ESRI
SURVEY AND
STATISTICAL
REPORT SERIES
NUMBER 113
July 2022

RECENT TRENDS IN SME INVESTMENT IN IRELAND:EXPLORING THE PANDEMIC AND THE BARRIERS TO GROWTH

LEONA CANTILLON, ERIC GARGAN, JANEZ KREN, MARTINA LAWLESS AND CONOR O'TOOLE

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

RECENT TRENDS IN SME INVESTMENT IN IRELAND:
EXPLORING THE PANDEMIC AND THE BARRIERS TO GROWTH

Leona Cantillon
Eric Gargan
Janez Kren
Martina Lawless
Conor O'Toole

July 2022

ESRI SURVEY AND STATISTICAL REPORT SERIES

NUMBER 113

Available to download from www.esri.ie

doi: https://doi.org/10.26504/sustat113

ABOUT THE ESRI

The mission of the Economic and Social Research Institute is to advance evidence-based policymaking that supports economic sustainability and social progress in Ireland. ESRI researchers apply the highest standards of academic excellence to challenges facing policymakers, focusing on 12 areas of critical importance to 21st century Ireland.

The Institute was founded in 1960 by a group of senior civil servants led by Dr T. K. Whitaker, who identified the need for independent and in-depth research analysis to provide a robust evidence base for policymaking in Ireland.

Since then, the Institute has remained committed to independent research and its work is free of any expressed ideology or political position. The Institute publishes all research reaching the appropriate academic standard, irrespective of its findings or who funds the research.

The quality of its research output is guaranteed by a rigorous peer review process. ESRI researchers are experts in their fields and are committed to producing work that meets the highest academic standards and practices.

The work of the Institute is disseminated widely in books, journal articles and reports. ESRI publications are available to download, free of charge, from its website. Additionally, ESRI staff communicate research findings at regular conferences and seminars.

The ESRI is a company limited by guarantee, answerable to its members and governed by a Council, comprising 14 members who represent a cross-section of ESRI members from academia, civil services, state agencies, businesses and civil society. The Institute receives an annual grant-in-aid from the Department of Public Expenditure and Reform to support the scientific and public interest elements of the Institute's activities; the grant accounted for an average of 30 per cent of the Institute's income over the lifetime of the last Research Strategy. The remaining funding comes from research programmes supported by government departments and agencies, public bodies and competitive research programmes.

Further information is available at www.esri.ie

THE AUTHORS

Leona Cantillon is an Administrative Officer in the Banking Policy Division, and Eric Gargan is an Assistant Principal in the Banking Policy Division, Department of Finance. Janez Kren is a Postdoctoral Research Fellow, Martina Lawless is a Research Professor, and Conor O'Toole is an Associate Research Professor at the Economic and Social Research Institute (ESRI).

ACKNOWLEDGEMENTS

The research carried out in this report was funded by the Department of Finance under the joint research programme on Macroeconomics, Taxation and Banking. We would like to thank everyone involved in the programme for helpful comments. We are grateful to officials in the Department of Finance for access to the underlying microdata and to our survey partners B&A for their work on the firm surveys.

TABLE OF CONTENTS

EXECUTIVE SUMMARY . . . . . **V**

1 INTRODUCTION **1**

2 BACKGROUND AND CONTEXT **2**
2.1 Characteristics of SMEs and investment types 2
2.2 Performance of SMEs in Ireland 3

3 TRENDS IN SME INVESTMENTS **9**
3.1 Investment trends by type of asset 9
3.2 Exploring investment trends across firms and regions 15
3.3 Investment in digitalisation and digital transformation 24
3.4 Investment in human capital 27

4 INVESTMENT BARRIERS AND FINANCING CONSIDERATIONS **28**
4.1 Capital adequacy, risk and uncertainty 29
4.2 Investment financing and access to finance 34
4.2.1 Firms' subjective view on credit environment 34
4.2.2 Observational data on financing structure 37

5 MULTIVARIATE ANALYSIS OF INVESTMENT ACTIVITY **40**
5.1 Methods 40
5.2 Results 41

6 CONCLUSION **43**

REFERENCES **44**

APPENDIX I ADDITIONAL INVESTMENT TRENDS BY FIRM TYPE **47**

APPENDIX II DATA SUMMARY **51**
II.1 Composition of the sample 51
II.2 Data cleaning 52
II.3 Types of investments 52

LIST OF TABLES

3.1 Digital investments . . . 25
3.2 Investments in staff . . . 27
4.1 Share of financing by source (per cent) . . . 39
5.1 Variable definitions and expected regression coefficients . . . 41
5.2 Investment regression results . . . 42
II.1 Sample composition by sector, size, and age category . . . 51
II.2 Summary of regression variables . . . 53

LIST OF FIGURES

2.1 Overview of SME economic performance . . . 5
2.2 SME investment trends: Ireland and the EU . . . 6
2.3 Overview of SME credit trends . . . 8
3.1 Overview of SME investment activity . . . 11
3.2 Share of investment by asset type . . . 12
3.3 Investment by asset type (level €) . . . 13
3.4 Distribution of investment by asset type, proportion of firms by level (€) . . . 14
3.5 Investment by firm type, percentage and level (median €) of investors only . . . 17
3.6 Investment by sector, percentage and level (median €) of investors only . . . 20
3.7 Fixed asset investment by region, percentage and change from 2019 to 2020 . . . 22
3.8 Intangible investment by region, percentage and change from 2019 to 2020 . . . 23
3.9 Digital investment by region, percentage and change from 2019 to 2020 . . . 26
4.1 Current capacity adequacy . . . 29
4.2 Capacity adequacy by firm group . . . 30
4.3 Current risk appetite . . . 30
4.4 Risk appetite by firm group . . . 31
4.5 Appetite for risk 2018-2021 . . . 32
4.6 Uncertainty . . . 33
4.7 Uncertainty by firm group . . . 33
4.8 Access to finance and willingness to borrow . . . 35
4.9 Access to finance . . . 36
4.10 Borrowing appetite by firm type . . . 36
4.11 Appetite for borrowing 2018-2021 . . . 37
I.1 Investment by firm age and asset class (percentage and level) . . . 47
I.2 Investment by firm size and asset class (percentage and level) . . . 48
I.3 Investment by firm export and asset class (percentage and level) . . . 49
I.4 Investment by sector and asset class (percentage and level) . . . 50

EXECUTIVE SUMMARY

Introduction

The substantial negative impact of the COVID-19 and associated economic restrictions on turnover and employment in the overall economy, and in the small and medium enterprise (SME) sector in particular, have been well documented since the onset of the pandemic in March 2020. This report looks in depth at how SME investment activity has fared throughout 2020. The immediate pressure of adjusting to the dramatic change in economic circumstances arising from the pandemic might have reduced incentives and resources available for investment for many SMEs across a range of asset types. At the same time, however, adapting to the new ways of providing goods and services in time of health restrictions may have resulted in increased need for some types of investment.

This report provides a detailed examination of the information available on SME investment across a range of asset categories, how this investment is financed and the investment challenges faced by SMEs in the current environment. Although SMEs make up the bulk of firms and employment in Ireland, aggregate statistics on investment activity tends to be dominated by larger firms. This report addresses the resulting data gap in order to provide a statistical review of the key trends in the data using firm-level data collected as a specific module on the Department of Finance Credit Demand Survey.

The report presents survey data for the year 2020, with time series comparisons back to 2016 for context and comparison. The main findings in each of the analytical chapters are provided below. To review trends in investment, we draw on a number of metrics. First, we look at how many Irish companies invest by presenting the percentage of firms investing. Second, we gauge the magnitude of investment by looking at a) the typical value of investment and b) looking at how large investments are relative to the firms' existing assets. All of these indicators are presented across different types of assets namely; fixed assets including buildings, transport equipment, machinery, intangible assets and staff investment.

Main Findings

- **Trends in investment across firms**
    - The key finding of the analysis is that the number of firms and the level of investment both dropped in 2020 relative to 2019, indicating the COVID-19 pandemic is having a marked effect on investment for smaller firms. The drop in the level of investment was greater than the fall in the number of firms investing which suggests capital plans have been scaled back rather than cancelled altogether. A sharp fall between 2018 and 2019 is also evident in the data and may be linked to the Brexit difficulties occurring during this period.

- The proportion of investing SMEs was relatively constant between 2017 and 2019 at approximately 64 per cent or just under two-in-every three firms. The impact of the COVID-19 pandemic can be clearly seen in the data as the share of investing enterprises dropped by 9 percentage points to 55 per cent.
- Larger SMEs cut their level of investment by more than smaller SMEs.
- While the share of investing firms dropped across all asset classes, the steepest drops were in machinery, equipment and other fixed assets. There is a smaller reduction in the share of firms investing in larger fixed capital assets (such as buildings). This is likely due to this type of investment being part of longer-term, multi-annual plans, which firms may be unlikely to pull out of, even if short-term uncertainty rises.
- The mean investment in 2020 was just over €93,000, down from €106,000 in 2019 (a 12 per cent reduction). However, it is not clear that this can be entirely attributed to a COVID-19 effect as there was also a substantial drop between 2018 and 2019, when mean investment fell by 32 per cent from €156,000. The median investment fell from €30,000 to €23,000 between 2019 and 2020; this represents a 23 per cent drop.
- Considerable heterogeneity is also evident across groups of firms with the proportion of younger firms investing dropping by 25 per cent, more than for older firms. Part of this reflected a notable contraction in building and vehicle investors amongst young firms.
- Bucking the trend for younger firms was their continued investment in intangibles which is important in terms of innovation and productivity. Research has shown these firms are important as engines of employment growth.
- The level of investment declined sharply in sectors hit particularly hard by the public health restrictions such as hotels and restaurants, wholesale and retail and construction. While many firms continued to invest in these sectors, the typical value of each investment was markedly down in 2020 on 2019 levels.
- The share of enterprises investing was lowest in Dublin at 45 per cent and highest in the Mid-West (65 per cent). Dublin also posted one of the larger declines in the share of enterprises investing between 2019 and 2020. However, when it comes to intangible assets, Dublin and the Mid-East have considerably higher investment rates.
- Overall, the share of SMEs investing in digital activities declined by 5 percentage points. However, the mean expenditure was up 22 per cent and the median expenditure was up 7 per cent.
- The proportion of firms investing in human capital (or staff) dropped during the pandemic; in particular, larger SMEs cut the level of spending by one-fifth in 2020.

- **Risk, capacity and uncertainty**

  - Nearly eight-in-ten enterprises are happy with their existing capacity, which may point to a low level of investment appetite. The share is notably lower for young firms (67 per cent) who are often the drivers of job creation and may have a considerable demand for expansion.
  - Two factors impacting firms' investment choices are risk and uncertainty. Fewer than one-in-every two firms indicated they would be willing to expand if it meant more risk, with micro firms the least willing to do so.
  - In addition, 57 per cent of firms indicated that uncertainty was a major barrier to business investment. Traditional manufacturing, construction and professional, technical and scientific sectors had the highest share of firms indicating uncertainty was a considerable factor in determining their activities.

- **Investment financing and access to credit**

  - Irish firms continued to display a preference for self-financing of investment and this trend has continued for many years. In terms of external financing sources, bank loans are the most prevalent financing type. External equity and other types are used by fewer than 3 per cent of firms.
  - Close to one-third of firms agreed or strongly agreed that access to finance was a barrier to investment. This is higher amongst young firms. In contrast, 47 per cent of enterprises disagreed that access to finance was a problem.
  - In terms of the willingness to borrow to expand, 37 per cent of enterprises would be willing to borrow to expand while 48 per cent or nearly one-in-every two firms would not be willing to borrow to expand.
  - A very clear drop in the borrowing appetite has occurred since the pre-pandemic period with the share of firms willing to borrow to expand falling from 45 per cent in 2019 to 38 per cent in 2021. The share of firms who indicate they would not borrow to expand has increased by an even larger margin, from 39 per cent in 2019 to 48 per cent in 2021. This clearly highlights the drop in credit demand for investment purposes that has occurred since the onset of the COVID-19 crisis and also correlates with the drop in investment documented in previous sections.

- **Regression analysis**

  - Regression analysis suggests that investment in machinery and equipment and human capital (staff training etc.) fell by more than would be expected in 2020, even given the severity of the economic shock, suggesting uncertainty is playing a very important role at present.
  - Indebtedness appears to be holding back investment in buildings and intangibles while internal funds are linked to investment in staff and intangibles, highlighting the importance of internal funds for capital outlays for these assets.

1 INTRODUCTION

To have adequate scope to grow and develop, firms need to continually invest in fixed and other assets to boost output and enhance productivity. Indeed, fixed and intangible capital investment is a critical determinant of long-term productivity growth leading to long-term economic growth and job creation.[1] As the Irish economy recovered rapidly from the financial crisis, a clear feature of the SME market was a slow recovery in capital investment and an apparent low appetite for external borrowing. This is evident from previous research which has indicated sustained increases in firm turnover and profitability but a continued low share of external finance usage with internal funding of investment dominating (Gargan et al., 2018; Lawless et al., 2020b). This context in the period just prior to the onset of the pandemic led to questions being raised around whether demand-side factors (such as uncertainty or risk appetite) were outweighing supply-side investment determinants (such as the cost of, and access to, financing). The COVID-19 pandemic had a major impact on SMEs (see O'Toole et al., 2021) and thus their capital formation choices are likely to be intertwined with this shock.

In the aftermath of the COVID-19 pandemic as the economy begins to recover, business investment and innovation are likely to be even more important. While aggregate Irish investment flows are dominated by multinational firms, little is documented nationally on the trends in small, domestic firm investment activity. Therefore, despite the critical importance of understanding trends in capital investment, few data sources specifically collect information on the SME investment patterns.

To address these data gaps at firm level, the Department of Finance in conjunction with the ESRI introduced a module on "Investment activity and company assets" into the SME Credit Demand Survey (CDS) in 2017, which has been repeated annually since then. The CDS has been a key tool used by the Department of Finance to monitor the demand for, and supply of, credit for SMEs. This module contains a series of questions specifically asking about firms' investment and assets. In addition, the module also contains questions regarding investment financing sources, barriers and firms' attitudes. Moreover, firms are asked to provide a numeric figure of the value of their total assets, as well as declaring the percentages of assets that were in fixed or liquid form. These data therefore fill in the information gaps outlined above.[2] These data allow an empirical picture to be built up across Irish firms addressing the following questions:

- Which type of assets are SMEs investing in and what is the rate of investment relative to the level of existing total assets?

[1] Throughout the text, we use the terms "fixed asset" and "fixed tangible asset" interchangeably and specify whenever we are considering intangible assets. The asset types included in the report are described in Appendix II.3.

[2] For details regarding the composition of the sample and the data imputation and cleaning process, please see Appendix II.

- Do firms consider their investment activity to be optimal and, if not, what are the barriers to investment?
- How are firms financing this investment?

Results from previous waves of this survey were presented in Gargan et al. (2018) and Lawless et al. (2020b). The aim of this report is to provide a statistical update on the indicators presented in this article and to review trends in investment across SMEs over time. In particular, given the extraordinary economic disruption caused by the pandemic to many domestic SMEs (see O'Toole et al., 2021), it is critically important to assess the impact on capital formation as this directly impacts their long-term productivity growth. Our main objective is to provide up-to-date profiling of investment that can be used to monitor the sector and to feed into the development of SME support policies. In addition, new and more detailed information regarding firms' risk attitudes, investment uncertainty or investment funding sources is also included in this report.

The structure of the report is as follows: Section 2 presents the trends in SME investment over time and across firms. Section 3 considers developments in investment barriers, financing and explores investment adequacy. Section 4 explores the determinants of investment in a multivariate setting while Section 5 concludes.

2 BACKGROUND AND CONTEXT

2.1 Characteristics of SMEs and investment types

The performance of the SME sector is of considerable interest to policymakers both in Ireland and internationally. The economic contribution of SMEs is substantial in most countries: for example, CSO (2020) reports that 99.8 per cent of all active enterprises in Ireland are classified as SMEs and that these firms account for 67.8 per cent of employment and 46 per cent of turnover (based on 2018 data). Broadly similar patterns are evident across the European Union. Despite their share in overall economic activity, however, aggregate investment in Ireland is dominated by larger firms. While some of this may be expected in the context of the multinational-dominated structure of the Irish economy, it is important from a policy perspective to ensure that the investment activity of SMEs is not constrained by factors that are amenable to policy intervention and that the sector performs to its full potential.

The link between investment activity and financing is frequently a key focus of policy activity as a result of the differences in financing structure observed in SMEs compared to larger firms in many countries. Berger and Udell (1998) provide a number of reasons for financing options to be more limited for smaller firms. In particular, information can be more opaque for smaller firms than for larger firms (particularly those with publicly traded stock and published accounts) making it more difficult and costly for financial institutions to evaluate applications for credit. The smallest

and youngest firms, which face the greatest difficulties in convincing investors or lenders of their quality, tend to rely on initial financing from the business owner's own resources, trade credit and, in certain cases, from angel finance. As the firm grows and becomes more established, it begins to gain access to more formal sources of finance. Coleman and Robb (2011) find that the problems of informational opacity are particularly relevant for high-technology start-ups and that consequently these firms have to rely on greater proportions of owner-provided equity until they can build up a credit record that enables them to access external funding. They hypothesise that the reason that external funding is less available to these high-technology firms is due to their limited tangible assets and high level of intangible intellectual property which cannot be pledged as collateral. For this reason, the inclusion of digital investments in the most recent survey is an addition of considerable interest.

The measurement of intangible assets poses a number of challenges which has impacted their incorporation into National Accounts and growth accounting at a macroeconomic level and into firm performance analysis. These come about both from the intangible nature of the assets themselves, differences in accounting conventions compared to economic concepts and also the wide variety of forms that intangible assets or knowledge-based capital can take. A unifying methodological framework for the measurement of intangible assets in macroeconomic data was developed by Corrado et al. (2009) and this has also influenced how these assets are identified and analysed in firm-level data. Corrado et al. (2009) grouped into three main categories: economic competences (brand value, firm-specific human capital and organisational structure), innovative property (arising from R&D investments) and digitised information (IT capital). Their approach is primarily expenditure based with a key underlying assumption that a firm's (or country's) annual spending on intangible assets contributes to production for a number of years. In this case, the expenditure should be capitalised rather than as a intermediate input for a single year's production.

The link between investment in intangible assets and firm performance has been made in a number of detailed studies using firm-level data, such as Di Ubaldo and Siedschlag (2021) for Ireland, Riley et al. (2011) for the UK and Marrocu et al. (2012) using data for six European countries. A number of papers point to the importance of complementarities between different types of intangible investments (Di Ubaldo and Siedschlag, 2021) and between intangible investments and human capital within the firm (Arrighetti et al., 2014; Añón Higón et al., 2017).

