) | (0.002) | (0.005) | (0.001) | (0.005) |
| *N* | 4 870 | 833 | 4 768 | 854 | 4 870 | 833 | 4 870 | 833 | 4 847 | 892 | 4 870 | 833 |

**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: 'Manufacturing and energy' (CAE-Rev. 3 B, C, D, E) is used as the reference economic activity sector. Standard errors are shown in parenthesis. Significance levels: *** p < 0.01, ** p < 0.05, and * p < 0.1.

## Table A.2. – panel (b)

*Probit model regressions – marginal effects – additional probability vs. baseline scenario*

| ***Adaptation mechanisms*** | **Change in distribution channels (7)** | | **Change in product range (8)** | | **Stock decrease (9)** | | **Stock increase (10)** | | **Change in supply chains (11)** | | **Change in activity (12)** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs |
| ***Firmographic variables*** | | | | | | | | | | | |
| *Age* | -0.001 (0.016) | 0.137* (0.071) | -0.014 (0.015) | 0.087 (0.065) | 0.006 (0.015) | 0.123 (0.078) | 0.001 (0.014) | -0.036 (0.051) | 0.011 (0.013) | 0.034 (0.050) | -0.001 (0.002) |
| *Lisbon* | 0.004 (0.012) | 0.037 (0.028) | 0.024** (0.011) | -0.019 (0.028) | 0.003 (0.011) | -0.005 (0.025) | -0.006 (0.010) | -0.014 (0.028) | -0.005 (0.010) | -0.048* (0.024) | -0.000 (0.002) |
| *Highly skilled employees* | -0.047 (0.109) | 0.026 (0.271) | -0.026 (0.117) | -1.697* (0.872) | -0.348 (0.211) | -0.728 (0.518) | 0.006 (0.103) | 0.106 (0.243) | 0.075 (0.092) | 0.180 (0.194) | |
| ***Economic activity variables*** | | | | | | | | | | | |
| *Construction & real estate* | 0.061*** (0.018) | 0.054 (0.056) | -0.068*** (0.016) | 0.062 (0.067) | -0.071*** (0.015) | 0.016 (0.056) | -0.059*** ( 0.016) | -0.070 (0.057) | -0.035** (0.015) | 0.026 (0.057) | -0.001 (0.002) |
| *Distributive trade* | 0.186*** (0.014) | 0.326*** (0.036) | 0.027* (0.014) | 0.013 (0.031) | 0.094*** (0.015) | 0.147*** (0.034) | -0.002 ( 0.014) | -0.029 (0.034) | 0.002 (0.012) | 0.017 (0.027) | 0.004 (0.003) |
| *Transportation & storage* | -0.014 (0.025) | 0.128** (0.058) | 0.025 (0.035) | 0.082 (0.062) | -0.075*** (0.023) | -0.052 (0.035) | -0.070*** (0.026) | -0.155*** (0.030) | 0.014 (0.031) | 0.005 (0.046) | |
| *Accommodation & food serv.* | 0.187*** (0.028) | 0.336*** (0.094) | 0.128*** (0.029) | 0.357*** (0.099) | 0.335*** (0.031) | 0.371*** (0.099) | 0.008 (0.024) | -0.057 (0.068) | 0.100*** (0.027) | 0.255 (0.096) | 0.009 (0.007) |
| *Information & communication* | 0.195*** (0.034) | 0.159** (0.072) | 0.030 (0.030) | 0.082 (0.073) | -0.044* (0.023) | -0.034 (0.046) | -0.098*** (0.019) | | -0.039* (0.022) | | 0.002 (0.006) |
| *Other services* | 0.083*** (0.018) | 0.227*** (0.048) | 0.075*** (0.020) | 0.109** (0.052) | -0.029* (0.016) | -0.004 (0.037) | -0.026 (0.017) | 0.030 (0.052) | 0.030* (0.017) | 0.036 (0.042) | 0.002 (0.003) |
| ***International trade variables*** | | | | | | | | | | | |
| ***Exporter*** | **0.017 (0.014)** | **0.036 (0.032)** | **0.028** (0.013)** | **0.038 (0.032)** | **0.018 (0.012)** | **0.059** (0.028)** | **0.048*** (0.011)** | **-0.007 (0.032)** | **0.022* (0.011)** | **-0.003 (0.028)** | **0.002 (0.002)** |
| *Multinational enterprise* | 0.034** (0.015) | -0.005 (0.027) | -0.004 (0.015) | 0.011 (0.026) | 0.006 (0.015) | -0.004 (0.024) | 0.018 (0.013) | 0.047* (0.026) | 0.012 (0.013) | 0.074 (0.022) | -0.002 (0.004) |
| ***Financial variables*** | | | | | | | | | | | |
| *Debt-to-equity* | 0.006 (0.023) | -0.068 (0.046) | -0.002 (0.022) | -0.023 (0.043) | -0.002 (0.022) | 0.011 (0.039) | -0.013 (0.021) | -0.029 (0.046) | 0.014 (0.022) | 0.004 (0.038) | 0.008 (0.003) |
| *Investment* | 0.007*** (0.001) | 0.011** (0.005) | 0.004** (0.018) | 0.000 (0.005) | 0.000 (0.001) | -0.000 (0.004) | 0.002* (0.001) | 0.005 (0.005) | -0.025 (0.020) | 0.005 (0.005) | -0.000 (0.000) |
| *N* | 4 847 | 892 | 4 870 | 833 | 4 870 | 833 | 4 870 | 797 | 4 870 | 797 | 4 435 |

