

COVID Resilience by Firms

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Summary:

This paper describes measures of Covid resilience by firms and how they are matched to other firm-level data. The resilience measures are based on scraping the websites of approximately 130,000 UK firms monthly since May 2020. Textual analysis is used to divide firms into four groups: innovators, informers, stickers and online firms. We used two different approaches for the automatic classification of firms in each monthly period. The first approach is a conventional content analysis model based on predetermined covid-related keywords. The second approach uses a top-notch natural language processing model based on deep neural networks. The paper presents descriptive evidence of firms' innovative reaction on covid related challenges as well as an econometric framework that outlines the connection between firms' pre-covid digital readiness and its ability to better survive the disruption, after controlling for financial viability. The work also contains some useful methodological guidance on fuzzy merging with other firm data sources, FAME and BGT vacancy data, approaches for automated content analysis and bias controlling techniques.

Abstract:

Government restrictions during the covid-19 pandemic led to heterogeneous reactions from the private sector. One cohort of companies reacted by taking some extraordinary and fundamental steps to sustain their revenue flows - introduce new business models, establish online delivery options, roll out new products or services (Bai et al., 2020 and Dingel and Neiman, 2020). On the other hand, 'stickers' applied to furlough schemes and did not invest in their development (Baker et al., 2016). A lot of companies went on pause, introduced salary cuts, sent their employees on furlough or went out of business. Impacts were likely to depend on the firms' performance before the crisis, most importantly their financial position, but also their digital readiness.

This research aims to study behaviour, innovation and survival rate among UK enterprises during the COVID-19 crisis. This is hampered by the lack of timely data on firm performance since the

pandemic started. To address this we use innovative online sources of data to obtain more granular and faster indicators for private sector companies. Using web scraping and natural language processing tools, we create a companies resilience indicator dividing firms into innovators (firms that actively react to COVID-19 crisis), informers (firms that choose to wait until things get back to normal but keep their customers informed), stickers (firms who just stick to government guidelines, whether it means continuing or suspending their businesses), online (firms who transferred substantial part of their business to online) and inactive (a residual group of firms who do not react).

We use the word resilience to refer to the way in which companies coped, adapted and overcame covid induced challenges. The study approaches the question of whether the resilience of the company depends on its innovation and hiring patterns. BetheBusiness (2020) suggests that the COVID pandemic had a heterogeneous effect on UK firms, driving technology adoption and innovation for some firms and delaying decision making for others. Our paper aims to answer how much this diversity might be due not only to the different financial situation of firms but also due to their different pre-crisis technological readiness.

The business impact of the COVID survey (ONS, BICS) clearly showed that knowledge and IT-intensive industries survived the first COVID wave better. We hypothesize that it happened due to the better agility and faster ability to respond to changes, better IT skills that enabled companies to quickly switch to remote working procedures. (Nures and Lopes, 2013) suggest that firms with established innovation processes and high economic dynamics can better survive crises. Jin and McElheran (2018) also evidence that usage of modern ICT technologies increases the survival of firms. Consequently, we think that companies with better technical capabilities and technologically skilled human capital are better able to adapt and survive during and after the COVID-19 crisis.

We emphasize that our study is based on purely online-generated datasets. In order to pursue our study questions, we use four sources of information. The first is an indicator of cloud technologies used as a proxy to a firm's technological readiness. Using web scraping and meta-information domain name server registries (DNS), we obtain monthly data from 2014 and ongoing. The second source is job vacancy data collected in real-time by Burning Glass Technologies (BGT) for the UK labour market to study the occupational and skill patterns in hiring before and during the COVID-19 crisis, focusing in particular on digital skills. Our third data source, resilience measure is based on scraping the websites of approximately 130,000 UK firms monthly since May 2020. Similarly to Kinne et. Al (2020), Yang and Han (2020), we utilize Automated Content Analysis techniques to build the resilience indicator using deep learning models for natural language processing, such as BERT and Jurassic-1. We also obtain background information about businesses and their financial performance using Financial Analysis Made Easy (FAME) dataset, getting yearly data from 2014.

This paper begins with a short review of the literature. It then explains the methodology used to construct our resilience indicator and its merging with company accounts, including some descriptive statistics. We then set out the framework we will use to examine the relationship between digital readiness and resilience. In conclusion, we emphasize that governments should not only focus on saving the labour force but also subsidize investments for the digital transformation.