2.2 Performance of SMEs in Ireland

The decade prior to the onset of the COVID-19 pandemic contained a number of different business cycles for Irish SMEs. From 2010 to 2013, the economy struggled to shake off the economic shock from the financial crisis and many firms experienced extreme financial distress leading to a high level of liquidations. However from 2014, the economy began to recover rapidly leading

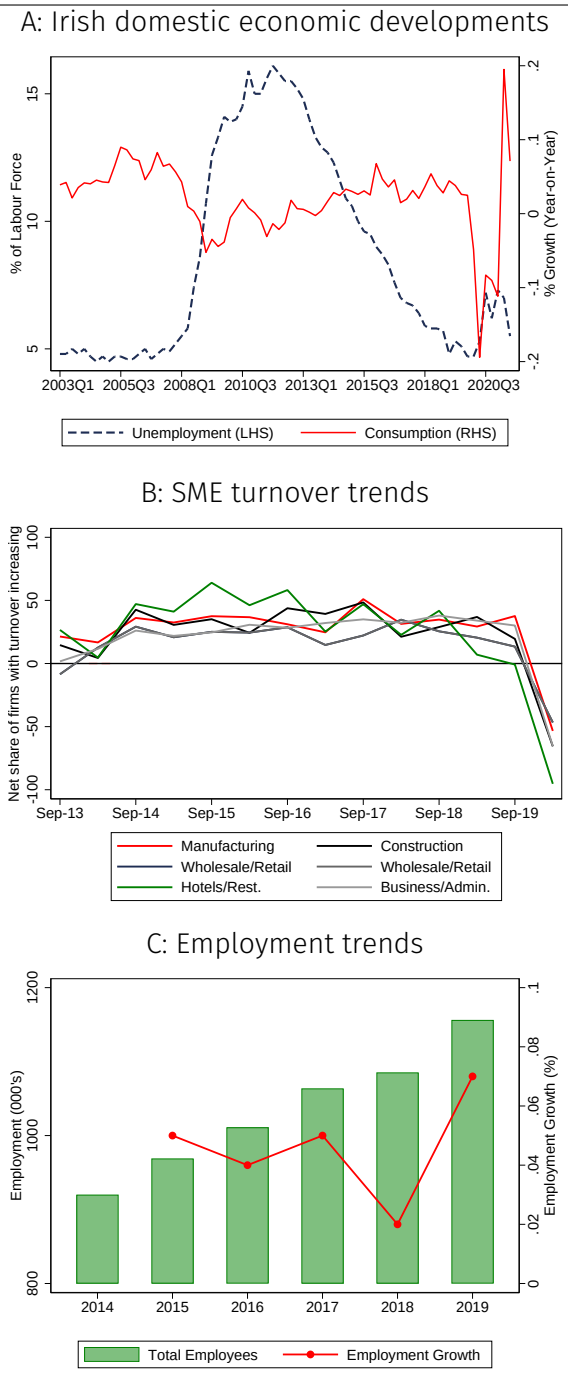
to sustained increases in turnover and employment for many SMEs. This allowed a period of recovery to occur. However, the onset of the uncertainties around Brexit challenged the recovery phase, in particular in 2019, albeit that the Irish domestic economy continued to grow rapidly in this period. Then the COVID-19 pandemic occurred in this context. Figure 2.1 presents data to demonstrate these trends. Panel A presents the trend in household expenditure (as many SMEs are domestically focused) and unemployment, both key indicators of the performance of the Irish economy. The economic recovery, with falling unemployment and rising consumption, is particularly clear from 2013 onwards.

The COVID-19 pandemic-related disruption is also clear towards the end of the consumption trend with the major volatility from Q2 2020 onwards. The increasing economic activity can be seen to feed through into a greater share of SMEs reporting turnover growth: panel B shows an increase in the net share of firms reporting increasing rather than decreasing turnover from the Department of Finance Credit Demand Survey.[3] The disruption following Brexit and the COVID-19 pandemic is clearly seen at the end of this figure with the net share dropping in 2019 and then falling dramatically in 2020. Panel C in Figure 2.1 uses data from the CSO Business in Ireland survey and shows the major increase in employment that occurred in SMEs during the period 2014 to 2019.

However, despite the improvement in economic conditions, SME investment does not appear to have rebounded as rapidly as other performance metrics. Numerous papers have documented this and attributed the trend to different factors. In the early period directly after the onset of the financial crisis, a number of research publications highlighted the impact of financial factors on SME investment trends. Gerlach-Kristen et al. (2015) find that credit access issues impacted Irish SME investment and employment during the acute phase of the financial crisis. Lawless et al. (2015) also found that debt overhang (from excess leverage built up during the credit boom) also played a role to dampen investment and increase financial distress. Lawless et al. (2013) find that the share of firms using bank financing to fund investment dropped by 50 per cent between 2005 and 2012. This change also highlighted a marked increase in the share of firms self financing activities, a feature which has continued to date. More recent research has indicated a rebound in investment such as Gargan et al. (2018) and Lawless et al. (2020b). However, investment is still lower than would be expected with such a fast growing economy. Figure 2.2 presents the data from the European Investment Bank highlighting the share of SMEs investing. While it shows more Irish firms invest than their European peers, the investment rate did not change majorly as the economy rapidly grew.

[3] This indicator reports the percentage of firms reporting increasing turnover minus the share of firms reporting decreasing turnover.

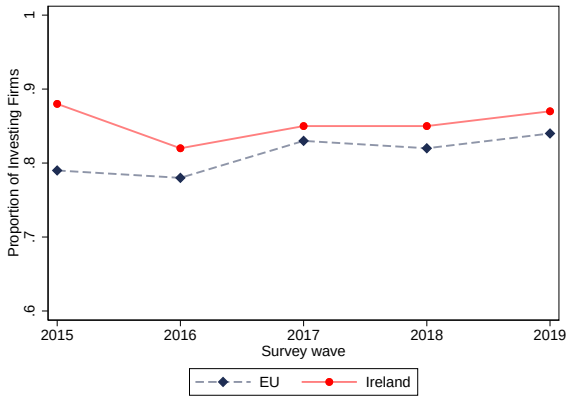
Figure 2.1: Overview of SME economic performance



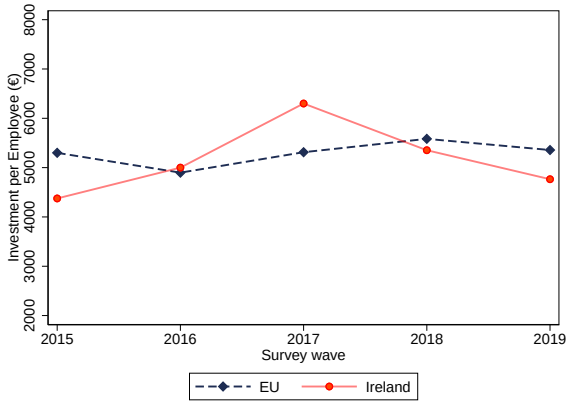
Source: A) CSO; B) Credit Demand Survey; C) CSO.

Figure 2.2: SME investment trends: Ireland and the EU

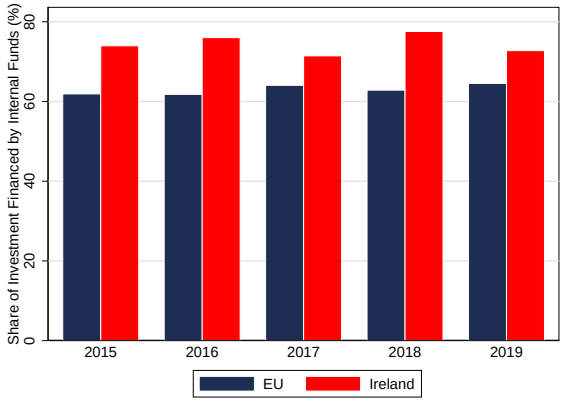
A: Share of firms investing pre-COVID



B: Level of investment (per employee) pre-COVID



C: Internal financing share of investment

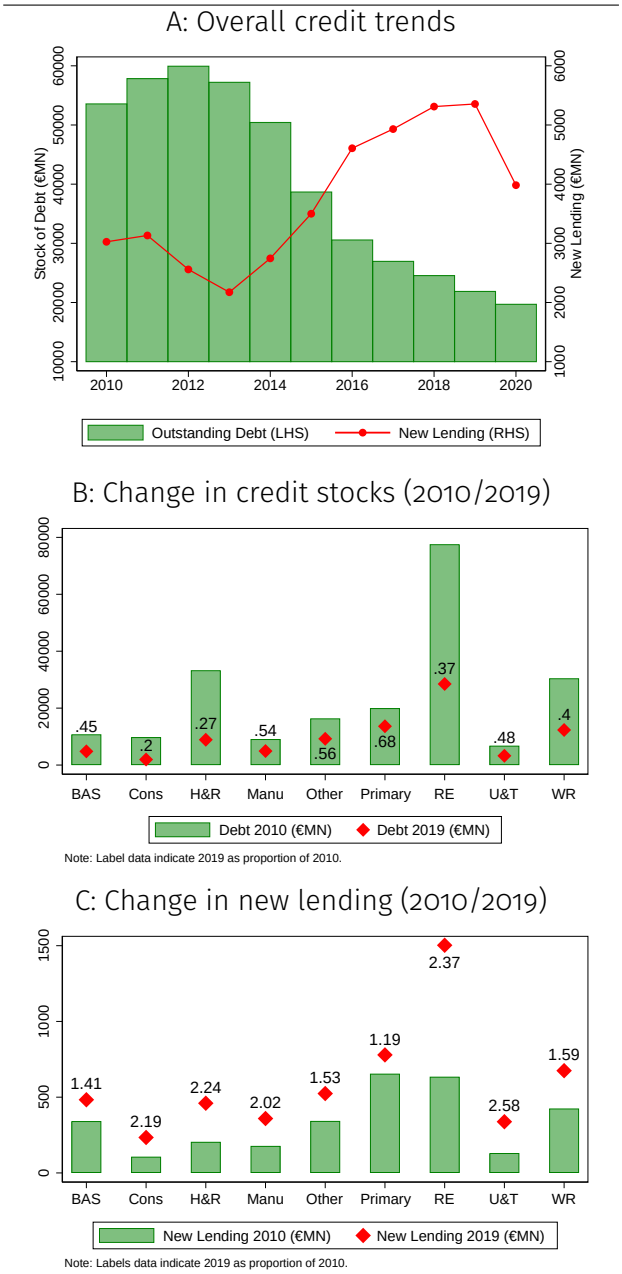


Source: EIBIS Database.

In terms of credit developments, the build up of excess credit during the financial crisis unwound in the aftermath leading to a major period of deleveraging of SME credit. This can be seen in Figure 2.3 which demonstrates the considerable drop in SME credit between 2010 and 2019 both on an aggregate basis but also across sectors. In recent years, before the onset of the pandemic, new bank lending to SMEs (Figure 2.3:A and C) had begun to recover both in aggregate terms and on a broad sectoral basis.

However, despite the pick up in economic and credit conditions, the change in the financing share of investment (which shows considerably more self-financing than before the crisis and than European peers) has persisted for many years (see Figure 2.2: C) and did not appear to have followed the economic cycle. The extent to which this is due to demand-side factors (such as risk aversion to debt following the financial crisis or general borrowing appetite) or supply-side factors (such as the cost of, and access to, credit) continues to pose questions to researchers and policymakers.

Figure 2.3: Overview of SME credit trends



Source: Central Bank of Ireland.

3 TRENDS IN SME INVESTMENTS

This section provides an overview of the extent to which Irish SMEs are investing in different types of assets, both tangible and intangible. We use two indicators to monitor trends in each type of investment. First, we look at how many firms are investing by tracking the percentage of investing firms. Second, we use a number of metrics to measure the extent of investment in level terms. We provide numerical values for the mean and median investment level as well as measuring the scale of the investment relative to the firm size.

This section will also explore if investment activities vary across different firm categories defined in terms of age, size and sector of operation, location and exporting status. A number of different asset classes are covered in this section. First, in terms of fixed assets we document trends in building, vehicle, and machinery and equipment and other assets. Second, we explore trends in investment in intangible assets. Third, we present new data on investment in digitalisation, and finally we explore trends in investment in staff.

3.1 Investment trends by type of asset

We begin by providing a comparison of the investment activity of firms from 2016 to 2020 in Figure 3.1. We define investment in this section as capital outlays on buildings, vehicles, other machinery and equipment and intangible assets. Investment in digital technologies and human capital are explored in separate subsections. We first consider total investment which is the sum of these component asset types. Figure 3.1:A presents the share of SMEs investing as a percentage of all firms in the sample. The proportion of investing SMEs was relatively constant between 2017 and 2019 at approximately 64 per cent or just under two-in-three firms. The impact of the COVID-19 pandemic can be clearly seen in the data as the share of investing enterprises dropped by 9 percentage points (or 14 per cent) to 55 per cent of companies. While these data indicate over half of Irish SMEs still did undertake some investment in capital assets in 2020 during the pandemic, the fall off is notable, and a key concern is whether this has been due to the temporary postponement due to the ongoing uncertainties or whether a permanent loss of capital investment occurred.

Figure 3.1:B presents the mean and median investment in euros for the period 2016 to 2020. It must be noted that these data are calculated for only the sample of firms who invested (zero value investment firms are excluded from the calculations). Both the mean and median level of investment has continued to trend downwards in 2020, having dropped markedly in 2019. It is possible that the drop in 2019 is correlated with the potential disruption from the ongoing Brexit uncertainties and the continued uncertainties and economic malaise caused by the pandemic accelerated this trend. The mean investment in 2020 was just over €93,000, down from €106,000 in 2019 (a 12 per cent reduction). However, the drop between 2018 and 2019 was more substantial,

dropping by 32 per cent from €156,000. The median investment fell to €23,000 from €30,000 between 2019 and 2020; this represents a 23 per cent drop. The median investment is well below the mean which suggests that the distribution of investment across enterprises is highly right-skewed. This can be seen in panel C of Figure 3.1 which presents the distributional charts for 2019 and 2020. The movement of the distribution towards lower value investments can be clearly seen in 2020.

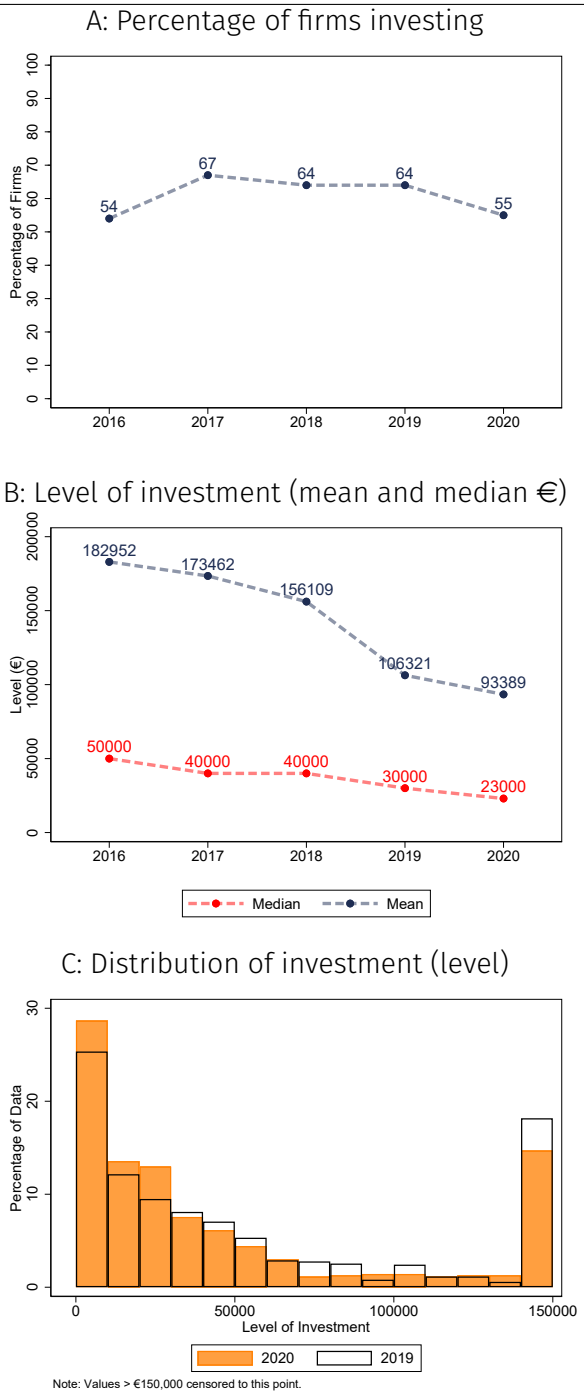
Aggregate percentages however hide important variation in the share of firms investing in different types of assets. Figure 3.2 splits out the proportion of investing firms for the following types of assets: buildings; vehicles; other fixed assets, machinery and equipment; and intangible assets. Approximately one-in-five SMEs or 20 per cent invested in buildings in 2020. This is relatively stable from the previous years. The share of SMEs investing in vehicles dropped marginally from 27 per cent in 2019 to 25 per cent (or one-in-four) in 2020, a decline of 7 per cent.

A much more dramatic pull back of investment in other fixed assets is evident; the proportion of firms investing in these assets dropped from 45 to 35 per cent between 2019 and 2020; a decline of 22 per cent. Relatively fewer firms invested in intangible assets generally (7 per cent in 2020). The proportion remained stable through the period examined, including during the pandemic.

Given the specific nature of the COVID-19 shock and the uncertainties it is generating for SMEs, it is not surprising to see a drop in investment activity. The differential adjustment across asset types (which was less evident for buildings and vehicles and more on other fixed assets) likely reflects the interaction between firms multi-annual planning, adjusting to the COVID-19 environment and the ongoing uncertainties. For example, building investment is likely to be a longer-term commitment which is tied into multi-annual investment strategies; this arguably makes it less susceptible to short-term variations due to heightened uncertainty. Other machinery and equipment is likely a category that can be adjusted quickly in response to uncertainty, such as seen during the pandemic.