**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: In models (10) and (11) for large firms, observations for 'information and communication' are omitted as they predict failure perfectly. Furthermore, model (12) for large firms is not included as failures and successes are predicted perfectly. 'Manufacturing and energy' (CAE-Rev. 3 B, C, D, E) is used as the reference economic activity sector. Standard errors are shown in parenthesis. Significance levels: *** p < 0.01, ** p < 0.05, and * p < 0.1.

## Table A.3. – panel (a)

*Interaction Probit model regressions – marginal effects – additional probability vs. baseline scenario*

| ***Adaptation mechanisms*** | **Teleworking (1)** | | **Investing in IT (2)** | | **Reorganisation of work teams (3)** | | **Flexible working hours (4)** | | **Diversification of production (5)** | | **Redirection of target markets (6)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms |
| ***Tax payment deferrals*** | | | | | | | | | | | | |
| *At Exporter = 0* | 0.045*** (0.016) | -0.026 (0.054) | 0.057*** (0.015) | 0.030 (0.046) | 0.090*** (0.020) | 0.108* (0.055) | 0.049*** (0.018) | 0.103* (0.055) | 0.066*** (0.018) | 0.061 (0.046) | 0.152*** (0.017) | 0.069* (0.040) |
| ***At Exporter = 1*** | **0.001 (0.021)** | **-0.048 (0.052)** | **0.091*** (0.021)** | **0.026 (0.049)** | **0.036 (0.026)** | **0.037 (0.053)** | **0.001 (0.024)** | **0.084 (0.052)** | **0.013 (0.024)** | **0.069 (0.046)** | **0.119*** (0.023)** | **0.079* (0.045)** |
| ***Short-time work schemes*** | | | | | | | | | | | | |
| *At Exporter = 0* | -0.038** (0.016) | -0.014 (0.060) | -0.003 (0.016) | -0.046 (0.051) | 0.108*** (0.023) | 0.075 (0.061) | 0.020 (0.021) | 0.044 (0.060) | -0.028 (0.021) | 0.062 (0.053) | 0.135*** (0.020) | -0.003 (0.042) |
| ***At Exporter = 1*** | **-0.044* (0.024)** | **-0.068 (0.052)** | **0.034 (0.024)** | **-0.026 (0.048)** | **0.055* (0.029)** | **-0.046 (0.053)** | **-0.018 (0.027)** | **-0.044 (0.052)** | **-0.002 (0.027)** | **0.064 (0.048)** | **0.079*** (0.026)** | **0.097** (0.044)** |
| ***Publicly guaranteed credit lines*** | | | | | | | | | | | | |
| *At Exporter = 0* | -0.026 (0.016) | -0.001 (0.064) | 0.072*** (0.017) | 0.031 (0.053) | 0.065*** (0.021) | 0.047 (0.065) | 0.014 (0.020) | 0.046 (0.064) | 0.052*** (0.019) | 0.048 (0.055) | 0.148*** (0.019) | 0.097* (0.050) |
| ***At Exporter = 1*** | **-0.017 (0.022)** | **-0.147 (0.058)** | **0.113*** (0.023)** | **-0.043 (0.054)** | **0.047* (0.026)** | **0.002 (0.059)** | **0.021 (0.025)** | **0.011 (0.059)** | **0.025 (0.024)** | **0.097* (0.052)** | **0.167*** (0.024)** | **0.103** (0.052)** |
| ***Debt moratoria*** | | | | | | | | | | | | |
| *At Exporter = 0* | 0.014 (0.018) | 0.005 (0.064) | 0.078*** (0.017) | -0.004 (0.053) | 0.072*** (0.022) | 0.056 (0.066) | 0.020 (0.021) | -0.035 (0.063) | 0.051** (0.020) | 0.051 (0.056) | 0.122*** (0.020) | 0.089* (0.051) |
| ***At Exporter = 1*** | **-0.018 (0.023)** | **-0.051 (0.058)** | **0.099*** (0.023)** | **-0.064 (0.052)** | **0.056** (0.025)** | **0.059 (0.058)** | **0.023 (0.025)** | **0.034 (0.003)** | **0.023 (0.025)** | **-0.006 (0.049)** | **0.141*** (0.025)** | **0.147*** (0.053)** |

**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: The baseline scenario does not assume recourse to government support measures. Only the interactions terms between exporters and government support measures are shown in the table. Standard errors are shown in parenthesis. Significance levels: *** p < 0.01, ** p < 0.05, and * p < 0.1.