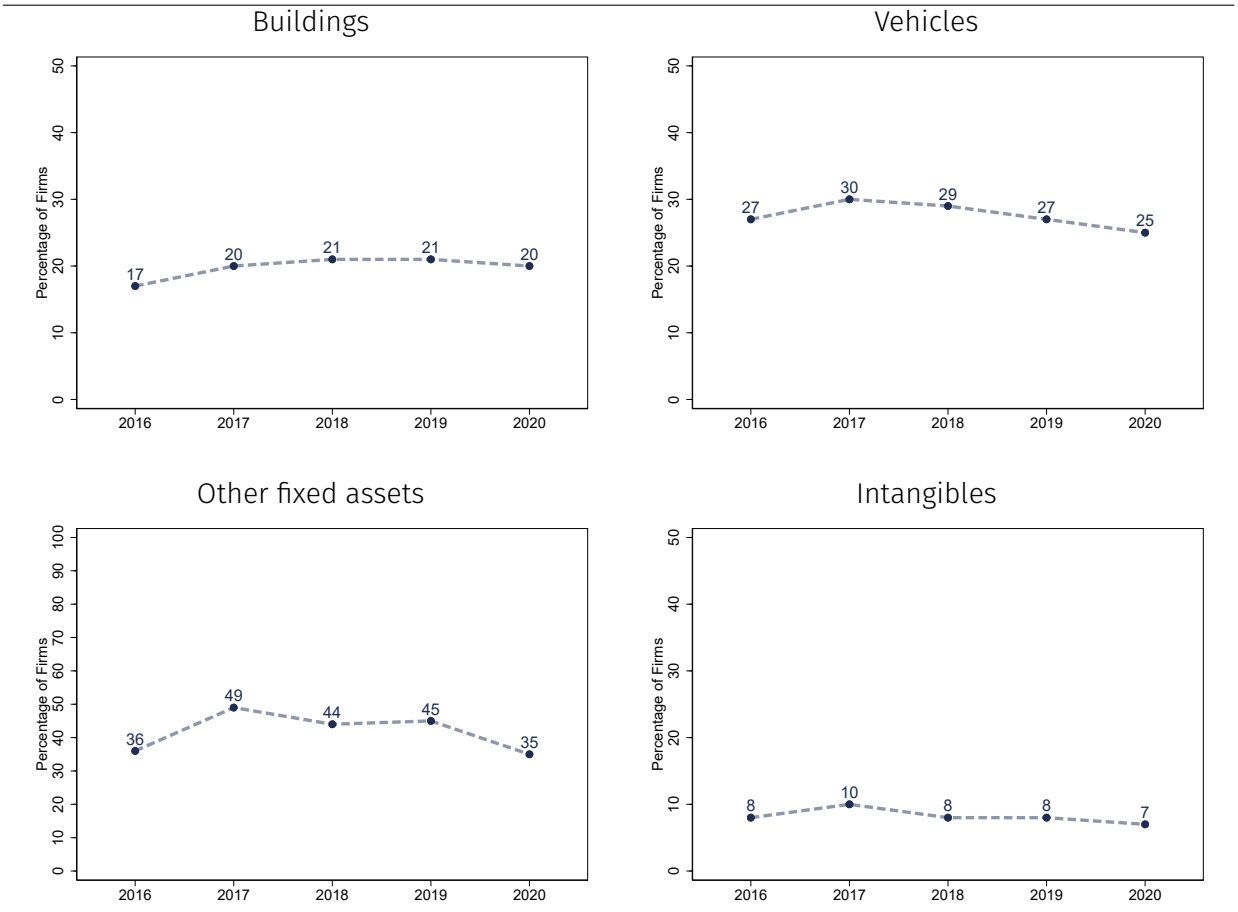
Figure 3.3 presents the trends in the mean and median investment activity by asset type. Investments in buildings are larger on average than other investment items, but this is due to considerable distributional skew and a small number of very large investments. Average investment in buildings in 2020 was just under €117,000 while the median was €25,000. These investments include repairs, maintenance and depreciation-related upkeep investments as well as building purchase and improvements. The decline in the average investment in buildings was just over 5 per cent, but the median investment declined by nearly 40 per cent. The mean investment in vehicles increased by nearly 6 per cent to €48,452 while the median investment in vehicles increased by 20 per cent to €30,000. There was a substantial drop in the average and median value of investment in other fixed assets including machinery and equipment between 2018 and

Figure 3.1: Overview of SME investment activity



Nominal values (B and C). *Source:* 2017-2021 DoF Credit Demand Surveys.

Figure 3.2: Share of investment by asset type

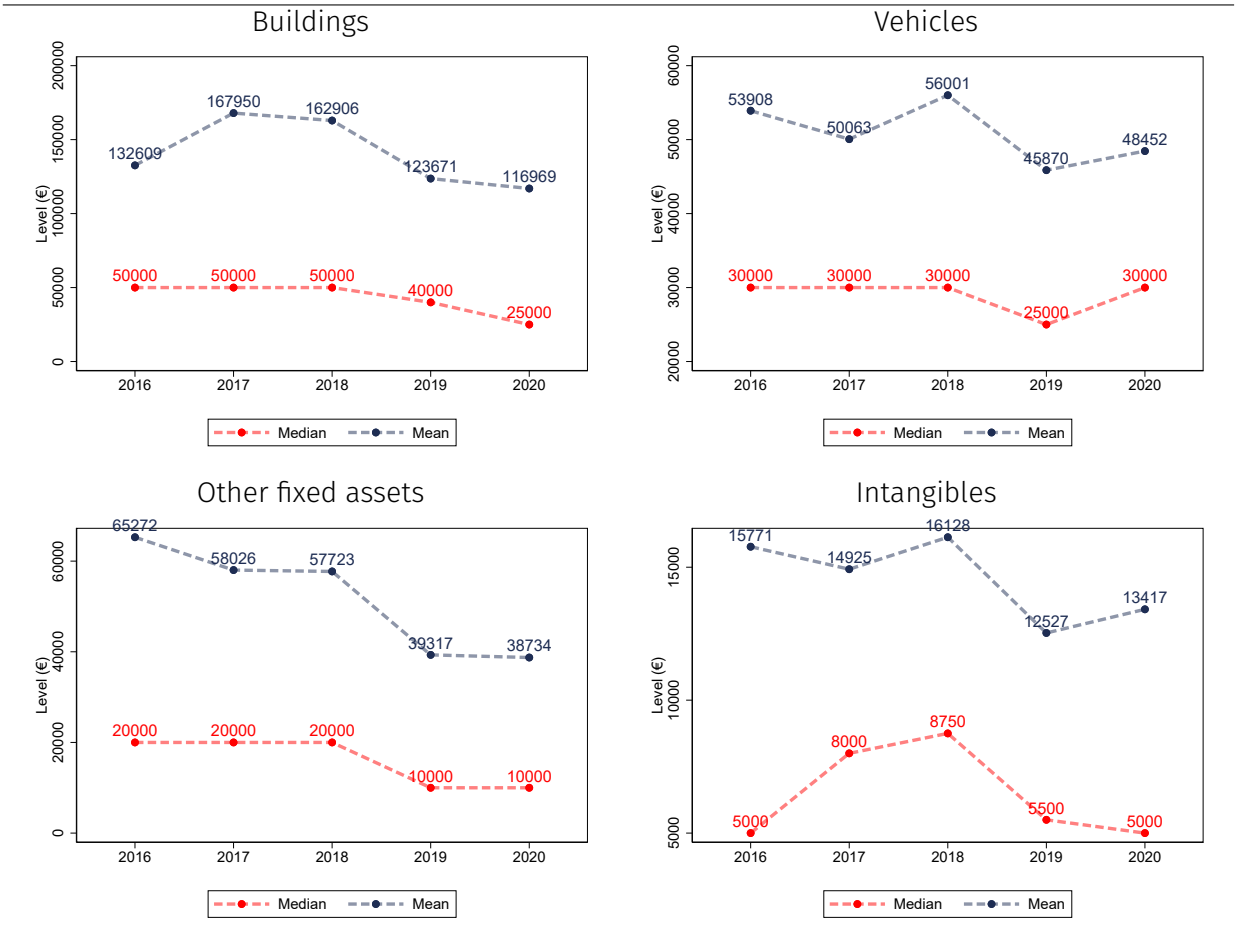


Source: 2017-2021 DoF Credit Demand Surveys.

2019. This may be due to uncertainties around Brexit but this is not conclusive. There was little change between 2019 and 2020 in the mean or median.

The final asset class presented in Figure 3.3 is for intangible assets. Again, a large drop is evident between 2018 and 2019. The median investment also fell from €5,500 to €5,000 between 2019 and 2020. The mean investment rose between these two years suggesting that some large investments are skewing the average (if median falls and average rises, the skew is likely to have increased). It must be noted that these investment figures are presented in nominal terms and therefore (in value terms) relative price changes over time can affect the observed trends. As no SME specific asset price deflators are available, nominal trends are presented for levels throughout this report.

Figure 3.3: Investment by asset type (level €)

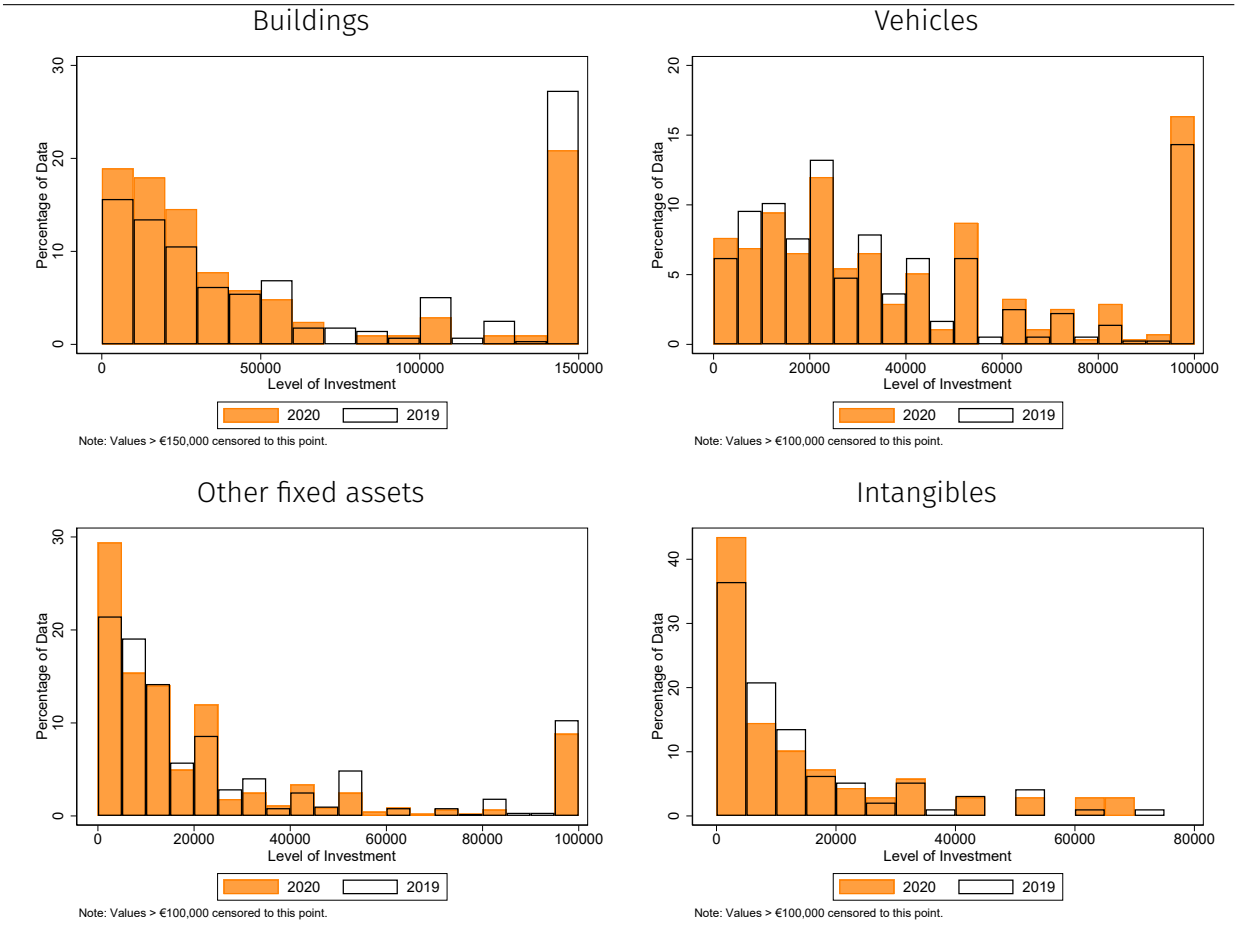


Nominal values. *Source:* 2017-2021 DoF Credit Demand Surveys.

The final charts presented in this subsection relate to the distribution of the level of investment. Histograms presenting the percentage of investments at different values for each asset class

are presented in Figure 3.4. These charts provide an insight into how much firms are spending across all enterprises. It is also useful to identify trends over time in the distribution as these can provide insight into what size investments explain changes in the median or mean values. For reference, we provide two histograms: 2019 values are in orange and 2020 values in white bars. For buildings, a leftward shift of the distribution is evident which suggests a generalised reduction in the level of investment. For vehicles, the upward movement in investment values towards €50,000 plus investments appears in the data with the proportion of these investments being higher in 2020 than in 2019. For other fixed assets and intangibles, the share of the smallest (less than €5,000) investments increased in 2020 relative to 2019.

Figure 3.4: Distribution of investment by asset type, proportion of firms by level (€)



Nominal values. *Source:* 2020 and 2021 DoF Credit Demand Surveys.

In general, a number of trends are evident when positioning SME investment in 2020 in a historical and cross-asset-class perspective. The number of firms and the level of investment both dropped in 2020 relative to 2019 indicating the COVID-19 pandemic is having a marked effect on capital

formation for smaller firms. The role of uncertainty is likely to be important during the pandemic, an issue we return to later in the report. The fall in the level of investment between 2018 and 2019 may be due to the uncertainties around Brexit that persisted at the time. While the share of investing firms dropped across all asset classes, the steepest drops were in machinery, equipment and other fixed assets. It is not unsurprising that the drop is larger in this category as larger investment items (such as buildings) are likely to be part of longer-term, multi-annual plans, which firms may be unlikely to pull out of, even if short-term uncertainty rises. Drops in the level of investment are also evident for some asset classes.

3.2 Exploring investment trends across firms and regions

While the overall trend in investment provides insight into the aggregate picture for Irish SMEs, it often hides considerable heterogeneity across different types of firms or groups of enterprises. From the perspective of understanding the development of fixed capital expenditure and, in particular, for diagnosing how different firms may face barriers to investment, exploring this heterogeneity is important. In this section, we explore trends in investment for four specific groups of enterprises; a) firm age groups; b) firm size groups; c) exporting status; and d) firm sector. We also provide an overview of regional differences across Ireland by considering the trends in investment at a NUTS 3 regional disaggregation.

Figure 3.5 presents the average percentage of investing firms (Column A) and the mean investment level (Column B) by firm age, size group and exporting status. Three different age categories are defined throughout this report according to the number of years a firm has been operating: 1) *young firms* (less than ten years); 2) *established firms* (10-19 years) and *older firms* (20+) years. Size categories are defined with respect of the number of employees in each firm. The Micro category includes firms that employ between one and nine people, Small firms have between ten and 49 employees, and Medium firms employ between 50 and 249 people. The final characteristic is exporting status, indicating if a firm has sales outside of Ireland or not.

Considering trends across the age distribution, in 2020, nearly one-in-every two young firms invested in fixed capital but the highest proportion of investing firms was amongst older firms. Focusing on the impact of the pandemic, the proportion of investing firms dropped in all three age groups with the largest declines being amongst the youngest firms (down 25 per cent), with established firms down 19 per cent and older firms down 10 per cent. This clearly highlights a cross-age impact of COVID-19 on enterprises but with a disproportionate impact on the youngest firms.

Figure I.1 in Appendix I contains additional charts which present the trends by age group and asset class. When these more disaggregated data are reviewed, a clearer impact on the age distribution can be seen. For investment in buildings, the proportion of firms undertaking capital

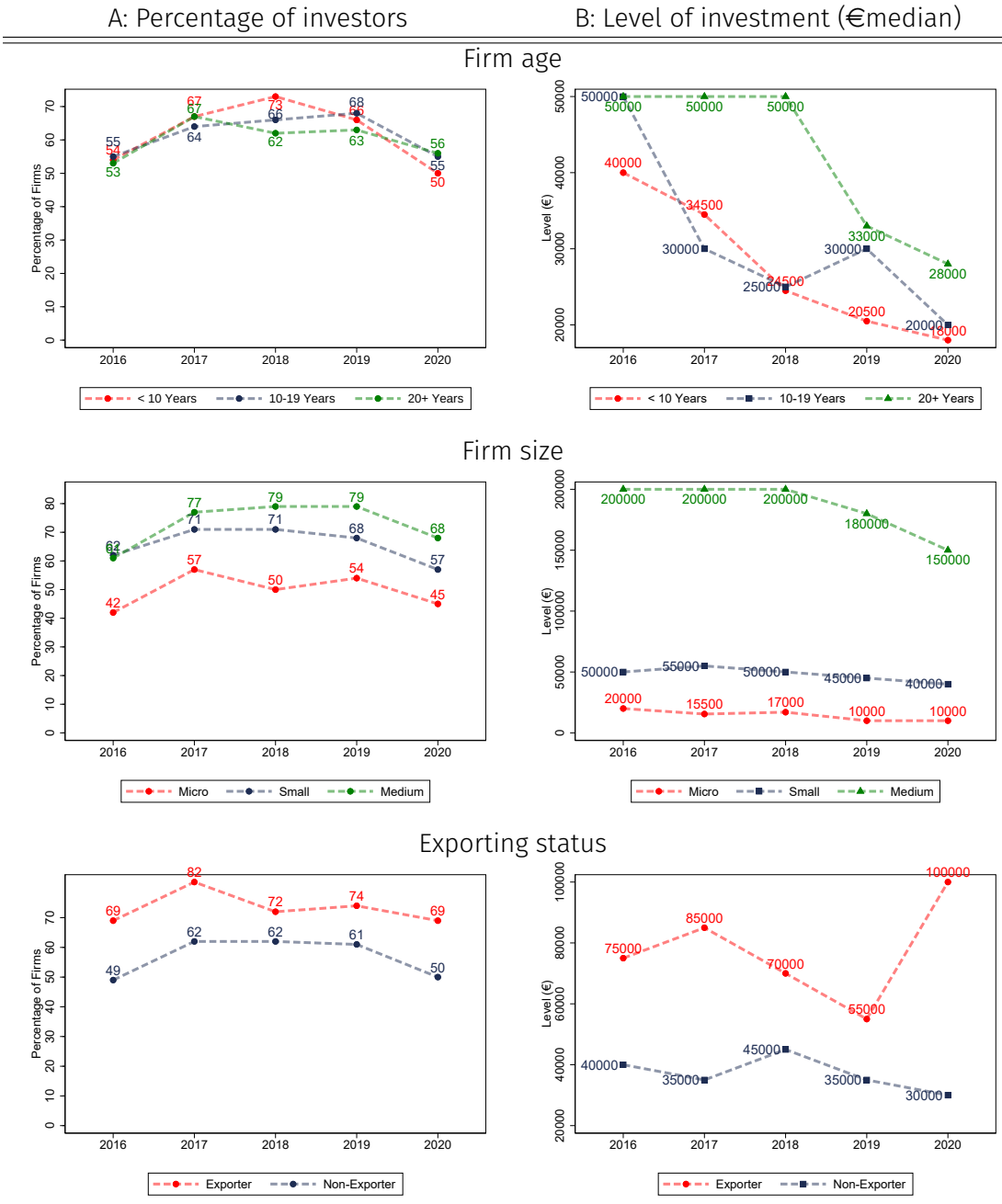
expenditure dropped by half (51 per cent) for young firms from approximately one-in-five firms to one-in-ten firms and by 38 per cent for established firms, but it increased for the oldest firms. As nearly 20 per cent of firms across the age distribution invested in 2019, this clearly highlights the uneven impact of the pandemic across the age distribution. One such factor may be the change in working from home patterns across various types of enterprises. However, further data are needed on this as we do not have sufficient information to disentangle this. The number of firms investing in vehicles dropped by nearly a third for younger firms but by only 8 per cent for older firms. Investment in other fixed assets has dropped as a share of firms across the age distribution. For intangible assets, investment actually declined for older firms but remained relatively static for the youngest firms.

For those firms that did invest, the median level of investment in 2020 was highest for the oldest firms at €29,000 (Figure 3.5; with established firms typically investing €20,000 and the youngest firms €18,000. These levels are all down on 2019 levels by 17 per cent, 33 per cent and 14 per cent respectively. Figure I.1 in Appendix I again provides the breakdown in the level of investment for investing firms across the age distribution for different asset types. Focusing on the level of investment in buildings it declined substantially across all age groups with the biggest drop being over 56 per cent for established (10-20-year-old) firms.