## Table A.3. – panel (b)

*Interaction Probit model regressions – marginal effects – additional probability compared with baseline scenario*

| ***Adaptation mechanisms*** | **Change in distribution channels (7)** | | **Change in product range (8)** | | **Stock decrease (9)** | | **Stock increase (10)** | | **Change in supply chains (11)** | | **Change in activity (12)** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs | Large firms | MSMEs |
| ***Tax payment deferrals*** | | | | | | | | | | | |
| *At Exporter = 0* | 0.048*** (0.015) | 0.008 (0.039) | 0.101*** (0.015) | 0.107*** (0.040) | 0.088*** (0.015) | 0.084** (0.037) | 0.008 (0.013) | -0.026 (0.042) | 0.026** (0.013) | 0.027 (0.037) | 0.001 (0.003) |
| ***At Exporter = 1*** | **0.041* (0.022)** | **0.085* (0.043)** | **0.096*** (0.021)** | **0.102** (0.044)** | **0.088*** (0.019)** | **0.131*** (0.037)** | **0.010 (0.018)** | **-0.070** (0.035)** | **0.057*** (0.018)** | **0.106*** (0.037)** | **0.005 (0.006)** |
| ***Short-time work schemes*** | | | | | | | | | | | |
| *At Exporter = 0* | 0.001 (0.018) | -0.031 (0.044) | 0.090*** (0.018) | 0.067 (0.041) | 0.131*** (0.019) | 0.048 (0.038) | 0.014 (0.015) | -0.074* (0.041) | 0.065*** (0.016) | 0.022 (0.040) | 0.003 (0.004) |
| ***At Exporter = 1*** | **0.026 (0.024)** | **0.012 (0.044)** | **0.033 (0.023)** | **0.034 (0.043)** | **0.144*** (0.023)** | **0.165*** (0.041)** | **-0.034* (0.020)** | **-0.075** 0.038** | **0.007 (0.019)** | **0.030 (0.035)** | **0.010 (0.006)** |
| ***Publicly guaranteed credit lines*** | | | | | | | | | | | |
| *At Exporter = 0* | 0.042** (0.017) | 0.082* (0.049) | 0.111*** (0.018) | 0.080 (0.049) | 0.095*** (0.017) | 0.085* (0.047) | 0.018 (0.014) | -0.045 (0.046) | 0.042*** (0.015) | 0.007 (0.033) | -0.001 (0.003) |
| ***At Exporter = 1*** | **0.022 (0.022)** | **0.043 (0.048)** | **0.127*** (0.022)** | **0.156*** (0.053)** | **0.101*** (0.021)** | **0.045 (0.045)** | **0.051** (0.020)** | **-0.055 (0.037)** | **0.077*** (0.019)** | **0.099*** (0.038)** | **0.000 (0.006)** |
| ***Debt moratoria*** | | | | | | | | | | | |
| *At Exporter = 0* | 0.046*** (0.017) | 0.048 (0.049) | 0.102*** (0.018) | 0.096* (0.050) | 0.078*** (0.017) | 0.136*** (0.052) | 0.005 (0.014) | -0.014 (0.050) | 0.031** (0.015) | 0.054 (0.047) | -0.002 (0.002) |
| ***At Exporter = 1*** | **0.042* (0.023)** | **0.042 (0.048)** | **0.082*** (0.022)** | **0.124** (0.052)** | **0.093*** (0.021)** | **0.096** (0.047)** | **0.050** (0.020)** | **-0.027 (0.039)** | **0.055*** (0.019)** | **0.150*** (0.046)** | **0.000 (0.006)** |

**Source**: COVID-IREE and SCIE, INE; authors' calculations.

**Notes**: In models (10) and (11) for large firms, observations for 'information and communication' are omitted as they predict failure perfectly. Furthermore, model (12) for large firms is not included as failures and successes are predicted perfectly. 'Manufacturing and energy' (CAE-Rev. 3 B, C, D, E) is used as the reference economic activity sector. Standard errors are shown in parenthesis. Significance levels:

## GEE Papers

1: Evolução do Comércio Externo Português de Exportação (1995-2004)
João Ferreira do Amaral

2: Nowcasting an Economic Aggregate with Disaggregate Dynamic Factors: An Application to Portuguese GDP
Antonio Morgado | Luis Nunes | Susana Salvado

3: Are the Dynamics of Knowledge-Based Industries Any Different?
Ricardo Mamede | Daniel Mota | Manuel Godinho

4: Competitiveness and convergence in Portugal
Jorge Braga de Macedo

5: Produtividade, Competitividade e Quotas de Exportação
Jorge Santos

6: Export Diversification and Technological Improvement: Recent Trends in the Portuguese Economy
Manuel Cabral

7: Election Results and Opportunistic Policies: An Integrated Approach
Toke Aidt | Francisco Veiga | Linda Veiga

8: Behavioural Determinants of Foreign Direct Investment
Ricardo Pinheiro-Alves

9: Structural Transformation and the role of Foreign Direct Investment in Portugal: a descriptive analysis for the period 1990-2005
Miguel de Freitas | Ricardo Mamede

10: Productive experience and specialization opportunities for Portugal: an empirical assessment
Miguel de Freitas | Susana Salvado | Luis Nunes | Rui Costa Neves

11: The Portuguese Active Labour Market Policy during the period 1998-2003 - A Comprehensive Conditional Difference-In-Differences Application
Alcina Nunes | Paulino Teixeira

12: Fiscal Policy in a Monetary Union: Gains from Changing Institutions
Susana Salvado

13: Coordination and Stabilization Gains of Fiscal Policy in a Monetary Union
Susana Salvado

14: The Relevance of Productive Experience in the Process of Economic Growth: an Empirical Study
Diana Vieira

15: Employment and Exchange rates: the Role of Openness and Technology
Fernando Alexandre | Pedro Bação | João Cerejeira | Miguel Portela

16: Aggregate and sector-specific exchange rate indexes for the Portuguese economy
Fernando Alexandre | Pedro Bação | João Cerejeira | Miguel Portela

17: The Macroeconomic Determinants of Cross Border Mergers and Acquisitions and Greenfield Investments
Paula Neto | Antonio Brandao | António Cerqueira

18: Does the location of manufacturing determine service sectors' location choices? Evidence from Portugal
Nuno Crespo | Maria Paula Fontoura

19: A hipótese do Investment Development Path: Uma Abordagem por Dados em Painel. Os casos de Portugal e Espanha
Miguel Fonseca | António Mendonça | José Passos

20: Outward FDI Effects on the Portuguese Trade Balance, 1996-2007
Miguel Fonseca | António Mendonça | José Passos

21: Sectoral and regional impacts of the European Carbon Market in Portugal
Margarita Robaina Alves | Miguel Rodriguez | Catarina Roseta-Palma

22: Business Demography Dynamics in Portugal: A Non-Parametric Survival Analysis
Alcina Nunes | Elsa Sarmento

23: Business Demography Dynamics in Portugal: A Semi-parametric Survival Analysis
Alcina Nunes | Elsa Sarmento

24: Digging Out the PPP Hypothesis: an Integrated Empirical Coverage
Miguel de Carvalho | Paulo Júlio

25: Regulação de Mercados por Licenciamento
Patrícia Cerqueira | Ricardo Pinheiro Alves

26: Which Portuguese Manufacturing Firms Learn by Exporting?
Armando Silva | Óscar Afonso | Ana Paula Africano

27: Building Bridges: Heterogeneous Jurisdictions, Endogenous Spillovers, and the Benefits of Decentralization
Paulo Júlio | Susana Peralta

28: Análise comparativa de sobrevivência empresarial: o caso da região Norte de Portugal
Elsa Sarmento | Alcina Nunes

29: Business creation in Portugal: Comparison between the World Bank data and Quadros de Pessoal
Elsa Sarmento | Alcina Nunes

30: The Ease of Doing Business Index as a tool for Investment location decisions
João Zambujal Oliveira | Ricardo Pinheiro Alves

31: The Politics of Growth: Can Lobbying Raise Growth and Welfare?
Paulo Júlio

32: The choice of transport technology in the presence of exports and FDI
José Pedro Ponte | Armando Garcia Pires

33: Tax Competition in an Expanding European Union
Ronald Davies | Johannes Voget

34: The usefulness of State trade missions for the internationalization of firms: an econometric analysis
Ana Paula Africano | Aurora Teixeira | André Caiado

35: The role of subsidies for exports: Evidence from Portuguese manufacturing firms
Armando Silva