Young firms also posted a drop in building investment of over 40 per cent while the oldest firms dropped the level of building investment by 25 per cent. As noted above, this may be due to changing work patterns which have resulted in a greater share of employees working from home, therefore the need for larger buildings is lessened. However, it is not possible to identify this in our data. Investment in vehicles rose across all age groups with the largest increase for the youngest firms (up nearly 40 per cent to €25,000 in 2020). Established and older firms also increased the level of investment in vehicles with the median rising by 25 per cent and 17 per cent respectively (to €25,000 and €35,000) in 2020. For other fixed assets, no change was reported for young or established firms but older firms dropped investment by 33 per cent. The level of investment increased with age. As with the proportion of investment, the youngest firms maintained their investment in intangibles while drops were recorded for the older two age cohorts of 25 and 33 per cent respectively.

The second firm grouping that is presented in Figure 3.5 is firm size. While investment propensity is generally increasing with firm size, the proportion of investing SMEs dropped across all size classes; the share for micro firms dropped by 16 per cent between 2019 and 2020 to 45 per cent of enterprises; the share of small firms dropped by 15 per cent to 57 per cent of enterprises between 2019 and 2020; and finally the share of investors amongst medium-sized firms dropped by 13 per cent between 2019 and 2020 to approximately 13 per cent.

Figure 3.5: Investment by firm type, percentage and level (median €) of investors only



Nominal values (B). *Source:* 2017-2021 DoF Credit Demand Surveys.

In terms of the level of investment, again this is typically increasing with firm size, ranging from a median of €10,000 for micro firms to €150,000 for medium-sized firms in 2020. The impact of COVID-19 on the level of investment (between 2019 and 2020) is increasing in firm size with median-sized SMEs pulling back more; the decline for medium-sized SMEs is 17 per cent; 11 per cent for small firms with micro firms unchanged.

Figure I.2 in Appendix I provides the breakdown of the proportion of investors and the level of investment for investing firms across the size distribution for different asset types. The share of medium-sized firms investing fell by 20 per cent between 2019 and 2020, to stand at 29 per cent; small firms also recorded a reduction in the proportion investing in buildings, dropping by 5 per cent to stand at circa 21 per cent. A marginal rise was posted for micro firms to just under 12 per cent (a 1 per cent increase between 2019 and 2020). Focusing on the level of investment in buildings, the median investment declined between 2019 and 2020 by 50 per cent to stand at €100,000. Small firms also experienced a decline in the typical investment in buildings by 35 per cent between 2019 and 2020 to stand at €32,500. The median investment in buildings increased marginally for micro firms.

For investment in vehicles, the share of investing firms declined for micro and small firms by 28 and 16 per cent respectively (to stand at 15 and 26 per cent in 2020). The share of vehicle investors amongst medium-sized firms actually rose between 2019 and 2020 to 39 per cent, a 14 per cent increase. Despite the rises in the extensive margin, all size classes experienced an increase in the level of investment in vehicles between 2019 and 2020.[4]

Focusing on investment in other fixed assets (including machinery and equipment), the share of investors decreased for all size classes with the largest declines being for small firms; in 2020, the share of micro firms investing dropped to 30 per cent (an 18 per cent decline year-on-year), the share for small firms decreased to 34 per cent (a 26 per cent decline year-on-year) and the share of medium-sized firms fell to 44 per cent (a 25 per cent decline year-on-year). The level of investment in this asset class rose for medium and small firms. Finally, considering the investment activity in intangibles across the size distribution, the share of micro firms investing in these assets dropped by 30 per cent year-on-year to under 6 per cent in 2020; the share dropped marginally for small firms (down 2 per cent) and dropped by 14 per cent for medium-sized firms.

In terms of the level of investment in intangibles, it dropped for micro and medium-sized firms but rose substantially for small firms. It must be noted that the relatively small number of firms that invest in intangible assets every year is likely to lead to considerable volatility in the series.

[4] The increases ranged from 13 per cent for micro firms, 43 per cent for small firms and 10 per cent for medium-sized firms.

The final grouping presented in Figure 3.5 is exporting status. It is clear that the share of investing firms fell more sharply for domestic facing enterprises; the share declined from 61 per cent to 50 per cent for domestic firms between 2019 and 2020 while it declined more modestly for exporters from 74 to 69 per cent. Domestic firms were more likely to have faced the impact of restrictions to commercial activity due to the pandemic public health restrictions so it is not surprising that these firms pulled back on investment to a greater extent.

In terms of the level of investment, there was a decline for domestic firms in the median investment from €35,000 in 2019 to €30,000 in 2020. The median investment for exporters increased substantially to €100,000 in 2020 from €55,000 in 2019. Figure I.3 in Appendix I presents the breakdown of investment activity by exporting status and asset class.

In terms of the proportion of investors, while the trends are relatively similar for buildings, other fixed assets and intangibles, exporters increased investment in vehicles which bucked the trends of the other asset classes. The median investment in vehicles also rose sharply in 2020 for exporters. This may reflect a greater requirement to have flexibility in terms of their supply chains with the headwinds of the pandemic and Brexit-related effects.

A very notable feature of the economic shock associated with COVID-19 was the unequal impact across sectors in the Irish economy (O'Toole, 2020). Furthermore, research on the impact on SMEs also highlighted that particular sectors were very hard hit, especially those which were most affected by public health closures and restrictions (retail, hospitality etc). It is therefore important to consider the investment trends on a sectoral basis as this can give a more direct impact on which pandemic related restrictions may have been feeding through to firms' capital structure choices.

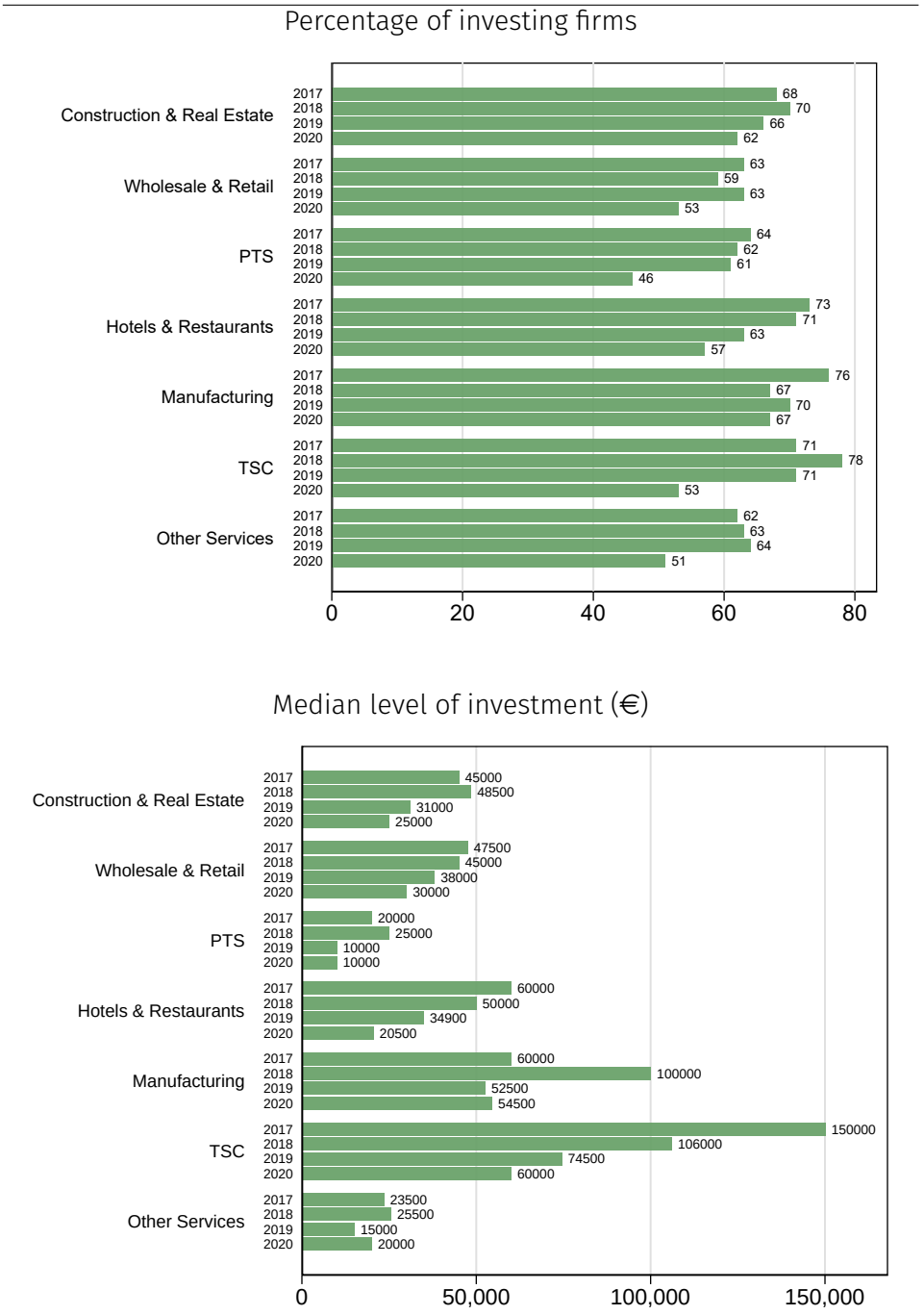
Figure 3.6 presents the share of investment and level of investment for eight industrial and service sectors: construction and real estate; wholesale and retail; professional, technical and scientific (PTS); hotels and restaurants; manufacturing (food manufacturing, non-high-tech and high-tech manufacturing); transport, storage and communications (TSC); and other services.[5]

All sectors experienced a decline in the share of investors in 2020 compared to 2019; the largest declines were concentrated in the TSC sector which dropped to 53 per cent of firms in 2020, a 26 per cent decline, and the PTS sector which experienced a 23 per cent year-on-year decline to 46 per cent in 2020. Retail and wholesale as well as hospitality firms experienced a 16 per cent and 10 per cent decline respectively.

Figure 3.6 also displays the median level of investment by sector from 2017 to 2020. It is clear that in 2020 the level of investment has dropped very substantially in the sectors hardest hit by the pandemic: the level of investment has declined by nearly 40 per cent year-on-year to

[5] Firms in the primary agriculture and financial, insurance and banking sectors were excluded.

Figure 3.6: Investment by sector, percentage and level (median €) of investors only



Professional, technical and scientific (PTS); Transport, storage and communications (TSC)
Nominal values. *Source:* 2018-2021 DoF Credit Demand Surveys.

2020 in the hotels and restaurants sector (to stand at €20,500) while investment in the retail and wholesale sector dropped by over 22 per cent to stand at €29,500. Large declines were also experienced by the construction and real estate sector (18 per cent fall between 2019 and 2020) and the TSC sector. Other sectors that saw a substantial fall in the share of firms investing did not see a corresponding reduction in the median investment for those firms that did undertake investment, such as in high-tech manufacturing.

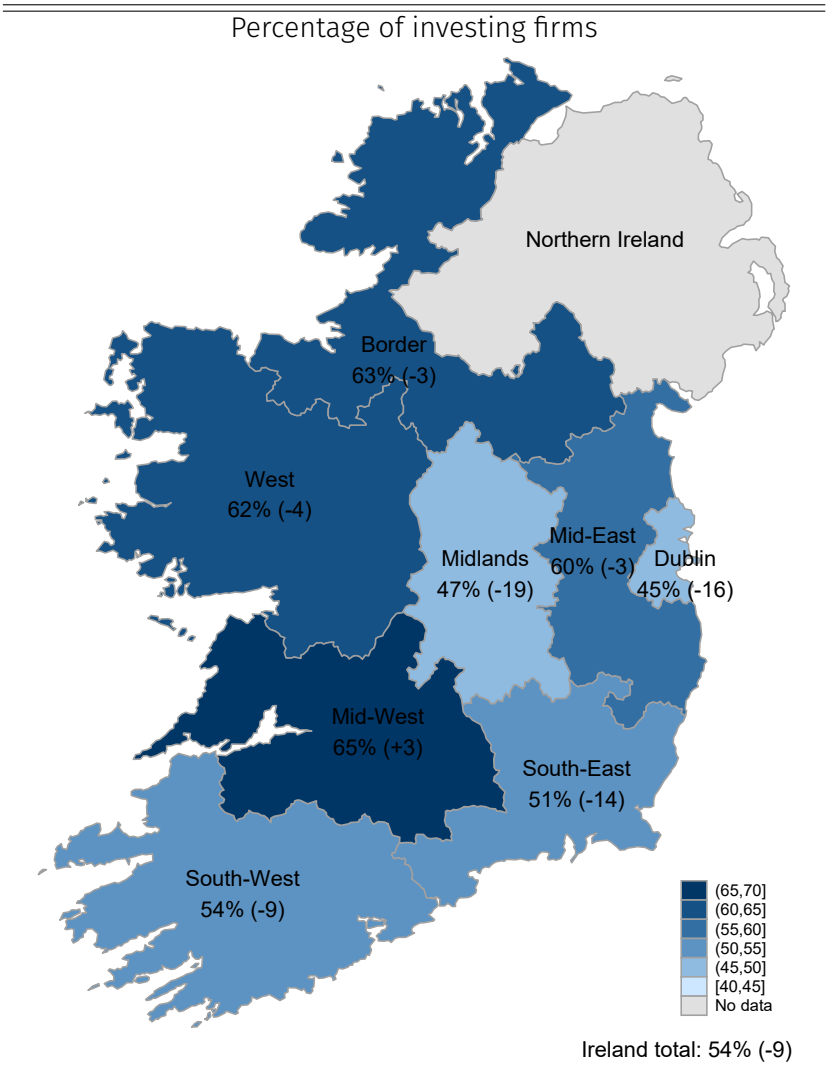
The change in the share of investing firms and the median level of investment by sector for different asset types are presented in Appendix I in Figure I.4. In terms of building investments, the share of investing firms increased in the TSC, other services, high-tech manufacturing and construction sectors and declined in wholesale and retail, PTS, and hotels and restaurants. However, the median level of investment for investing enterprises declined considerably across all sectors.

For vehicle investments, the share of investors declined in 2020 for the following sectors: construction, wholesale and retail, high-tech manufacturing and TSC. Both traditional and high-tech manufacturing firms cut back on investment in other fixed assets including machinery and equipment in terms of the share of firms and the typical level of investment. Also of note is the drop in the share of firms investing in intangibles in these two sectors. Investment in intangibles is low in general outside these two sectors.

Finally, to provide a breakdown of investment activity on a regional basis in Ireland, Figures 3.7 and 3.8 present the share of investing enterprises for the NUTS 3 regions in Ireland for fixed assets (buildings, vehicles and machinery and equipment) and intangible assets respectively. The highest proportion of investing firms was in the Mid-West, Border and West regions at just under two-in-every three firms. The lowest proportion was in the Dublin region at 45 per cent.

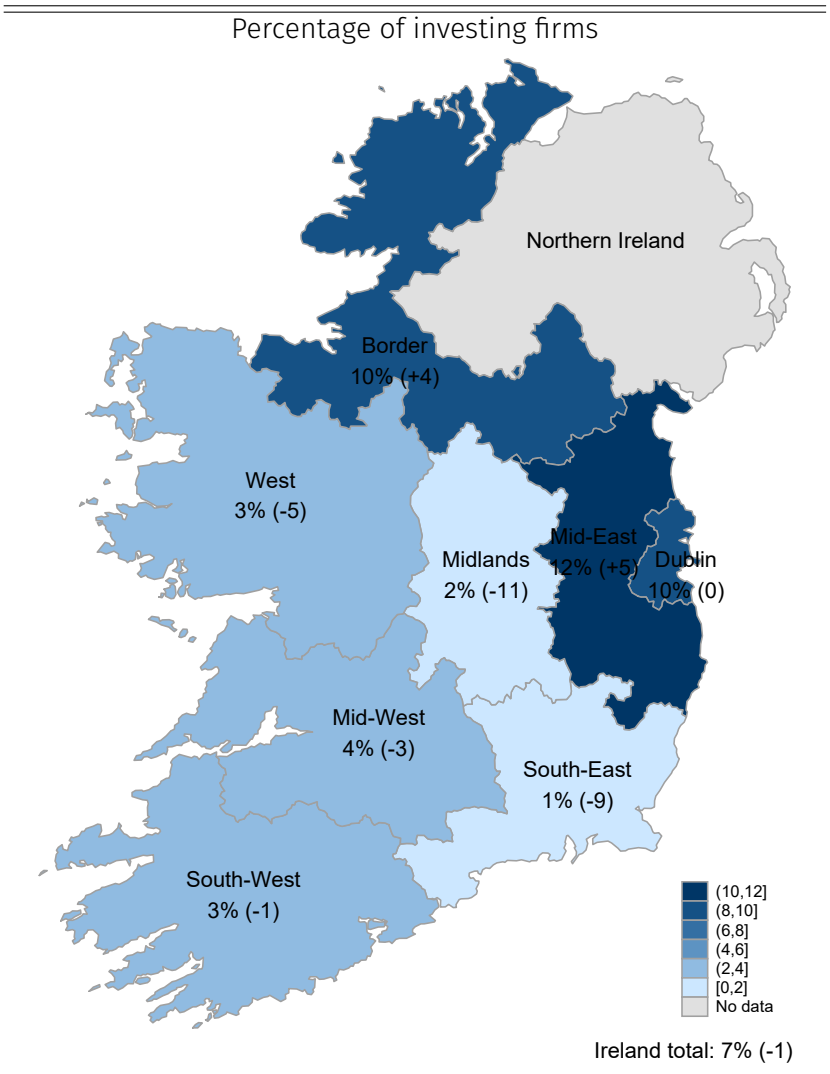
The change (in percentage points) from 2019 to 2020 is presented in parenthesis. The Midlands and Dublin recorded the largest declines at 19 and 16 percentage points respectively. Focusing on intangible assets (Figure 3.8), Dublin and the Mid-East have considerably higher shares of investors, which may reflect the structure of high-tech and knowledge capital firms that are clustered in and around the capital city.

Figure 3.7: Fixed asset investment by region, percentage and change from 2019 to 2020



Source: 2020 and 2021 DoF Credit Demand Survey.

Figure 3.8: Intangible investment by region, percentage and change from 2019 to 2020



Source: 2020 and 2021 DoF Credit Demand Survey.

3.3 Investment in digitalisation and digital transformation

A critical element in the adoption of productivity enhancing technologies is investment in digitalisation. For SMEs looking to expand their markets, or to introduce efficiency enhancing technologies, the ability to keep up to date and at the knowledge frontier of the latest digital position for their sections is likely to be critical. Indeed, both Irish government and European Union economic development strategy has digitalisation as a core element. In an attempt to understand better the digital activities of Irish firms, a question on digitalisation was added to the most recent wave of the investment survey. The question included in the survey was as follows:

> *Did you invest in the following: Digital technologies or e-commerce activities (such as automation, robotics, artificial intelligence, blockchain, data analytics infrastructure, internet communication devices etc)?*

The survey also asked the data for 2019 on a backdated basis within the 2020 survey so that information on both 2019 and 2020 could be compared. This is of particular importance given the COVID-19 pandemic and the very specific nature of the economic shock that accompanied the pandemic. Indeed, the required public health restrictions which acted to close particular sectors of the economy may have been a catalyst for firms to move to online activities thus spurring digitalisation investment. These questions are important to explore and our retrospective data for 2019 allow us to provide a pre- and post-COVID impact.

The summary results for the digitalisation data are presented in Table 3.1. The share of investing firms is presented as well as the median and mean data for those firms who did invest. Breakdowns are provided for sector, size, age category and exporting status as with the previous data. In 2020, just under one-in-every three firms invested in digital activities. The average investment level was €20,000 with a median investment level of €7,500.

Overall, the share of SMEs investing in digital activities actually declined by 5 percentage points. However, the mean expenditure was up 22 per cent and the median expenditure was up 7 per cent. While it is surprising that the share declines during the pandemic, the fact that investment levels increased markedly does indicate that SMEs increased their capital expenditure in digital activities as expected during the COVID-19 pandemic.

Considering the trends across groups of enterprises, the share of exporters who invested fell, but the median investment of those investing increased by 50 per cent. The share of non-exporters who invested also declined while the median level of investment was unchanged. Across age groups, the proportion of enterprises investing in digital activities was greatest for young firms while, in terms of size, it was highest for medium-sized enterprises.

On a sectoral basis, the share of firms investing in digital technologies was highest for the transport, storage and communications sectors, the professional scientific and technical and other

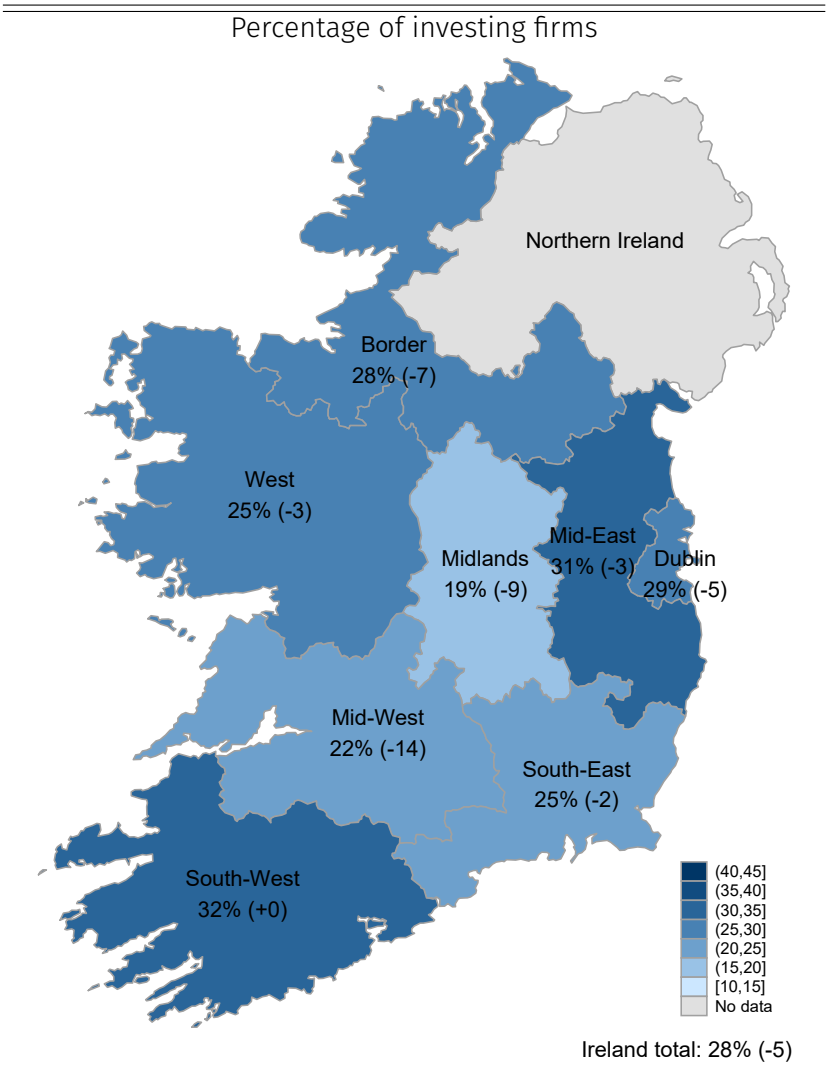
Table 3.1: Digital investments

	Share			Mean (€)			Median (€)		
	2020	2019	Δ	2020	2019	Δ	2020	2019	Δ
Total	28	32	-5	20,003	16,439	+22%	7,500	7,000	+7%
Construc. & Real est.	28	28	-0	11,915	10,227	+17%	5,000	5,000	0%
Wholesale & Retail	25	32	-7	13,630	11,952	+14%	6,000	5,000	+20%
PTS	30	33	-3	20,365	13,278	+53%	7,000	5,000	+40%
Hotels & Restaurants	22	30	-8	24,648	20,165	+22%	5,000	10,000	-50%
Manufacturing	28	40	-11	23,752	28,689	-17%	15,000	10,000	+50%
TSC	35	37	-1	49,465	25,339	+95%	10,000	10,000	0%
Other Services	34	31	+3	21,182	15,812	+34%	15,000	10,000	+50%
Micro	23	27	-4	6,489	5,095	+27%	3,000	2,500	+20%
Small	26	35	-9	19,720	16,046	+23%	7,500	9,000	-17%
Medium	37	37	-0	35,231	32,486	+8%	20,000	15,000	+33%
<10 Years	32	39	-7	17,852	16,926	+5%	5,000	5,000	0%
10-19 Years	22	35	-13	10,135	10,977	-8%	5,000	5,000	0%
20+ Years	29	30	-2	23,083	18,525	+25%	10,000	10,000	0%
Non-exporter	26	29	-4	17,249	13,642	+26%	5,000	5,000	0%
Exporter	33	42	-8	25,862	22,214	+16%	15,000	10,000	+50%

Professional, technical and scientific (PTS); Transport, storage and communications (TSC). Nominal values.
Source: 2020 and 2021 DoF Credit Demand Survey.

services sectors. The sector with the lowest share of firms investing in digital activities was hotels and restaurants. The largest declines in the percentage of firms who invested in digital technologies was in the manufacturing sector as well as the hotels and restaurants sector. However, the median investment by manufacturing firms increased by 50 per cent. The sectoral picture appears to indicate a pull back in the proportion of investing firms across the board but an increase in the typical investment once firms did invest.

Figure 3.9: Digital investment by region, percentage and change from 2019 to 2020



Source: 2021 DoF Credit Demand Survey.

Table 3.2: Investments in staff

	Share			Mean (€)			Median (€)		
	2020	2019	Δ	2020	2019	Δ	2020	2019	Δ
Total	23	32	-8	26,854	42,113	-36%	10,000	10,000	0%
Construc. & Real est.	24	38	-14	19,734	55,817	-65%	10,000	10,000	0%
Wholesale & Retail	19	28	-9	34,056	51,916	-34%	10,000	10,000	0%
PTS	24	29	-5	28,591	20,618	+39%	15,000	10,000	+50%
Hotels & Restaurants	19	33	-14	21,709	50,055	-57%	12,600	10,000	+26%
Manufacturing	27	36	-10	21,014	44,694	-53%	20,000	15,000	+33%
TSC	27	42	-15	52,872	41,041	+29%	20,000	25,000	-20%
Other Services	33	29	+4	19,495	16,696	+17%	5,000	9,000	-44%
Micro	13	18	-5	13,003	36,017	-64%	4,000	5,000	-20%
Small	29	37	-8	23,646	28,086	-16%	10,000	10,000	0%
Medium	32	46	-15	40,782	66,293	-38%	20,000	25,000	-20%
<10 Years	22	20	+2	38,151	62,133	-39%	10,000	7,000	+43%
10-19 Years	24	37	-13	33,282	28,901	+15%	10,000	10,000	0%
20+ Years	23	32	-9	22,646	45,256	-50%	12,600	10,000	+26%
Non-exporter	21	29	-8	25,518	37,958	-33%	10,000	7,000	+43%
Exporter	29	39	-10	29,506	51,144	-42%	15,000	20,000	-25%

Professional, technical and scientific (PTS); Transport, storage and communications (TSC). Nominal values.
Source: 2020 and 2021 DoF Credit Demand Survey.

3.4 Investment in human capital

The final type of investment that we consider in this section relates to human capital investment or investment in staff. Investing in human capital through training and development is also an important mechanism to boost long-term productivity growth. In the survey, we questioned firms as to the level of investments in their staff. This could include training and development courses etc. In 2020, we find that just under one-in-four firms invested in staff, this is a drop from one-in-three in 2019.

While the median level of investment for investing firms remained constant, there was a large drop in the mean investment: the median spend in 2020 was €10,000 while the average spend was €26,800. The share of enterprises investing in human capital dropped sharply in transport, storage and communications, construction and real estate, and hotels and restaurants. The average spend in manufacturing, hospitality, and construction also dropped sharply by over 50 per cent but the median spend did not fall: this suggests a drop in very large value investments. A question arises as to whether this dynamic is driven by larger SMEs cutting staff investment budgets? This appears to be the case as medium-sized firms cut their expenditure on staff in terms of the mean and median levels as well as the proportion.

4 INVESTMENT BARRIERS AND FINANCING CONSIDERATIONS

Section 2 contextualises the development in investment and investment financing for SMEs since the onset of the financial crisis. This can be characterised by improving economic conditions prior to the pandemic, a backdrop of decreasing SME debt due to deleveraging, but continued subdued credit demand and self-financing of investment. It is important to attempt to understand whether the latter points are due to supply-side issues such as access to credit or demand-side factors such as debt aversion, uncertainty etc.

In order to identify potential investment constraints that might be affecting the growth and development of domestic enterprises in Ireland, this section explores the attitudes of firms towards their investment activities. It explores the extent to which firms are content with their current capital stock, and probes the attitude of firms towards taking risks. Finally, it explores explicit measures of the extent to which access to finance is a barrier to investment as well as documenting firms' financing structures and the links between investment and cash holdings.

A number of additional survey questions were added to the most recent survey to attempt to better address these issues. While a number of these questions had been asked previously, providing a useful time series reference, a number are unique to this survey wave. To attempt to provide more insight into the attitudes of firms towards their investment activities, we included specific questions on firms' attitudes to expansion and taking on debt. The specific questions we included (in a traditional Likert scale format) were as follows:

1. On a scale from 1 to 5 (where 1 is strongly agree and 5 is strongly disagree), please indicate whether you agree or disagree with the statement: "I am happy with my current capacity".

2. On a scale from 1 to 5 (where 1 is strongly agree and 5 is strongly disagree), please indicate whether you agree or disagree with the statement: "I am willing to expand my business even if it brings more risk/challenge".

3. On a scale from 1 to 5 (where 1 is strongly agree and 5 is strongly disagree), please indicate whether you agree or disagree with the statement: "Uncertainty is a barrier to investment".

4. On a scale from 1 to 5 (where 1 is strongly agree and 5 is strongly disagree), please indicate whether you agree or disagree with the statement: "Access to external finance is a barrier to investment".

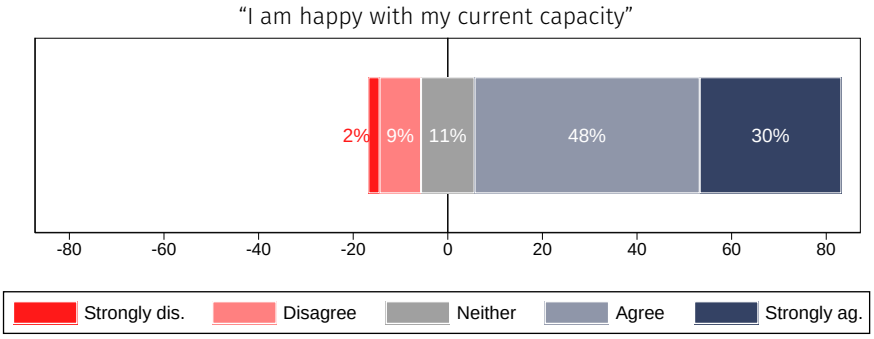
5. On a scale from 1 to 5 (where 1 is strongly agree and 5 is strongly disagree), please indicate whether you agree or disagree with the statement: "I am willing to borrow from banks to fund an expansion of my business".

The rest of this section is structured as follows: Section 4.1 considers the issues of capital adequacy, risk and uncertainty. Section 4.2 describes the evidence on firms' financing choices and perceptions of finance as a constraint to investment.

4.1 Capital adequacy, risk and uncertainty

The extent to which firms are happy with their existing capital stock and capacity, and their current risk appetite for any new investments given the prevailing level of uncertainty, are critical determinants of the flow of new capital expenditures. In this section, we explore these issues using the self-reported responses of firms to questions on risk, uncertainty and the adequacy of capital capacity. Figure 4.1 displays data on satisfaction with current capacity. Negative attitudinal responses are presented as minus figures for display purposes. This shows clearly that the vast majority of Irish SMEs are happy with their existing capacity; 77 per cent of SMEs reported either agreeing or strongly agreeing with this statement while just 10 per cent or one-in-ten indicated that they disagreed. This finding suggests investment appetites are somewhat subdued as few firms are suggesting pent up demand for capacity expansion.

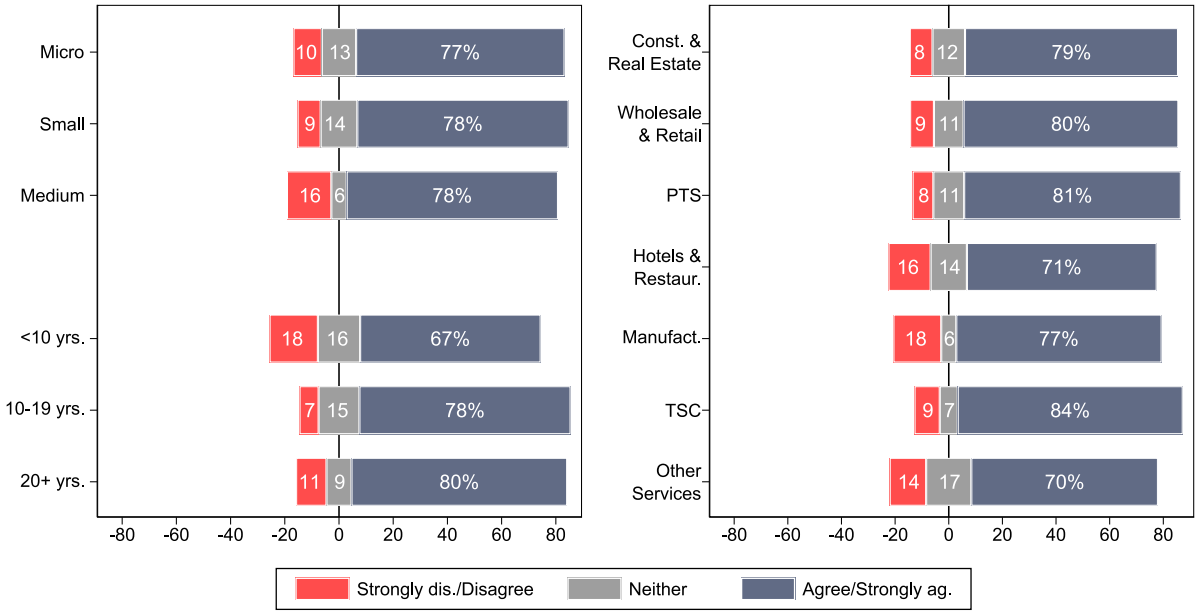
Figure 4.1: Current capacity adequacy



Source: 2021 DoF Credit Demand Survey.

As these findings may differ across subgroups of the SME population, in Figure 4.2 we also provide breakdowns of the share of firms agreeing, disagreeing or indicating neither by firm age, size and sector of activity. While few differences are evident across the size distribution, a notably lower share of young firms agree with the statement; only 67 per cent of the youngest firms are happy with their existing capacity. Research by Lawless (2014) indicates that young firms are the drivers of employment growth and this finding may indicate that a higher proportion of these firms have pent up investment demand in Ireland. Ensuring these firms face fewer barriers to realising this demand may be particularly beneficial in driving capital formation. We will return to this topic later in the section. We also consider the differences across high level sectoral groupings. The lowest share of firms who are satisfied with the current capacity is in the other services, hotels and restaurants, and traditional manufacturing sectors. However the differences are relatively minor and, in all sectors, over seven-in-ten firms are happy with their existing capacity.

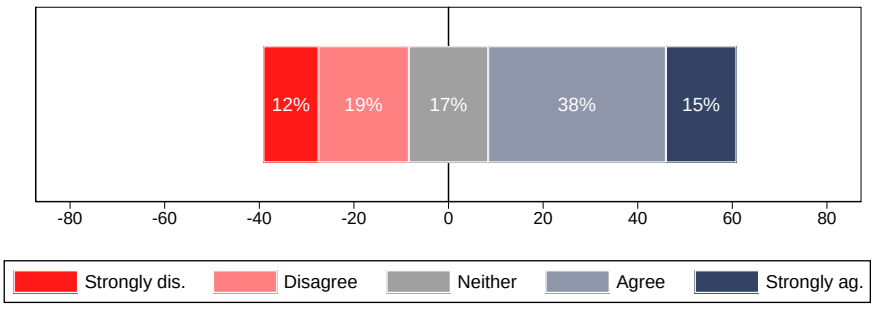
Figure 4.2: Capacity adequacy by firm group



Professional, technical and scientific (PTS); Transport, storage and communications (TSC).
Source: 2021 DoF Credit Demand Survey.

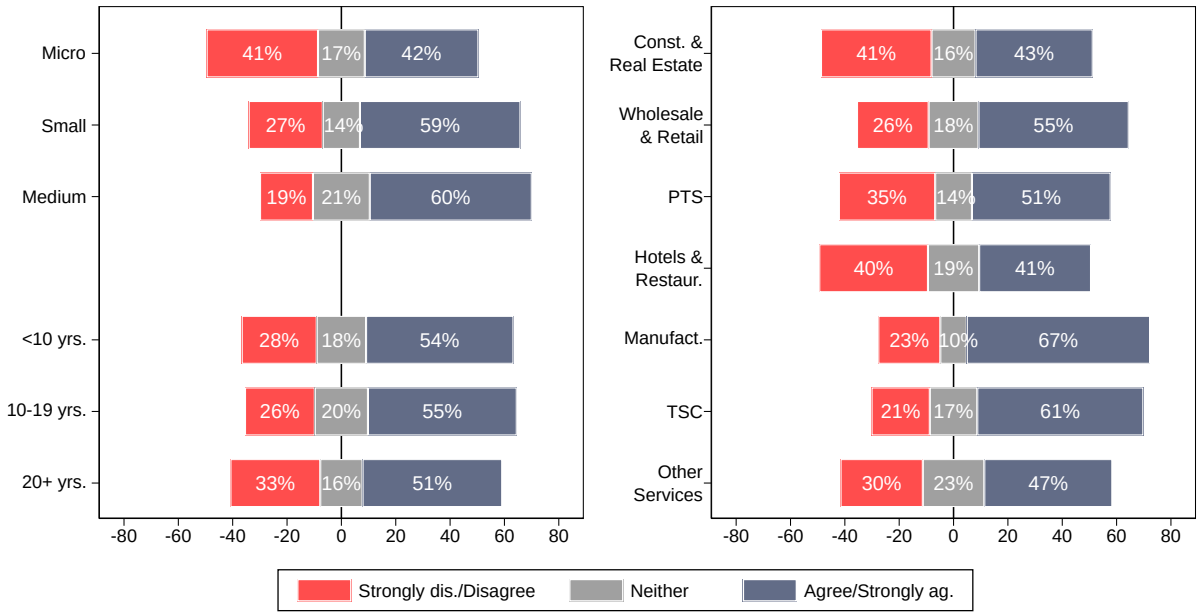
Figure 4.3: Current risk appetite

"I am willing to expand my business even if it brings more risk/challenge"



Source: 2021 DoF Credit Demand Survey.