36: Criação de empresas em Portugal e Espanha: análise comparativa com base nos dados do Banco Mundial
Elsa Sarmento | Alcina Nunes

37: Economic performance and international trade engagement: the case of Portuguese manufacturing firms
Armando Silva | Oscar Afonso | Ana Paula Africano

38: The importance of Intermediaries organizations in international R&D cooperation: an empirical multivariate study across Europe
Aurora Teixeira | Margarida Catarino

39: Financial constraints, exports and monetary integration - Financial constraints and exports: An analysis of Portuguese firms during the European monetary integration
Filipe Silva | Carlos Carreira

40: FDI and institutional reform in Portugal
Paulo Júlio | Ricardo Pinheiro-Alves | José Tavares

41: Evaluating the forecast quality of GDP components
Paulo Júlio | Pedro Esperança | João C. Fonseca

42: Assessing the Endogeneity of OCA conditions in EMU
Carlos Vieira | Isabel Vieira

43: Labor Adjustment Dynamics: An Application of System GMM
Pedro Esperança

44: Corporate taxes and the location of FDI in Europe using firm-level data
Tomás Silva | Sergio Lagoa

45: Public Debt Stabilization: Redistributive Delays versus Preemptive Anticipations
Paulo Júlio

46: Organizational Characteristics and Performance of Export Promotion Agencies: Portugal and Ireland compared
Inês Ferreira | Aurora Teixeira

47: Evaluating the forecast quality of GDP components: An application to G7
Paulo Júlio | Pedro Esperança

48: The influence of Doing Business' institutional variables in Foreign Direct Investment
Andreia Olival

49: Regional and Sectoral Foreign Direct Investment in Portugal since Joining the EU: A Dynamic Portrait
Irina Melo | Alexandra Lopes

50: Institutions and Firm Formation: an Empirical Analysis of Portuguese Municipalities
Simão Arouca

51: Youth Unemployment in Southern Europe
João Leão | Guida Nogueira

52: Financiamento da Economia Portuguesa: um Obstáculo ao Crescimento?
João Leão | Ana Martins | João Gonçalves

53: O Acordo de Parceria Transatlântica entre a UE e os EUA constitui uma ameaça ou uma oportunidade para a Economia Portuguesa?
João Leão | Guida Nogueira

54: Prescription Patterns of Pharmaceuticals
Ana Gonçalves

55: Economic Growth and the High Skilled: the Role of Scale Eects and of Barriers to Entry into the High Tech
Pedro Gil | Oscar Afonso | Paulo Brito

56: Finanças Públicas Portuguesas Sustentáveis no Estado Novo (1933-1974)?
Ricardo Ferraz

57: What Determines Firm-level Export Capacity? Evidence from Portuguese firms
Ana Gouveia | Ana Luisa Correia

58: The effect of developing countries' competition on regional labour markets in Portugal
Tiago Pereira

59: Fiscal Multipliers in the 21st century
Pedro Brinca | Hans Holter | Per Krusell | Laurence Malafry

60: Reallocation of Resources between Tradable and Non-Tradable Sectors in Portugal: Developing a new Identification Strategy for the Tradable Sector
Ana Fontoura Gouveia | Filipa Canas

61: Is the ECB unconventional monetary policy effective?
Inês Pereira

62: The Determinants of TFP Growth in the Portuguese Manufacturing Sector
Daniel Gonçalves | Ana Martins

63: Practical contribution for the assessment and monitoring of product market competition in the Portuguese Economy – estimation of price cost margins
Luis Folque

64: The impact of structural reforms of the judicial system: a survey
Ana Gouveia | Silvia Santos | Corinna Herber

65: The short-term impact of structural reforms on productivity growth: beyond direct effects
Ana Gouveia | Silvia Santos | Inês Gonçalves

66: Assessing the Competitiveness of the Portuguese Footwear Sector
Fábio Batista | José Matos | Miguel Matos

67: The empirics of agglomeration economies: the link with productivity
Ana Gouveia | Silvia Santos | Marli Fernandes

68: Determinants of the Portuguese GDP stagnation during the 2001-2014 period: an empirical investigation
Carlos Figueira

69: Short-run effects of product markets' deregulation: a more productive, more efficient and more resilient economy?
Ana Gouveia | Silvia Santos | Gustavo Monteiro

70: Portugal: a Paradox in Productivity
Ricardo Pinheiro Alves

71: Infrastructure Investment, Labor Productivity, and International Competitiveness: The Case of Portugal
Alfredo Pereira | Rui Pereira

72: Boom, Slump, Sudden stops, Recovery, and Policy Options. Portugal and the Euro
Olivier Blanchard | Pedro Portugal

73: Case Study: DBRS Sovereign Rating of Portugal. Analysis of Rating Methodology and Rating Decisions
Annika Luisa Hofmann | Miguel Ferreira | João Lampreia

74: For Whom the Bell Tolls: Road Safety Effects of Tolls on Uncongested SCUT Highways in Portugal
Alfredo Pereira | Rui Pereira | João Pereira dos Santos

75: Is All Infrastructure Investment Created Equal? The Case of Portugal
Alfredo Pereira | Rui Pereira

76: Why Virtuous Supply-Side Effects and Irrelevant Keynesian Effects are not Foregone Conclusions: What we Learn from an Industry-Level Analysis of Infrastructure Investments in Portugal
Alfredo Pereira | Rui Pereira

77: The Role of Gravity Models in Estimating the Economic Impact of Brexit
Graham Gudgin | Ken Coutts | Neil Gibson | Jordan Buchanan

78: Infrastructure Investment in Portugal and the Traded/Non-Traded Industry Mix
Alfredo Pereira | Rui Pereira

79: Goods and Factor Market Integration: A Quantitative Assessment of the EU Enlargement
Lorenzo Caliendo | Fernando Parro | Luca David Opromolla | Alessandro Sforza

80: Understanding productivity dynamics:a task taxonomy approach
Tiago Fonseca | Francisco Lima | Sonia C. Pereira

81: On the Effects of Infrastructure Investments on Industrial CO2 Emissions in Portugal
Alfredo Pereira | Rui Pereira

82: Assessing Competition With the Panzar-Rosse Model: An empirical analysis of European Union banking industry
Suzana Cristina Silva Andrade

83: Health Care Investments and Economic Performance in Portugal: An Industry Level Analysis
Alfredo Pereira | Rui Pereira | Pedro G. Rodrigues

84: Is deregulation of product and labour markets promoting employment and productivity? A difference-in-differences approach
Hugo Correia | Ana Fontoura Gouveia

85: Foreign acquisition and internal organization
Paulo Bastos | Natália P. Monteiro | Odd Rune Straume

86: Learning, Prices, and Firm Dynamics
Paulo Bastos | Daniel A. Dias | Olga A. Timoshenko

87: The Diffusion of Knowledge via Managers' Mobility
Giordano Mion | Luca David Opromolla | Alessandro Sforza

88: Empresas Zombie em Portugal - Os sectores não transacionáveis da Construção e dos Serviços
Gabriel Osório de Barros | Filipe Bento Caires | Dora Xarepe Pereira

89: Collective bargaining through the magnifying glass: A comparison between the Netherlands and Portugal

Alexander Hijzen | Pedro Martins | Jante Parlevliet

90: A Lower VAT Rate on Electricity in Portugal: Towards a Cleaner Environment, Better Economic Performance, and Less Inequality
Alfredo Pereira | Rui Manuel Pereira

91: Who Seeks Re-Election: Local Fiscal Restraints and Political Selection
Susana Peralta | João Pereira dos Santos

92: Assessing the Competitiveness of the Metalworking Sector
João Marinho | Pedro Carvalho

93: The efficiency of Portuguese Technology Transfer Offices and the importance of university characteristics
Aurora Teixeira | André Monteiro

94: Persistence in innovation and innovative behavior in unstable environments
Joana Costa | Anabela Botelho | Aurora Teixeira

95: The effect of entrepreneurial origin on firms' performance - The case of Portuguese academic spinoffs
Natália Barbosa | Ana Paula Faria

96: Absorptive Capacity and Firms' Generation of Innovation - Revisiting Zahra and George's Model
Dina Pereira | João Leitão

97: Innovations in digital government as business facilitators: implications for Portugal
João Martins | Linda Veiga

98: Innovation and the economic downturn: Insights from Portuguese firms
Hugo Pinto | Tiago Santos Pereira | Elvira Uyarra

99: European Funds and Firm Dynamics: Estimating Spillovers from Increased Access
João Pereira dos Santos | José Tavares

100: Corporate Leverage and Investment in Portugal
Ana Martins | José Henrique Gonçalves | João Mário Ferreira Duque

101: The effects of official and unofficial information on tax compliance
Filomena Garcia | Luca David Opromolla | Andrea Vezzulli | Rafael Marques

102: Competition effect on innovation and productivity - The Portuguese case
Anabela Santos | Michele Cincera | Paulo Neto | Maria Manuel Serrano

103: Measuring the Welfare of Intermediation in Vertical Markets
Javier D. Donna | Pedro Pereira | Tiago Pires | Andre Trindade

104: Of course Collusion Should be Prosecuted. But Maybe... Or (The case for international antitrust agreements)
Filomena Garcia | Jose Manuel Paz y Miñõ | Gustavo Torrens

105: Product market competition and gender discrimination
Dudley Cooke | Ana P. Fernandes | Priscila Ferreira

106: Integration of Small Technology-Based Firms in Aeronautics
Anabela Reis | Joana Mendonça | Ligia Urbina

107: The Effects of Highway Tolls on Private Business Activity – Results from a Natural Experiment
João Pereira dos Santos | David B. Audretsch | Dirk Dohse

108: Competition and Firm Productivity: Evidence from Portugal
Pedro Carvalho

109: Do Exchange Traded Funds (ETFs) Outperform the Market? Evidence from the Portuguese Stock Index
Carlos Manuel Pinheiro | Hugo Hilário Varela

110: Assessing the Competitiveness of the Portuguese Chemical Sector
Ana Rita Marques | Cátia Silva

111: A General Equilibrium Theory of Occupational Choice under Optimistic Beliefs about Entrepreneurial Ability
Michele Dell'Era | Luca David Opromolla | Luis Santos-Pinto

112: O Mercado Segurador em Portugal: O Papel dos Gestores na Constituição de Provisões
Soraia de Sousa Bornett | Carlos Manuel Pinheiro

113: Exploring the implications of di erent loan-to-value macroprudential policy designs
Rita Basto | Sandra Gomes | Diana Lima

114: The Determinants of TFP Growth in the Portuguese Service Sector
Ana Martins | Tiago Domingues | Catarina Branco

115: Agglomeration and Industry Spillover Effects in the Aftermath of a Credit Shock
José Jorge | Joana Rocha

116: Entrepreneurial Human Capital and Firm Dynamics
Francisco Queiró

117: Global Value Chains and Vertical Specialization: The case of Portuguese Textiles and Shoes exports
Tiago Domingues

118: Firm heterogeneity and exports in Portugal: Identifying export potential
Frederico Oliveira Torres

119: Vantagens Comparativas Reveladas e suas determinantes: Uma Aplicação à Economia Portuguesa
Guida Nogueira | António Portugal Duarte

120: A Look at the main channels of Potential Impact of Brexit on the Portuguese Economy
Guida Nogueira | Paulo Inácio

121: How internationalization and competitiveness contribute to get public support to innovation? The Portuguese case
Anabela Santos, Michele Cincera, Paulo Neto | Maria Manuel Serrano

122: Grande Guerra e Guerra Colonial: Quanto Custaram aos Cofres Portugueses?
Ricardo Ferraz

123: Financing a Renewable Energy Feed-in Tariff with a Tax on Carbon Dioxide Emissions: A Dynamic Multi-Sector General Equilibrium Analysis for Portugal
Rui M. Pereira | Alfredo M. Pereira

124: Brown Sugar, how come you taste so good? The impact of a soda tax on prices and consumption
Judite Gonçalves | João Pereira dos Santos

125: ARFIMA Reference Forecasts for Worldwide CO2 Emissions and the National Dimension of the Policy Efforts to Meet IPCC Targets
José Beirute | Alfredo M. Pereira

126: Reference Forecasts for CO2 Emissions from Fossil-Fuel Combustion and Cement Production in Portugal
José M. Belbute | Alfredo M. Pereira

127: Regulated Early Closures of Coal-Fired Power Plants and Tougher Energy Taxation on Electricity Production: Synergy or Rivalry?
Alfredo Marvão Pereira | Rui Manuel Pereira

128: Picking Our Environmental Battles: Removal of Harmful Subsidies or Carbon Taxation?
Alfredo Marvão Pereira | Rui Marvão Pereira

129: Financing Future Feed-in Tariffs from Currently Installed RES-E Generating Capacity
Alfredo Marvão Pereira | Rui Marvão Pereira

130: Foreign Direct Investment, Income Inequality and Poverty in Portugal, 1973-2014: What does cointegration analysis tell us?
Aurora Teixeira | Ana Sofia Loureiro

131: On the Spillover Effects of CO2 Taxation on the Emissions of other Air Pollutants
Alfredo Marvão Pereira | Rui Marvão Pereira

132: On the Macroeconomic and Distributional Effects of the Regulated Closure of Coal-Operated Power Plants
Alfredo Marvão Pereira | Rui Manuel Pereira

133: The China Shock and Employment in Portuguese Firms
Lee Branstetter | Brian Kovak | Jacqueline Mauro | Ana Venâncio

134: Energy Taxation Reform with an Environmental Focus
Alfredo Marvão Pereira | Rui Manuel Pereira

135: ARFIMA Reference Forecasts for Worldwide CO2 Emissions and the Need for Large and Frontloaded Decarbonization Policies
José M. Belbute | Alfredo M. Pereira

136: Exporter Firms Behaviour, Evidence From Portuguese Firms Using Microdata
Luís Pedro Manso Machado

137: Collateral Value and Entrepreneurship: Evidence from a Property Tax Reform
Miguel Ferreira | João Pereira dos Santos | Ana Venâncio

138: The Financial Channels of Labor Rigidities: Evidence from Portugal
Edoardo M. Acabbi | Ettore Panetti | Alessandro Sforza

139: Can a small leak sink a great ship? A comprehensive analysis of the Portuguese household savings
Tiago Domingues | Margarida Castro Rego

140: Corporate taxes and high-quality entrepreneurship: evidence from a tax reform
Ana Venâncio | Victor Barros | Clara Raposo

141: Built Like a House of Cards? - Corporate Indebtedness and Productivity Growth in the Portuguese Construction Sector1
José Santos | Nuno Tavares | Gabriel Osório de Barros

142: Effectiveness of Simplex: The Case of Portuguese Social Security
António Alberto Nifrário de Pinho Tavares

143: Digital innovation in higher education: A questionnaire to Portuguese universities and polytechnic institutes
Paulo Nuno Vicente |Margarida Lucas | Vânia Carlos

144: Portugal in the Global Innovation Index: A panel data analysis
Marcelo P. Duarte | Fernando M. P. O. Carvalho

145: Intangible investments and productivity performance
Michele Cincera | Julie Delanote | Pierre Mohnen | Anabela Santos | Christoph Weiss

146: Digitalization in Two-sided Platform Competition
Filomena Garcia | Muxin Li

147: Collusion between two-sided platforms
Joana Pinho | Yassine Lefouili

148: Da confluência entre Big Data e Direito da Concorrência: As concentrações digitais - O caso Facebook/WhatsApp
Ana Rodrigues Bidarra

149: The Determinants of Total Factor Productivity in the Portuguese Quaternary Sector
Paulo Matos | Pedro Neves

150: Os modelos Input-Output, a estrutura setorial das economias e o impacto da crise da COVID 19
Pedro N. Ramos | João Ferreira | Luís Cruz | Eduardo Barata

151: Public Expenditure and private firm performance: using religious denominations for causal inference
Henrique Alpalhão | Marta Lopes | João Santos| José Tavares

152: Employee Training and Firm Performance: Quasi-experimental evidence from the European Social Fund
Pedro S. Martins

153: Dream Jobs
Luca David Opromolla | Giordano Mion | Gianmarco I.P. Ottaviano

154: Minimum wage and financially distressed firms: another one bites the dust
F. Alexandre | P. Bação | J. Cerejeira | H. Costa | M. Portela

155: Do short-term rentals increase housing prices? Quasi-experimental evidence from Lisbon
Susana Peralta | João Pereira dos Santos | Duarte Gonçalves

156: Economic and social policies under EMU
Ricardo Pinheiro Alves

157: International Sourcing in Portuguese Companies - Evidence from Portuguese Micro Data
Ana Martins | Guida Nogueira | Eva Pereira

158: The Impact of R&D tax incentives in Portugal
Rita Bessone Basto | Ana Martins | Guida Nogueira

159: The Determinants of Competitiveness of the Portuguese Defense Industry
Roxanne Merenda

160: How is the Minimum Wage Shaping the Wage Distribution: Bite, Spillovers, and Wage Inequality
Carlos Oliveira

161: Macroeconomy Impacts of the Covid-19 Pandemic in Some European Union Countries: a Counterfactual Analysis
António Portugal Duarte | Fátima Sol Murta

162: Digital adoption and productivity: understanding micro drivers of the aggregate effect
Natália Barbosa | Ana Paula Faria

163: Job Creation and Destruction in the Digital Age: What about Portugal?
Anabela M. Santos | Javier Barbero Jimenez | Simone Salotti | Andrea Conte

164: Is digital government facilitating entrepreneurship? A comparative statics analysis.
Joana Costa | Luís Carvalho

165: Automation trends in Portugal: implications in productivity and employment
Marta Candeias | Nuno Boavida | António Brandão Moniz

166: Digital Technologies for Urban Greening Public Policies
Maria José Sousa

167: The impact of a rise in transportation costs on firm performance and behaviour
Catarina Branco | Dirk C. Dohse | João Pereira dos Santos | José Tavares

168: Outward FDI, restructuring, performance upgrading and resilience: Firm-level evidence from Portugal
Natália Barbosa

169: Firm adaptation in COVID-19 times: The case of Portuguese exporting firms
João Capella-Ramos | Romina Guri

REPÚBLICA PORTUGUESA
ECONOMIA E MAR

Gabinete de Estratégia e Estudos