Figure 4.4: Risk appetite by firm group

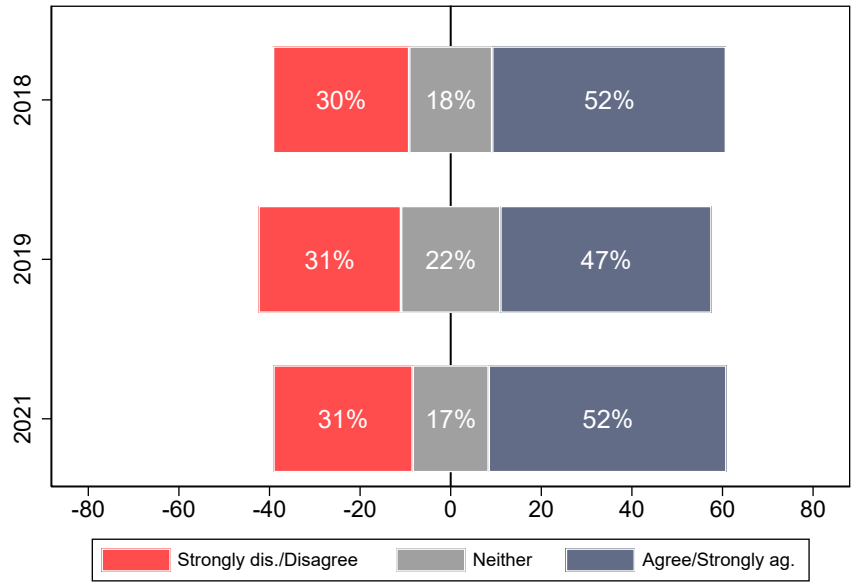


Professional, technical and scientific (PTS); Transport, storage and communications (TSC).
Source: 2021 DoF Credit Demand Survey.

Contentment with existing capacity may be driven by either demand or supply-side factors; on the demand side, firms may feel that there is insufficient demand in the market for any expansion to their existing operations; on the supply side, firms may be facing barriers that inhibit or lower their willingness or ability to expand. Two such supply-side factors are the degree of uncertainty and the level of the risk appetite of the enterprises. Considering the latter issue, Figure 4.3 presents the firms' responses in relation to risk appetite. These data indicate that 46 per cent of enterprises either agreed or strongly agreed with the statement that they would be willing to expand their business even if more risk is attached to the operations of the firm while 38 per cent either disagreed or strongly disagreed with this statement.

Considering the differences across groups of firms in Figure 4.4, it appears older firms are less willing to take on risk with a higher (lower) share of enterprises disagreeing (agreeing) with the statement. A very clear pattern emerges across firm size, with micro enterprises the least willing to expand if it means additional risk; while 42 per cent of micro enterprises agree with the statement, the share is approximately 60 per cent for both small and medium-sized enterprises. Clear sectoral differences are also evident with firms in construction, hotels and restaurants and professional, technical and scientific sectors the least likely to be willing to take on more risk. Firms in the traditional and high-tech manufacturing sectors are the most likely to be willing to take on additional risk; indeed, nearly eight-in-ten high-tech manufacturing firms are willing to do so.

Figure 4.5: Appetite for risk 2018-2021



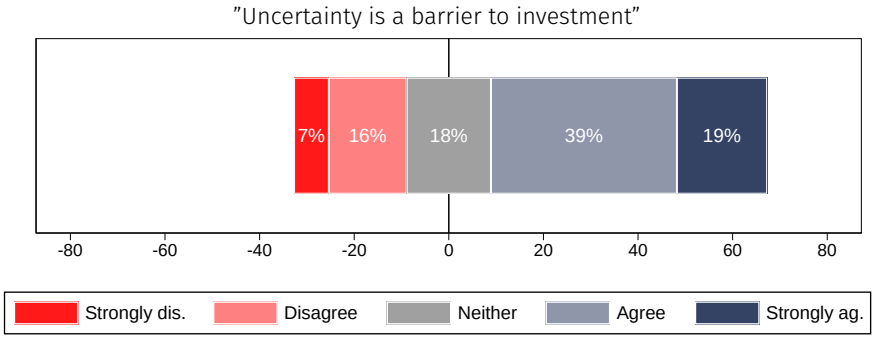
Source: 2018, 2019 and 2021 DoF Credit Demand Survey.

It is also important to consider trends over time in the risk appetite of enterprises. In particular, we are interested in the extent to which the operating environment has been affected by the extreme volatility of the COVID-19 pandemic, and to what extent this could be weighting on enterprises' risk appetite. Figure 4.5 presents data for the current survey wave and two historical periods, 2018 and 2019, to provide a pre-COVID benchmark. While there does not appear to be any reduction in the share of firms agreeing with the questionnaire statement on willingness to risk, a notable increase of 5 percentage points is observed in the disagreeing group. This suggests some reduction in the risk appetite.

Finally, we consider the issue of uncertainty of which the direct impact on investment is well documented in the enterprise literature (Bloom et al., 2007; Bloom, 2009). Figure 4.6 presents the reported data on whether firms agree with the statement that uncertainty is impacting their investment decisions. A total of 57 per cent of enterprises indicate that uncertainty was an issue for their investment while 23 per cent of enterprises disagreed.

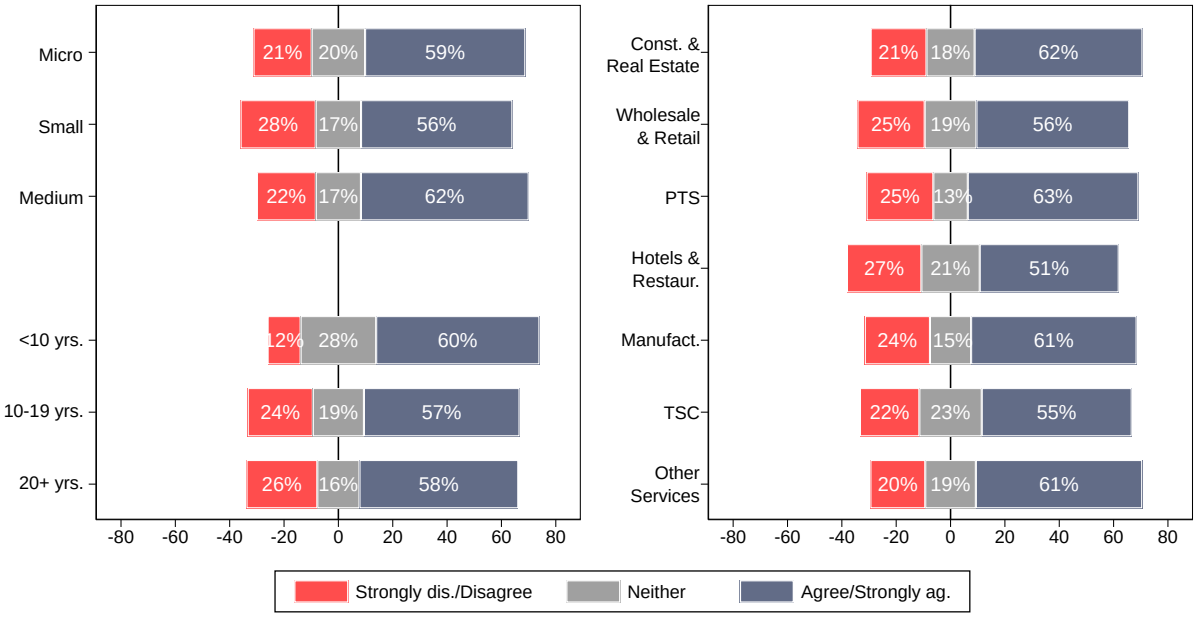
Exploring the differences across groups of firms as presented in Figure 4.7, younger firms were less likely to disagree but more likely to indicate neither agree or disagree. No clear patterns emerged across the size distribution, however notable differences exist across sectors. The sector least impacted by uncertainty was high-tech manufacturing where over half the responding enterprises disagreed. Traditional manufacturing, construction and real estate and PTS sectors had the highest share of firms indicating that uncertainty was a considerable factor in determining their activities.

Figure 4.6: Uncertainty



Source: 2021 DoF Credit Demand Survey.

Figure 4.7: Uncertainty by firm group



Professional, technical and scientific (PTS); Transport, storage and communications (TSC).
Source: 2021 DoF Credit Demand Survey.

4.2 Investment financing and access to finance

The issue of access to finance and its impact on investment is a long standing topic of interest to academics and policymakers. Indeed, globally and domestically, there are many policy supports targeted at SMEs which attempt to alleviate credit constraints and help support their investment such as credit guarantees, subsidised state loan programmes, and capital grants. In Ireland, examples of such supports are the Microenterprise Loan Fund Scheme, the Future Growth Loan Scheme and the COVID and non-COVID credit guarantee programmes. The period since the onset of the financial crisis in Ireland has in particular focused research and policy on how best to ensure sustained enterprise credit in Ireland and documenting the impact of credit constraints (Gerlach-Kristen et al., 2015).

In this specific subsection, we address the issue of financing in two distinct steps. First, we explore firms' subjective views on the availability of external finance as a barrier to investment and their appetite for borrowing. Second, we review data on their investment financing choices for 2020 and the preceding years to explore how firms have, in practice, financed their activities.

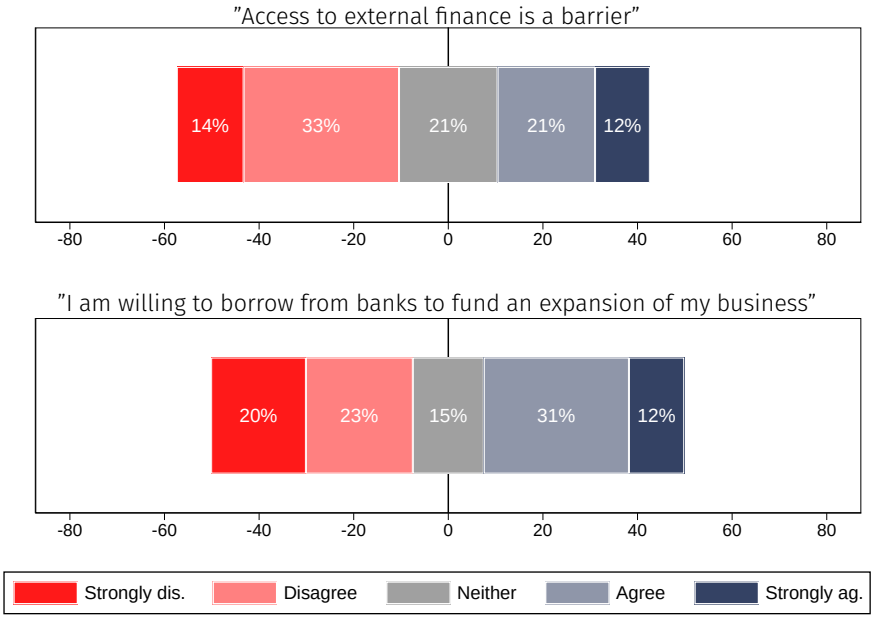
4.2.1 Firms' subjective view on credit environment

A number of the previous studies on investment financing, in particular Lawless et al. (2020b), have indicated a high usage of internal funds for Irish SMEs that is well above the European norm. While this empirical fact has been a long standing feature since the onset of the financial crisis, the extent to which it is driven by supply-side factors (tight credit access) or demand-side factors (low appetite for borrowing) is more difficult to ascertain but also likely to be time varying.

To attempt to provide some light on this issue, we review the survey results for two questions: one is specifically targeted at the supply side, by asking firms whether they see access to finance as a barrier; the other question is a demand-side question which attempts to understand whether firms are willing to borrow in the current climate. As in the previous section, firms responded to these questions on a five point Likert scale covering agree and disagree options. In total, 32 per cent or nearly one-in-three firms agreed or strongly agreed that access to finance was a barrier. In contrast, 47 per cent of enterprises disagreed that access to finance was a problem. In terms of the willingness to borrow to expand, 42 per cent of enterprises would be willing to borrow to expand while 43 per cent or nearly one-in-every two firms would not be willing to borrow to expand. These data indicate that while credit access is perceived to be an issue, a high proportion of firms have a low borrowing appetite.

Figure 4.9 breaks down the responses to the question on access to external finance as a barrier to investment by firm age, size and sector of operation. This provides a more granular assessment of where credit access challenges may be concentrated within the SME population. The share of younger firms agreeing with the statement was higher (at 42 per cent) as compared to older en-

Figure 4.8: Access to finance and willingness to borrow



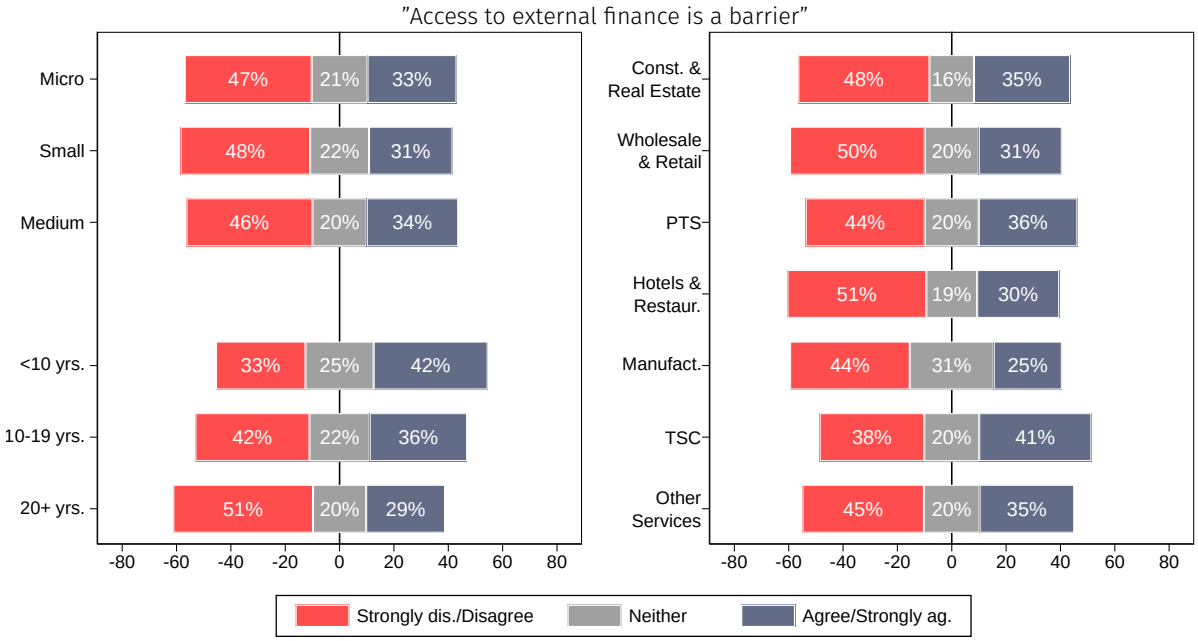
Source: 2021 DoF Credit Demand Survey.

terprises. Little difference exists across the size distribution. The sectors with the highest share of enterprises indicating that credit access is a difficulty are transport, storage and communications, construction, professional, technical and scientific and other services sectors. The lowest level of access to finance problems are reported in the high-tech manufacturing sector at fewer than one-in-five firms.

Figure 4.10 breaks the responses to the question on borrowing appetite by firm age, size and sector of operation. There is no real meaningful differential pattern across the age distribution. However, it is clear that micro sized firms are much less likely to borrow to expand: one-in-every two micro firms indicated that they would not be willing to borrow to expand as compared to one-in-three for small and medium-sized firms. In terms of the differences across sectors, firms had the highest borrowing appetite in transport, storage and communications, and traditional manufacturing at one-in-every two firms. The lowest borrowing appetite was in other services and professional technical and service firms.

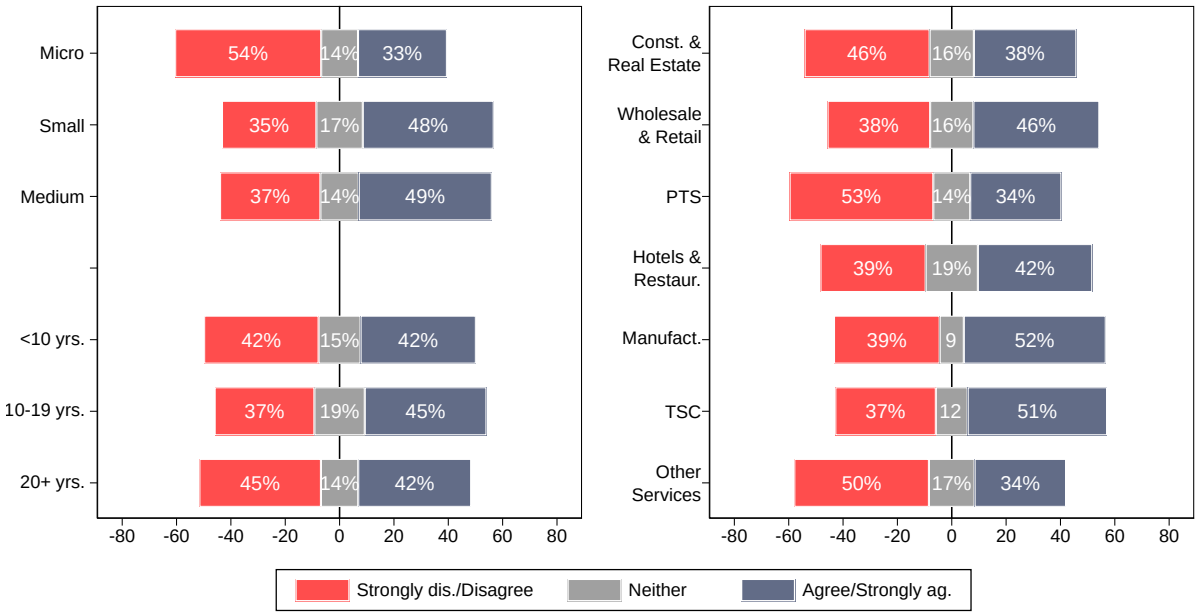
To explore the extent to which the borrowing appetite has changed since the onset of the COVID-19 pandemic, Figure 4.11 presents historical attitudinal data from 2018 and 2019 to compare with our recent 2021 survey. A very clear drop in the borrowing appetite has occurred since the pre-pandemic period with the share of firms willing to borrow to expand falling from 45 per cent in 2019 to 38 per cent in 2021. The share of firms who indicate they would not borrow to expand has increased by an even larger margin, from 39 per cent in 2019 to 48 per cent in 2021. This clearly highlights the drop in credit demand for investment purposes that has occurred since the

Figure 4.9: Access to finance



Professional, technical and scientific (PTS); Transport, storage and communications (TSC).
Source: 2021 DoF Credit Demand Survey.

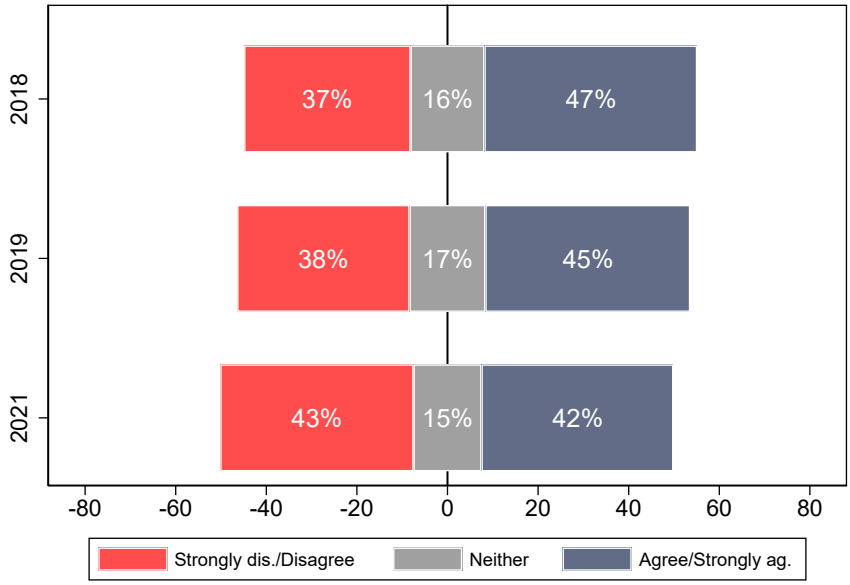
Figure 4.10: Borrowing appetite by firm type



Professional, technical and scientific (PTS); Transport, storage and communications (TSC).
Source: 2021 DoF Credit Demand Survey.

onset of the COVID-19 crisis and also correlates with the drop in investment activity documented in previous sections.

Figure 4.11: Appetite for borrowing 2018-2021



Source: 2018, 2019 and 2021 DoF Credit Demand Survey.

4.2.2 Observational data on financing structure

After identifying the investment patterns, attitudes and constraints of Irish SMEs in the previous sections, this section is concerned with the sources being used in order to fund investment. The main objective of this section is to explore how firms are financing their investment activities. Our survey asks enterprises what proportion of their investment was financed by the following types of financing: internal financing or owners capital; bank loans, external equity, leasing or hire purchase; supplier credit; and other financing. A long standing empirical fact in Ireland has been a high usage of internal financing to fund investment. In this section, we present the following:

- The typical percentages used by enterprises who finance their operations (i.e. the average financing mix);
- The extensive margin corresponds to the percentage of firms that used each type of funding source; and
- The intensive margin which is the amount used if a particular source is chosen as part of the capital structure.

These data are presented in Table 4.1. We present the main new data for 2020 but also previous data for 2017 and 2018 for fixed assets to provide a comparison point pre the COVID-19 pandemic.

We do not have pre-COVID data for the financing structure for intangibles therefore we only include 2020 data for these assets. It is useful to compare the financing structure for tangibles and intangibles separately given the long standing issues noted in the literature on financing constraints and different funding challenges for intangible assets (for example see Hall et al., 2016); typically intangible assets are less collateralisable and can be more challenging to borrow against.

The first set of figures in the table relates to the average financing structure. Focusing first on fixed (tangible) assets, Irish firms predominantly finance from internal funds and this share has actually risen through the pandemic. This increase has been at the expense of leasing and hire purchase which has dropped from 6 percentage points to 1 percentage point. The average bank financing share for intangibles is more than 50 per cent less than for fixed assets which is expected. The second set of figures in the table relates to the proportion of firms using each financing type. In total, nine-in-ten enterprises use internal funds for both tangibles and intangibles while 17 (5) per cent use bank financing for tangible (intangible) assets. Only 3 per cent of firms use equity financing for investment.

If firms do use each asset type, we can measure the percentage of the total investment that they fund using that source. This was 95 per cent for internal funds in 2020, up nearly 10 percentage points from 2018. If bank financing was used for tangible (intangible) assets, the proportion of the total investment funded from that source was 65 (97) per cent. For equity, the proportions were 80 per cent and 61 per cent respectively.

Table 4.1: Share of financing by source (per cent)

	Fixed assets				Intangibles
Sources of funding	2017	2018	2019	2020	2020
Average financing:					
Internal/owner	82	80	.	85	84
Bank loans	11	11	.	11	5
External equity	1	0	.	3	2
Other/refused	3	3	.	2	3
Leasing or hire	3	6	.	1	5
Supplier credit	0	0	.	0	1
Proportion using each type:					
Internal/owner	95	83	.	89	88
Bank loans	17	16	.	17	5
External equity	3	1	.	3	3
Other/refused	4	5	.	2	3
Leasing or hire	8	14	.	2	7
Supplier credit	1	1	.	0	1
Intensity of use if chosen:					
Internal/owner	87	86	.	95	95
Bank loans	65	70	.	65	97
External equity	26	5	.	80	61
Other/refused	74	66	.	89	96
Leasing or hire	31	42	.	41	70
Supplier credit	11	6	.	10	100

Source: 2018, 2019 and 2021 DoF Credit Demand Survey.

5 MULTIVARIATE ANALYSIS OF INVESTMENT ACTIVITY

The preceding sections of this report have provided a detailed description of the state of play in relation to investment activity, its financing and the barriers firms face in capital choices. These statistics allow us to provide a snapshot for how investment flows are trending across groups of firms and different types of capital goods. However, to fully understand the developments in investment trends, and to associate particular movements in the data with economic phenomena, a more thorough multivariate analysis of these data is required. This is also the case for the issues relating to access to finance which have been explored above.

In this section, we estimate cross-sectional investment models linking investment activity to a series of economic factors (such as indebtedness, cash holdings, and profitability) as well as a range of firm characteristics, to provide more insights on the explanatory factors determining investment. Second we explore whether, over and above the explanatory power of these factors, a statistically robust change in the overall level of investment in 2020 can be distinguished vis-à-vis the 2019 data.

5.1 Methods

Investment decisions by their nature are lumpy and infrequent, in that SMEs choose to invest in a particular year, and then may not invest in that particular asset again for a number of years. From a technical point of view, this means that many firms have no investment activities while others have large positive values. To deal with these types of data, an econometric approach that allows for this behaviour is needed. While a number of different approaches are possible, we follow Lawless et al. (2020a) and use a tobit model approach.[6]

We specify the following latent variable investment model:

$$\ln(I(A))_i^* = \beta_1 + \beta_2 \pi_i + \beta_3 \Delta T_i + \beta_4 \left(\frac{D}{A}\right)_i + \beta_5 \left(\frac{D}{T}\right)_i + \beta_6 \left(\frac{Cash}{T}\right)_i + \epsilon_i \tag{5.1}$$

$$\ln(I(A))_i^* = \begin{cases} \ln(I(A))_i & \text{if } I(A)_i > 0 \\ 0 & \text{if } I(A)_i^* = 0 \end{cases} \tag{5.2}$$

where $I(A)$ is the expenditure on investments by firm i, for asset class A. The error term ϵ_i is distributed i.i.d. normal. The vector of control variables X_i contains information for sector, size and firm age. We include the following variables to capture the fundamental economic drivers

[6] While Lawless et al. (2020a) use a Heckman model in their main specification, we do not use this approach due to the absence of an appropriate selection variable.

of investment: profits (π) is a dummy variable which takes the value of 1 if the firm's operating expenditure was lower than its turnover; ΔT_i captures the change in turnover in between the current and preceding years of the survey; the debt-to-asset ratio and the debt-to-turnover ratio are included to capture firm indebtedness and the firms' debt burden; and the cash-to-asset ratio to capture the role of internal financing and availability of own resources for investment purposes.

Table 5.1: Variable definitions and expected regression coefficients

Variable		Exp. coef.
Firm has operating profits=1	π_i	$\beta_2 > 0$
Change in turnover	ΔT_i	$\beta_3 > 0$
Debt-to-Total Asset Ratio	$\left(\frac{D}{A}\right)_i$	$\beta_4 < 0$
Debt-to-Turnover Ratio	$\left(\frac{D}{T}\right)_i$	$\beta_5 < 0$
Cash-to-Total Asset Ratio	$\left(\frac{Cash}{T}\right)_i$	$\beta_6 > 0$

The data used for this assessment are the two years of the survey 2019 and 2020. The reason for limiting the analysis to these two periods is data availability and to provide a more direct comparison of the pre and during COVID scenarios. All continuous, non-censored variables are trimmed to remove outliers greater than or equal to the 1 per cent tails of the distribution. When we include the variables above in the model, it is expected that these variables should capture the main economic shocks from COVID-19, in particular the change in turnover. However, it is also highly likely that, due to the exceptionally uncertain operating environment within which firms are working, and the difficulty understanding the future demand profile, firms will lower their investment by more than the economic shock might suggest. If this is the case, a variable that captures the year 2020 should be statistically significant and negative, even with the inclusion of these other variables. If this is the case, it will provide clear evidence that investment flows are lower than we would expect even given the economic shock, a clear sign of heightened uncertainty. It must also be noted that this research focuses on cross-sectional correlations and associations and does not attempt to make statements about direct causation.

5.2 Results

The results of the regression analysis are presented in Table 5.2. The results of the regressions across different asset classes are presented in the columns. The first column is a regression with the total capital as the dependent variable (total fixed assets and intangibles) excluding staff. The separate assets are presented in columns (2) to (6) in the following order: buildings, vehicles, other fixed assets, intangibles, and staff.

Table 5.2: Investment regression results

	(1) Total†	(2) Buildings	(3) Vehicles	(4) Oth. fixed	(5) Intangibles	(6) Staff
Fundamentals:						
- Profit dummy	0.873	0.371	2.406*	0.875	6.464***	1.105
	(0.682)	(1.626)	(1.239)	(0.903)	(2.242)	(1.149)
- Turnover change	0.010	0.012	0.013	0.008	−0.004	0.011
	(0.007)	(0.020)	(0.014)	(0.010)	(0.028)	(0.013)
Debt and Liquidity:						
- DTA	−0.044	−1.899*	0.636	0.273	1.125	−0.132
	(0.342)	(0.990)	(0.628)	(0.441)	(1.010)	(0.568)
- DTI	0.342	0.716	−0.179	0.684	−4.053*	−0.252
	(1.034)	(2.019)	(1.744)	(1.232)	(2.135)	(1.407)
- Cash/TA	−0.860	−2.472	0.842	0.974	7.316**	4.512***
	(0.928)	(2.742)	(1.822)	(1.245)	(3.399)	(1.482)
2020 dummy	−1.937***	−0.313	−1.582	−2.328***	−0.627	−2.897***
	(0.524)	(1.313)	(1.004)	(0.721)	(1.936)	(0.914)
Observations	1,821	1,824	1,824	1,821	1,823	1,791

†Excluding staff and digital

All regressions include sets of dummy variables to control for sector, size, and firm age category.

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

One feature is that few of the variables are consistently strong in terms of their impact. This could be due to the fact that as these data are cross-sectional, we do not observe the intertemporal decision-making impulses that are behind firms' decisions regarding investment i.e. as we do not observe the firms' activities over time, it is difficult to explain flows (changes in capital) with only level variables. Furthermore, there may be a low correlation between current growth and investment if firms are invested now and adjustment costs are hampering current activities. It is also the case that different factors may have a differential impact on different types of capital expenditure.

This does appear to be the case in our sample with some interesting results clearly evident across different asset classes. We see a clear link between profitability and purchase of vehicles and intangible assets. Indebtedness appears to be linked to a drag on investment in buildings; the debt-to-asset ratio is negative and significantly related to building investment. It could possibly be the case that building investment requires collateral that highly leveraged enterprises cannot access if they have few assets left to post as security. Indebtedness (in terms of debt-to-income ratio) is also negatively correlated with intangible assets suggesting high debt relative to income firms have lower intangibles. These debt-limiting findings are consistent with previous research on debt overhang.

We find that internal cash is linked to investment in staff and intangibles highlighting the importance of internal funds for capital outlays for these assets. We do not find an effect of the change in turnover on any asset variable. Of particular importance, we find that the dummy on the year 2020 indicator variable is negative and statistically significant for the following asset classes: overall, other fixed assets and staff. This suggests that firms lowered their investment in these assets by more than would be expected by the economic fundamentals alone in 2020. This, in turn, suggests that the uncertainty channel is playing an important role at present.

6 CONCLUSION

Despite its importance, until recently little was known about SME investment activity other than at an aggregate level with considerable data gaps in relation to composition and distribution across firms. In order to fill these gaps, the CDS run by the Department of Finance includes a specific investment and assets module since 2017. Using these data, this report tries to answer important questions that will provide valuable insight for policymakers. The statistics presented in this report are intended to provide a better understanding of investment patterns of Irish domestic small and medium enterprises. This information is of critical importance to assess and understand the growth possibilities and productive capacity of Irish indigenous enterprises.

The period prior to the onset of the COVID-19 pandemic can be characterised by the improving economic situation for SMEs with rising turnover and employment. However, investment did not rise as rapidly and self-financing of investment continued to predominate. The uncertainties around Brexit can also be seen in the data, in 2019 in particular. Thus uncertainty appears to have begun to feed through to investment prior to the pandemic.

That notwithstanding, as anticipated, the COVID-19 pandemic has had a notable effect on capital expenditures for SMEs. The degree to which standard business operations were disrupted and the degree of uncertainty pertaining to the epidemiological situation naturally led to a lowering of investment activity. However, like the COVID-19 economic shock itself, the impacts were not uniform and extremely heterogeneous across both asset classes and different groups of enterprises. This heterogeneity likely ties in with the degree of asymmetry in the exposure to the economic travails that have accompanied the pandemic. However, our regression work finds that, even controlling for the size of the economic shock that each firm experienced, investment in staff, machinery and equipment and other assets declined. This may be due to the ongoing uncertainties with firms pulling back by more than would typically be explained by their economic performance.

At this juncture, with the economic difficulties of the pandemic beginning to stabilise (albeit with a context of rising COVID-19 case numbers), it is important to take stock as to how capital formation now is going to help drive productivity and growth in the years ahead. The rise in

the level of digital investment demonstrated in this report, as well as the maintenance of the level of intangible asset spending, are both positive indicators of future growth. However, the fall off in staff investment is worrisome as human capital accumulation is a critical determinant of growth. It is likely that the COVID-19 pandemic will continue to provide challenges for many firms in determining the profile of demand for their goods and services. However, as this uncertainty wanes, firms should be more confident in their prospects and continue to invest for the future.

From a policy perspective, a number of points are important from our research. The main aim of this research stream on SME investment was to fill a long standing data gap in the Irish information infrastructure. The major benefit of addressing these data gaps is a richer picture of the sector can be built up and more detailed information becomes available with which to inform policymaking. Having granular and accurate information on investment and financing trends across SMEs is critical to correctly diagnosing and calibrating the policy response.

In our analysis we find a consistent impact of the COVID-19 pandemic on firms that goes above the impact identified through what happened with their own fundamentals. Indeed, it is likely given these uncertainty channels and the real effects on enterprises that without the extensive policy support for firms during the pandemic (through wage subsidies, fixed cost recovery etc.) the impact on investment would arguably have been greater. As we exit the pandemic period and firms begin to operate on a more normal economic footing, policymakers will need to be cognisant of correctly calibrating policies on investment such as lending supports which could be targeted at the group of firms identified as having access to finance concerns (such as the credit guarantee scheme or future growth loan scheme) to ensure they are flexible and allow the heterogeneity in the SME constraints to be addressed.

REFERENCES

Añón Higón, D., Gómez, J., and Vargas, P. (2017). Complementarities in innovation strategy: do intangibles play a role in enhancing firm performance? *Industrial and Corporate Change*, 26(5):865–886.

Arrighetti, A., Landini, F., and Lasagni, A. (2014). Intangible assets and firm heterogeneity: Evidence from Italy. *Research Policy*, 43(1):202–213.

B&A (2021). SME credit demand survey - October 2020 - March 2021, Final survey report. Technical report, Department of Finance.

Berger, A. N. and Udell, G. F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of banking & finance*, 22(6-8):613–673.

Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica*, 77(3):623–685.

Bloom, N., Bond, S., and van Reenen, J. (2007). Uncertainty and investment dynamics. *Review of Economic Studies*, 74(2):391–415.

Coleman, S. and Robb, A. M. (2011). Financing strategies of new technology-based firms. *Review of Economics and Finance*, 1(4):1–18.

Corrado, C., Hulten, C., and Sichel, D. (2009). Intangible capital and US economic growth. *Review of income and wealth*, 55(3):661–685.

CSO (2020). Business in Ireland 2018. Technical report, Central Statistics Office.

Di Ubaldo, M. and Siedschlag, I. (2021). Investment in knowledge-based capital and productivity: Firm-level evidence from a small open economy. *Review of Income and Wealth*, 67(2):363–393.

Gargan, E., Lawless, M., Martinez-Cillero, M., and O'Toole, C. (2018). Exploring SME investment patterns in Ireland: New survey evidence. *Quarterly Economic Commentary: Special Articles*.

Gerlach-Kristen, P., O'Connell, B., and O'Toole, C. (2015). Do credit constraints affect SME investment and employment? *The Economic and Social Review*, 46(1, Spring):51–86.

Hall, B., Moncada-Paternò-Castello, P., Montresor, S., and Vezzani, A. (2016). Financing constraints, R&D investments and innovative performances: new empirical evidence at the firm level for Europe. *Economics of Innovation and New Technology*, 25(3):183–196.

Lawless, M. (2014). Age or size? Contributions to job creation. *Small Business Economics*, 42(4):815–830.

Lawless, M., Martinez, M., and O'Toole, C. (2020a). COVID-19 pandemic and SMEs revenues in Ireland: What's the gap? *Quarterly Economic Commentary: Special Articles*.

Lawless, M., Martinez-Cillero, M., O'Toole, C., Gargan, E., Cantillon, L., and McGoldrick, P. (2020b). SME investment report 2019. Technical report.

Lawless, M., McCann, F., and O'Toole, C. (2013). The importance of banks in SME financing: Ireland in a European context. Economic Letters 05/EL/13, Central Bank of Ireland.

Lawless, M., O'Connell, B., and O'Toole, C. (2015). SME recovery following a financial crisis: Does debt overhang matter? *Journal of Financial Stability*, 19(C):45–59.

Marrocu, E., Paci, R., and Pontis, M. (2012). Intangible capital and firms' productivity. *Industrial and Corporate Change*, 21(2):377–402.

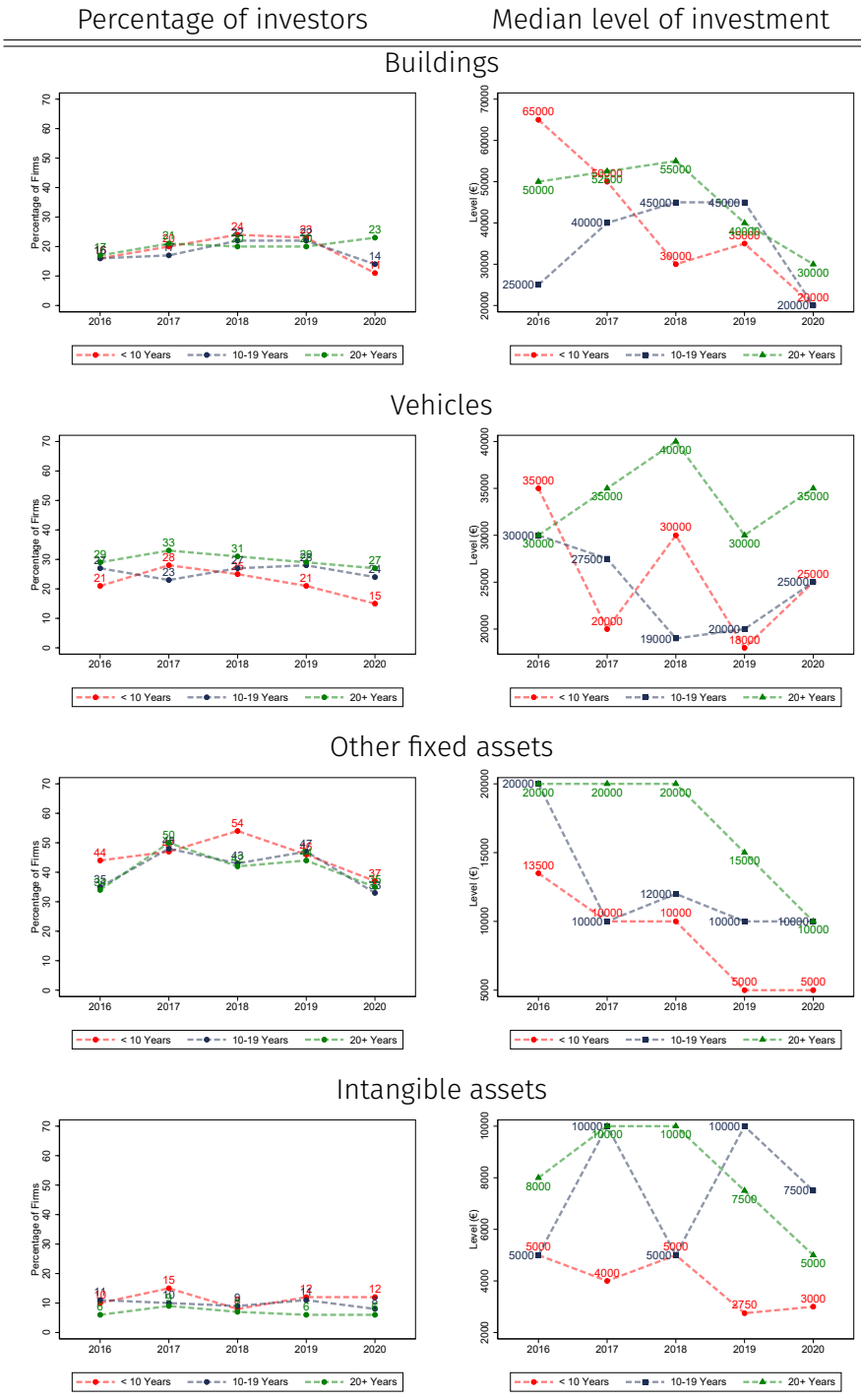
O'Toole, C. (2020). The lockdown tale of two economies in Ireland: How big tech and pharma bucked the trend. Research Notes RN20200301, Economic and Social Research Institute (ESRI).

O'Toole, C., Lawless, M., Kren, J., McCann, F., and McQuinn, J. (2021). New survey evidence on COVID-19 and Irish SMEs: Measuring the impact and policy response. *The Economic and Social Review*, 52(2).

Riley, R., Robinson, C., and Davison, S. (2011). Skills and economic performance: The impact of intangible assets on UK productivity. *Evidence report*, 39.

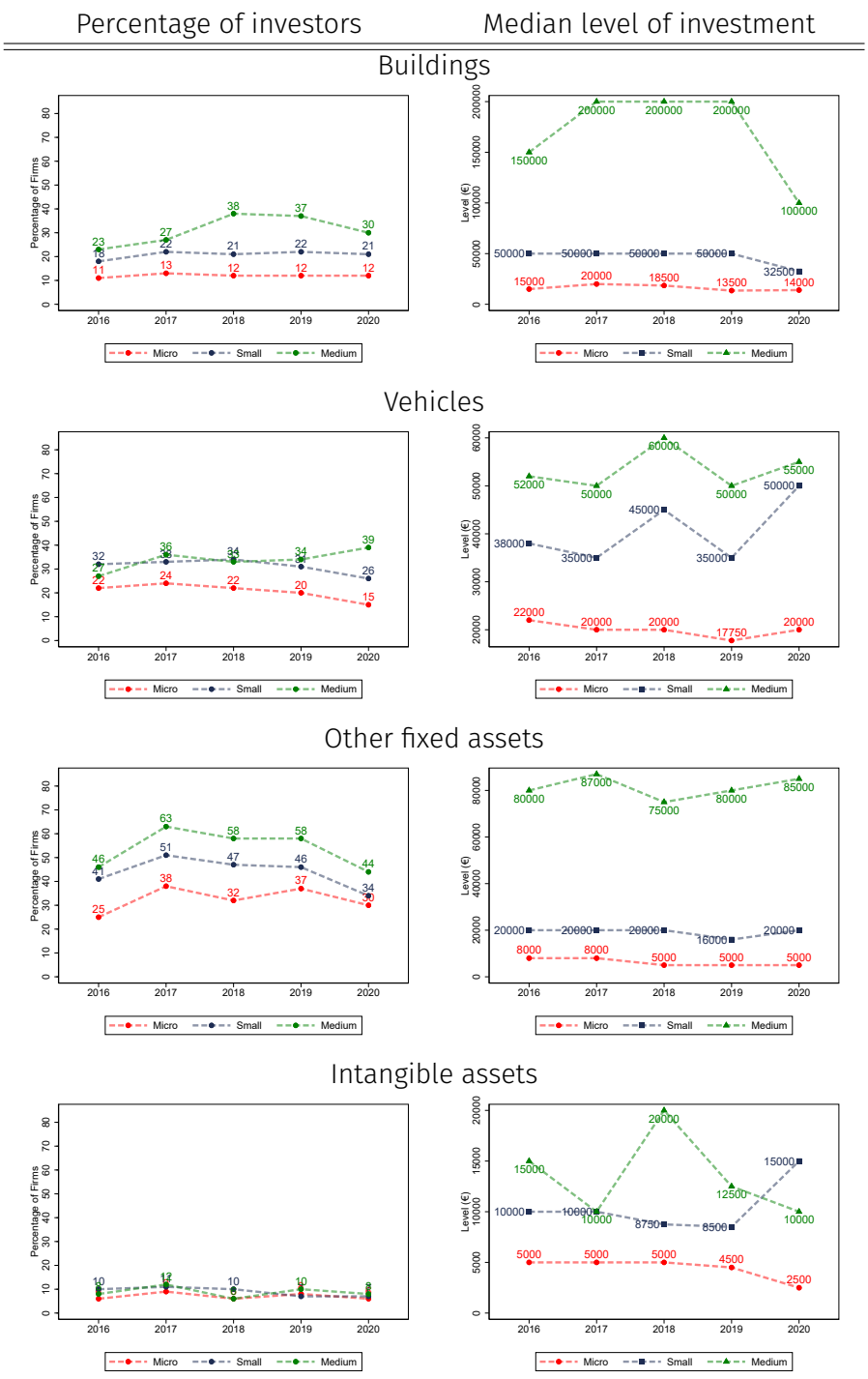
APPENDIX I ADDITIONAL INVESTMENT TRENDS BY FIRM TYPE

Figure I.1: Investment by firm age and asset class (percentage and level)



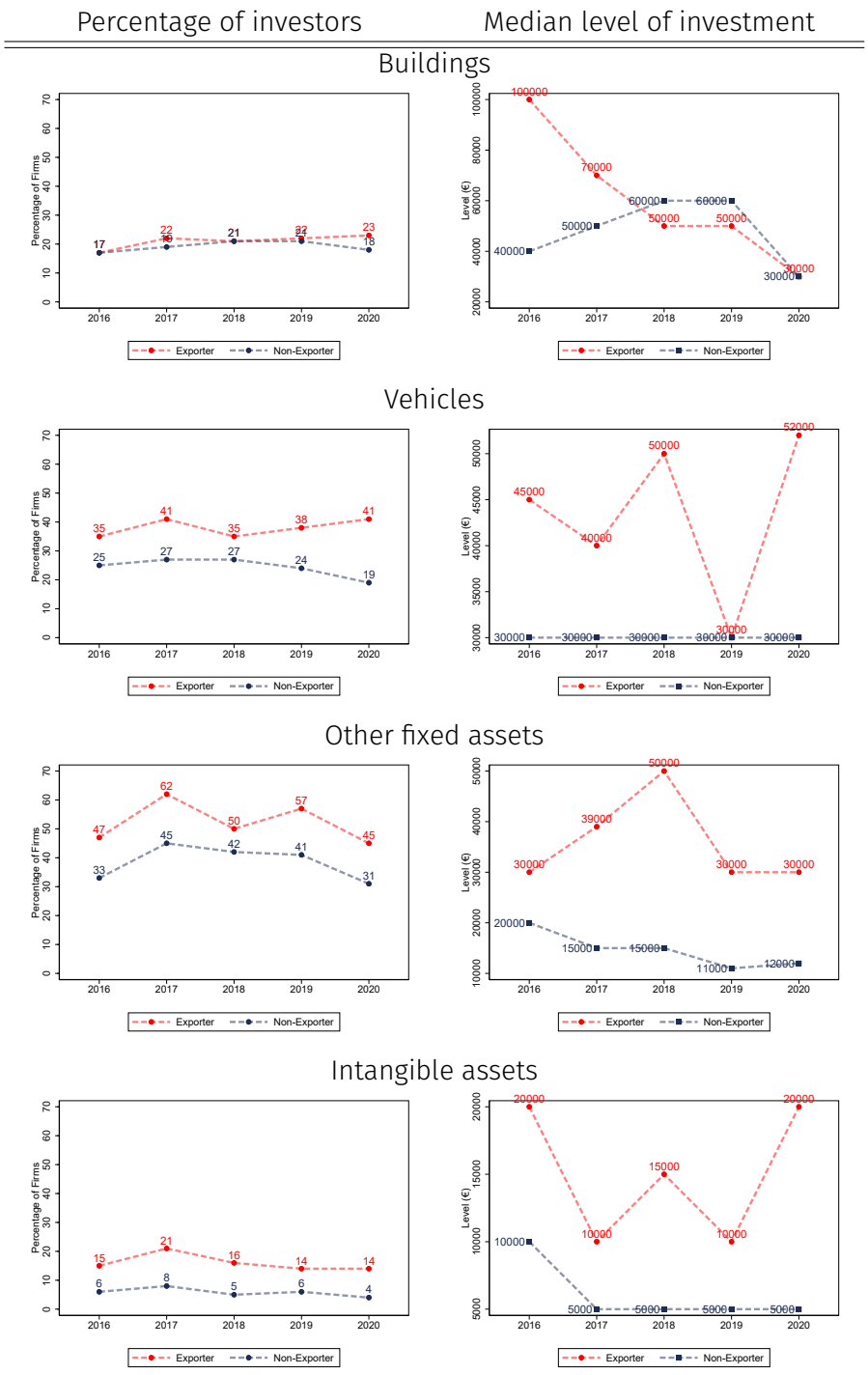
Source: 2017-2021 DoF Credit Demand Surveys.

Figure I.2: Investment by firm size and asset class (percentage and level)



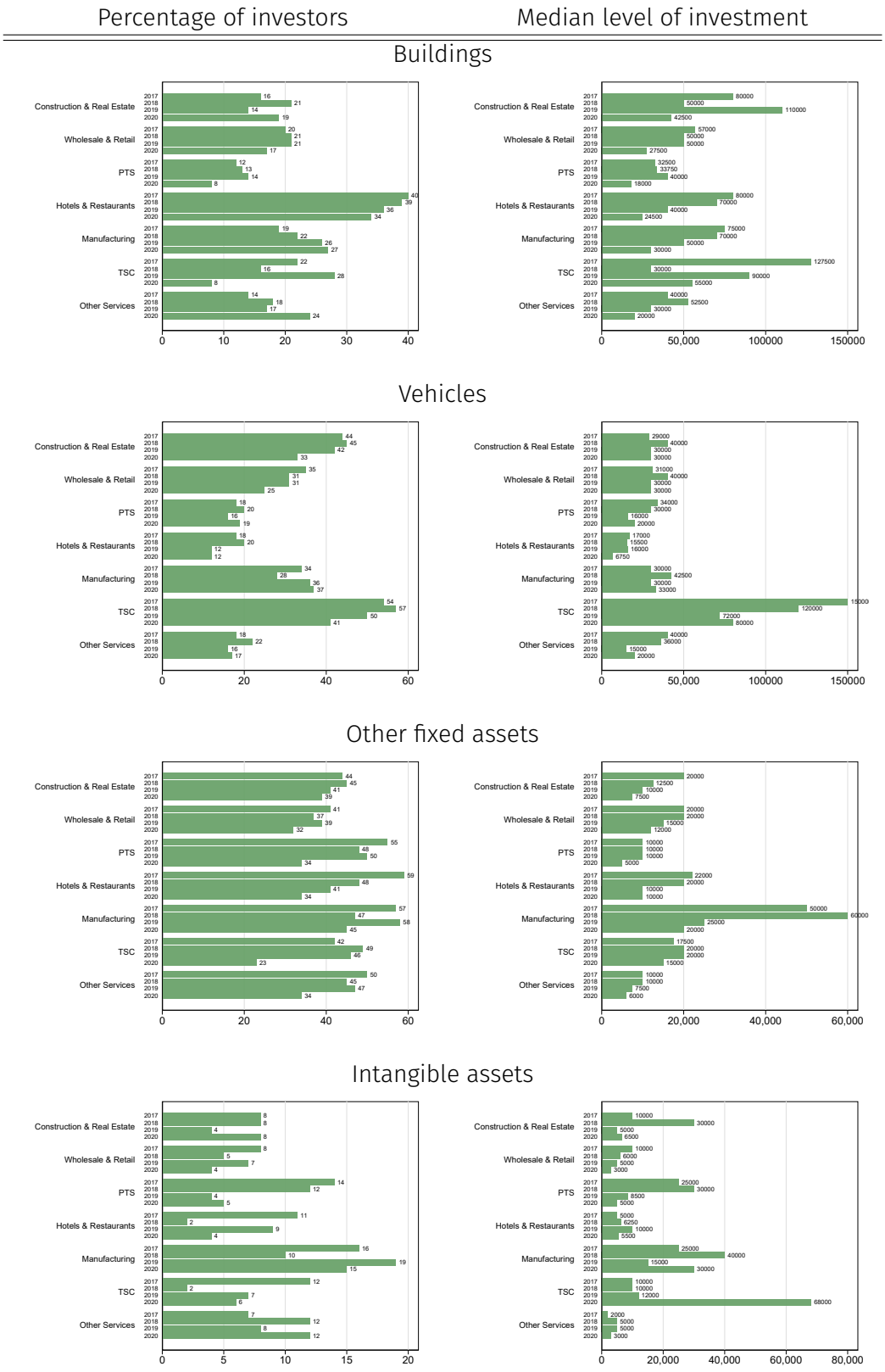
Source: 2017-2021 DoF Credit Demand Surveys.

Figure I.3: Investment by firm export and asset class (percentage and level)



Source: 2017-2021 DoF Credit Demand Surveys.

Figure I.4: Investment by sector and asset class (percentage and level)



Source: 2017-2021 DoF Credit Demand Surveys.

APPENDIX II DATA SUMMARY

II.1 Composition of the sample

Main data source of this report is the 2021 Department of Finance SME Credit Demand Survey. The survey was conducted in summer of 2021 with the sample size of 1,500 Irish SMEs. Two inclusion requirements are fewer than 250 employees, and less than €50 million of annual turnover in the past year.

The sample selection and sampling accuracy of the survey are described in B&A (2021). The dataset includes sampling weights based on company size and sector quota, which are then used throughout the report. Table II.1 provides the overview of the sample by sector, size and age category both directly and using survey weights.

Parts of the report refer to the data from previous waves of the same survey. These were conducted in 2017, 2018, 2020 (autumn) and 2019 (spring). In all of them the sample size was around 1,500 firms, and they followed the same data collection and cleaning procedure.

Table II.1: Sample composition by sector, size, and age category

	Unweighted			Weighted		
	Freq.	Per cent	Cum.	Freq.	Per cent	Cum.
Construction & Real Estate	214	15.1	15.1	158.3	11.0	11.0
Wholesale & Retail	410	29.0	44.1	473.6	32.8	43.7
PTS	278	19.7	63.8	227.3	15.7	59.4
Hotels & Restaurants	124	8.8	72.5	171.2	11.8	71.3
Manufacturing	142	10.0	82.5	183.6	12.7	84.0
TSC	89	6.3	88.8	62.6	4.3	88.3
Other Services	158	11.2	100.0	169.1	11.7	100.0
Micro	869	57.9	57.9	585.0	39.0	39.0
Small	544	36.3	94.2	570.0	38.0	77.0
Medium	87	5.8	100.0	345.0	23.0	100.0
<10 Years	208	13.9	13.9	187.7	12.5	12.5
10-19 Years	358	23.9	37.7	321.1	21.4	33.9
20+ Years	934	62.3	100.0	991.2	66.1	100.0
Total	1,500	100.0		1,500	100.0	

Source: 2021 DoF Credit Demand Survey.

II.2 Data cleaning

Some additional data cleaning was required to ensure maximal sample size and data quality. The approach here follows the practices used in previous research using Credit Demand surveys such as Lawless et al. (2020a) or O'Toole et al. (2021).

Firstly, some firms refused to provide the exact number of employees (1 obs) or their turnover (126 obs). However, in subsequent questions they have provided the band in which the value is located. In these cases, the missing value is imputed using the middle value of the band.

Secondly, on the question of the share of each investment financing option, adjustments were made when provided answers did not sum to 100 per cent. In most cases, the sum is close to (but not exactly) 100 per cent which is likely due to rounding error. Thus, the values were either scaled up or down accordingly. However, when the answer was incomplete then all shares were set to missing and thus ignored.

And thirdly, the distribution of investments is highly skewed which could excessively affect the means and the regression results. To mitigate this issue in each investment class the outliers are trimmed for values above the 99th percentile.

II.3 Types of investments

The survey asked firms to provide the euro value of their investments in 2020 for the following six asset classes:

A. Buildings or other construction activities.

B. Vehicles and other transport equipment.

C. Other fixed assets (including machinery and equipment).

D. Intangible assets (i.e. research and development, patents, trademarks and copyrights).

E. Investment in staff.

F. Digital technologies or e-commerce activities (such as automation, robotics, artificial intelligence, blockchain, data analytics infrastructure, internet communication devices etc.).

'Total fixed asset investments' is a sum of (A)+(B)+(C). Furthermore, total fixed assets are summed together with (D) into 'total (capital) investments'.

Table II.2: Summary of regression variables

Variable	Obs	Mean	Std. dev.	Min	Max
ln(Total capital inv.)*	2,796	5.692	5.208	0	15.46
ln(Buildings inv.)*	2,809	1.865	4.113	0	16.12
ln(Vehicles inv.)*	2,808	2.361	4.360	0	13.82
ln(Other fixed)*	2,803	3.467	4.619	0	14.00
ln(Intangible inv.)*	2,810	0.568	2.220	0	13.82
ln(Staff inv.)*	2,753	2.140	3.868	0	12.43
Profit dummy	2,851	0.825	0.380	0	1
Turnover change	2,598	-20.90	34.35	-99.96	100
DTA	2,074	0.382	0.809	0	7.813
DTI	2,618	0.148	0.359	0	3.900
Cash/TA	2,185	0.231	0.276	0	1
2020 dummy	2,860	0.495	0.500	0	1

Source: 2020 and 2021 DoF Credit Demand Surveys.

Whitaker Square,
Sir John Rogerson's Quay,
Dublin 2
Telephone **+353 1 863 2000**
Email **admin@esri.ie**
Web **www.esri.ie**
Twitter **@ESRIDublin**

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE