Cost of doing business during COVID-19 SME investment in public health compliance

Janez Kren[a,b], Martina Lawless[a,b], and Conor O'Toole[a,b]

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Abstract

In this paper, we use a novel survey module to consider investment in health-related expenditures by SMEs following the onset of the COVID-19 pandemic in Ireland. Using a unique dataset designed to capture expenditure on public health measures, we explore the heterogeneity in expenditure across firms and explore its determinants using traditional models. We find that 86 per cent of SMEs invested in health measures with a mean investment of €15,500 and a median of €3,500. Nearly all investment was financed by internal funds. Health investments are uncorrelated with economic performance and financial factors, in contrast to traditional models of investments. This highlights the random nature of the COVID-19 shock.

1 Introduction

The spread of COVID-19 across the world in 2020 heralded public health restrictions on economic and social life that were in many countries amongst the most stringent ever seen in peacetime. With varying restrictions still in place at the time of writing across countries, the full extent of the impact of these restrictions on economic outcomes is still playing out. Early indicators show substantial reductions in economic activity in line with the intensity of public health measures (Apedo Amah et al., 2020; Bartlett & Morse, 2020; Chetty et al., 2020).

Theses measures have impacted the level and distribution of economic activity in a multitude of ways. In terms of the impact on enterprises, much of the existing literature has focused on the impact on turnover and employment as well as the efficacy of the policy response (Apedo Amah et al., 2020; Cirera et al., 2020; Bartik et al., 2020a,b). However, a critical issue that is absent from the literature (as far as we are aware) is research on what investments firms made in mitigation measures or other public health-related expenditures to attempt to continue to operate safely. Given these investments (such as in premises changes, personal protective equipment and staff separation devises) were likely to be an important consideration for firms, it is useful to understand their size, determinants, financing and the heterogeneity of deployment across firms.

To address this gap in the literature around the impact of COVID-19, we examine how much small and medium enterprises (SMEs) in Ireland spent on compliance with social distancing and other public health measures and how these expenditures were financed. Ireland is a useful case study as it had some of the most stringent public health measures in the first lockdown phase from April to June 2020. This gives us an insight into the operational adjustment costs that firms faced as a result of the pandemic and how these varied across firm characteristics. To explore these issues, we use a novel survey collected by the Irish Ministry of Finance in late 2020. This provides information to quantify the impact of the pandemic on health compliance costs. A general overview of the survey can be found in Kren et al. (2021) which provides a detailed analysis of the broader impact on firms.

We find that almost all firms (86 per cent) incurred some level of expense to comply with the new health requirements, the mean expenditure was €15,595 with a median spend of €3,500. The main exception was amongst the self-employed who were less likely to invest in this area. In terms

of the level of expenditure, we find that the amount spent was mostly proportional to the number of employees. There were however differences across sectors (primarily contrasting consumer-oriented sectors with those less reliant on face-to-face transactions.) The investments were relatively small for most firms and almost entirely financed by existing internal funds (despite the pressures of COVID-19-related turnover reductions). Somewhat surprisingly, we find little correlation between these expenditures and traditional determinants of investment expenditure (such as profitability, access to finance, indebtedness etc). The lack of a correlation between firm performance and investment expenditures shows the unique nature of the shock and the randomness of its impact across enterprises.

The remainder of the paper is structured as follows. Section 2 presents the data and descriptive statistics. Section 3 outlines the regression analysis while section 4 concludes.

2   Data and descriptive statistics

Our data are taken from a bespoke survey module that was conducted in October 2020 as part of a long running SME Credit Demand Survey series, undertaken by the Irish Ministry of Finance. This survey has been used by a number of researchers to assess the impact of various financial and other factors on SME investment activity (Gerlach-Kristen et al., 2015; Lawless et al., 2015; Martinez-Cillero et al., 2020). A full overview of this module, which was designed to capture the impact of the COVID-19 pandemic on Irish SMEs, can be found in Kren et al. (2021). In this module, we asked firms the following question:

> "To deal with changes to the business environment around COVID-19, have you invested in your business with a view to changing your operation in line with public health guidelines e.g. adaptions for physical distancing, hand hygiene etc?"

If firms answered yes to this question, they were then asked how much in euros they spent and how it was financed (e.g. internal funds, external finance from banks, trade credit, equity and other financing).

Figure 2 plots the overall distribution of investments in health expenditures across all firms in the survey. There is a notable spike at zero expenditure, with 14% of SMEs reporting no outlays in this area. The median investment amount (indicated by the dashed line in the graph) is approximately €3,500.

The distribution is fairly skewed with the mean investment more than four times the median at €15,595 (the solid vertical line).

This leads us to ask how much the extensive (participation in expenditure) and intensive (spending amounts) margins vary by observable characteristics such as sector of activity and firm size. Might these be enough to understand the observed mass at zero and degree of skewness evident in the presentation of the data in Figure 2?
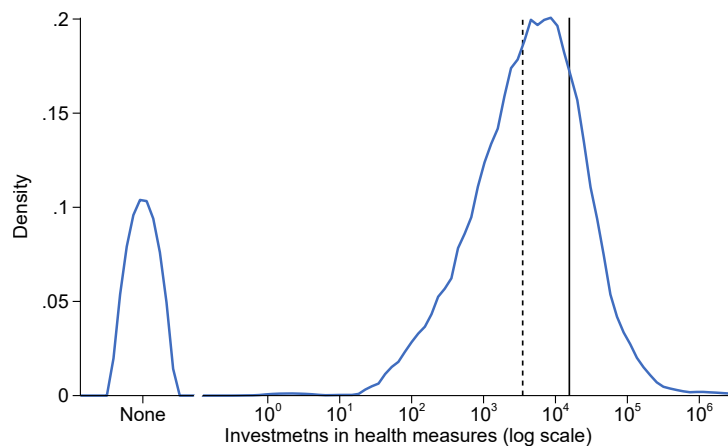

Figure 1: Kernel density estimation of total health-measure investments
Median = €3,500 (dashed line), mean = €15,595 (solid line). 14% of SMEs do not report any COVID-19 related public health investments.

Looking first at firm size as a driver of investment in complying with health measures, Figure 2 plots the probability of having invested any amount by number of employees and Figure 3 plots the amount. There is a strong positive relationship between firm size and the probability of investing, particularly at the lower end of the size distribution. This flattens off for firms with over ten employees with the probability of investing approaching one at that point. While firm size therefore plays a role in undertaking these investments, we find that the amount spent varies little per employee so although larger firms will have spent more overall, there is no real evidence of scale changing the per-employee cost.

Figure 3 shows the close fit of the mean and median expenditures per employee, both including and excluding those with zero expenditure. For the smallest firms, particularly those with fewer than five employees, there is an initial substantial gap between the expenditures depending on whether zero values are included. However, as the participation rate increases sharply

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to close to one by the time firms have more than ten employees, the measures converge.
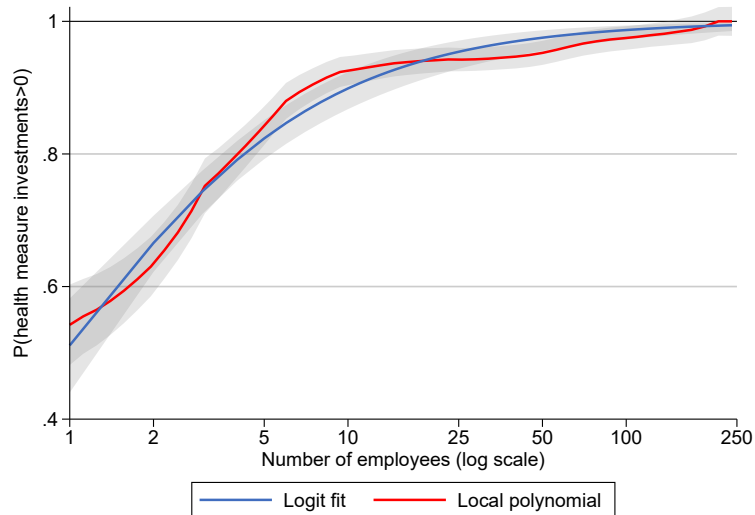

Figure 2: Probability of health measure investments as function of firm size
Shaded area is 95% confidence band.

We next split the survey sample into twelve sectors to give as great a degree of granularity as possible while maintaining adequately robust sample sizes. We also look at four size classifications for the firms: these are self-employed, other micro firms (employ between 2 and 9 people), small firms (10 to 49 employees) and medium firms (50 to 249 employees). Table 1 compares the distribution of health investments across these sectors and size classes, with the extent of the turnover shock from the pandemic for each group also presented for context. The first two columns give some background statistics on the groups: the first column reports the number of firms in each group out of the total of 1,503 firms in the survey; and the second column reports the average employment which shows a fair degree of variation across sectors.

For the health compliance investments, Table 1 first reports the share of firms that reported having positive expenditures in this area. It then reports the mean and median of expenditure scaled by the number of employees (health expenditures per employee). More detailed graphing of the full distributions of these investments by sector and size are presented in Appendix. Likewise, the extent of the turnover shock (in euros per employee per month) is reported in the same way. As already described
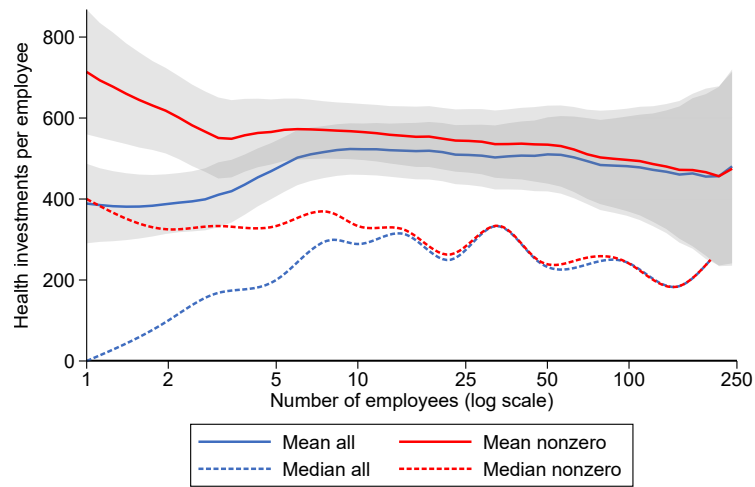
Figure 3: Value of health measure investments by firm size

Means conditional on size are estimated using kernel-weighted local polynomial smoothing. Conditional medians estimated using median spline. Blue lines include all firms in the sample, red lines exclude firms without COVID-19-related health measure investments. Shaded area is 95% confidence band.

above, the vast majority of firms (86%) spent some amount on compliance with health measures with a small but non-negligible group of 14% having no expenditure in this area.

The most evident variation in the participation margin is by firm size group. Almost all small and medium firms had some expenditure to comply with the new health restrictions. This falls to 79% for small firms and just half for the self-employed. Ability to work remotely and lower necessity for face-to-face contact amongst the smallest firms is likely to play a role in explaining this pattern across size groups. Once investment was being made, however, the variation in the level of expenditures seems relatively modest when expressed as an amount per employee. The mean expenditure by the self-employed and micro firms are rather lower than that of firms with more employees but there is very little difference in expenditures between small and medium sized firms. Across sectors, the highest expenditures are in human health, construction and hotels and restaurants. Administrative and professional services report the lowest average spending levels as well as both being at the lower end of the participation range. This is likely to reflect greater ease of remote working within these two sectors. This is an important finding as it shows the uneven cost on a sectoral level and is likely to have policy implications. For example, sectoral supports are likely to

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be more effective and desirable (in terms of targeting impacted firms) than blanket instruments.

The right-hand panel of Table 1 shows the reductions in turnover per employee across the broad sectors and size groups. The figures in the table contrast the period between mid-March and October 2020 to the level of activity in 2019. Considerable variation is evident both across and within groups. Using this survey, Kren et al. (2021) find a mean overall fall in turnover of over 26 per cent for all SMEs, with turnover halving for firms at the 25th percentile. As shown in this table, firms at the 75th percentile faced no reduction in turnover in many sectors. The exceptions are in hotels and restaurants, motor trade and transport, where even the better performing firms made losses. In contrast, the top quartile of firms in the retail sector increased turnover.

Table 1: Health measure investments in EUR per employee and size of COVID-19 turnover shock

	Freq.	Empl.	H. investments			Δ Turnover	
			%	Mean	Median	Mean	Median
Agriculture & food	59	24.7	78	471	222	-2,195	-236
Manufacturing	151	35.2	86	482	250	-2,626	-2,042
Construction	136	21.4	84	606	286	-3,360	-2,083
Wholesale	182	27.3	86	370	208	-4,858	-2,875
Retail trade	236	19.3	86	454	214	-1,501	-938
Motor trade & repair	52	16.0	97	470	250	-6,798	-5,515
Hotels & restaurants	167	51.6	94	605	222	-3,207	-2,083
Transport	61	41.0	90	405	250	-2,927	-2,398
Real estate & finance	64	30.5	93	474	278	-1,090	0
Professional serv.	226	23.7	76	373	154	-2,827	-1,146
Administrative serv.	90	52.0	84	300	111	-2,550	-868
Human health	77	37.5	95	894	444	-1,049	-500
Self-empl	157	1.0	50	386	0	-2,672	-1,250
Micro	429	4.7	79	430	200	-3,069	-1,458
Small	571	20.9	94	521	286	-3,082	-1,786
Medium	346	92.6	98	511	208	-2,417	-972
Total	1503	30.7	86	478	226	-2,879	-1478

Empl. = mean number of full-time equivalent employees. % = Percentage of firms who had invested into health compliance measures. Turnover shock in EUR per employee per month.

Faced with a new expense at the same time as a substantial reduction in turnover for many firms, an obvious question is how was this financed? Table 2 shows that, despite the environment of economic stress, the vast majority of firms financed the investments from existing internal resources. For the self-employed, we find that the resources of the firm and the owner are more intermingled with the owner supplementing the internal resources of the firm. This was occasionally reported for firms with employees but with a much lower incidence. External sources of funding played a minor role across all firm size groups. This is in line with the findings of Gargan et al. (2018) who reported on pre-COVID investment decisions of SMEs were strongly linked to availability of internal financing.

Table 2: Financing sources of health measure investments

| | Size category | | | | |
	Self-empl	Micro	Small	Medium	Total
Internal financing	80.4	85.9	86.2	91.4	87.1
Owner's contribution	15.3	5.7	2.1	1.2	3.6
Supplier credit	0.0	0.3	1.0	0.9	0.7
Bank loans	0.4	0.2	0.8	1.1	0.7
External equity	0.0	0.3	0.5	1.2	0.6
Leasing or hire purchase	0.0	0.2	0.2	0.0	0.1
Other	1.8	6.2	7.4	3.8	5.8
No answer	0.0	0.5	0.5	0.0	0.4

3 Regression analysis

In this section, we explore in more depth if the observed level of investment in health compliance measures vary in any systematic way with firm characteristics. We have already noted some variation across sectors and enterprise size (self-employed versus rest) in the descriptive statistics and now check if these are robust to the inclusion of other factors in a multivariate setting. To control for scale, we use investment per employee as our dependent variable and use a tobit regression specification to reflect the zero values associated with the choice to invest at all. We specify the following latent variable investment model:

$$\left(\frac{I}{E}\right)_i^* = \mathbf{X_i}\beta + \epsilon_i \tag{1}$$

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$$\left(\frac{I}{E}\right)_i = \begin{cases} \left(\frac{I}{E}\right)_i^* & \text{if } \left(\frac{I}{E}\right)_i^* > 0. \\ 0 & \text{if } \left(\frac{I}{E}\right)_i^* \leq 0. \end{cases} \tag{2}$$

where I is the expenditure on health investments by firm i, and E is the number of employees. The error term ϵ_i is distributed i.i.d. normal. The vector of explanatory variables X_i contains the main variables. In this vector, along with controls for sector and size described above, we include a number of other potential drivers of investment. We include a range of characteristics available in the survey that the literature on SME investment decisions would suggest may be important such as profitability, firm performance etc. These indicators are motivated by the traditional models linking investment to marginal product and firm profitability as well as documenting the role of financing factors (indebtedness, access to finance etc) (Lawless et al., 2020; Gilchrist & Himmelberg, 1995; Whited, 1992). In particular, we control for measures of firm performance and financial strength. For firm performance, we use profit per employee (in thousands of euro) prior to the pandemic and also the mean monthly wage. We also include a dummy variable for if the firm is an exporter, which is typically associated with better performance. For financial strength, we include a measure of the firm's internal resources (cash or equivalents per employee) and its existing external debt commitments (measures as the debt to asset ratio). We also include the response to a question on whether the firm had intended to invest in 2020 prior to the the outbreak of the pandemic. This variable should pick up performance expectations as well as capture more difficult to observe willingness to take risks.[1]

The key results are presented in Table 3. Possibly one of the most striking features of the regression analysis is the extent to which the expected standard drivers of firm investment do *not* have any association with spending on health compliance measures. Neither profit per employee of the debt to asset ratio are statistically significant in any of the specifications. Cash per employee is marginally significant in only one instance but even there the effect is extremely small with each €1000 in cash reserves linked to €1.70 of extra investment.

The characteristics (other than size and sector) most associated with higher expenditure per employee are average wage and an expectation of investing prior to the pandemic. The relationship with wages could be due to greater need for specific types of equipment being required for specialised roles or

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[1]   Summary statistics for these variables are available on request from the authors.

settings or, more simply, a reflection of greater resources available in higher-paying firms. Likewise, with a single cross-section of data, it is difficult to disentangle the mechanisms that could be behind the effect of having intended to invest in 2020 prior to the outbreak of the pandemic. Again, this may be picking up an effect of available resources that could be shifted from the existing planned investment to the new expenditure obligations coming from the cost of health compliance measures. Alternatively, it could be acting as a proxy for stronger firm growth expectations and management characteristics.

As in the descriptive statistics discussed earlier, the differences across firm size appear to come almost entirely from lower investments by the self-employed with little direct evidence of differences across other firm groups evident from the results in Table 3. This is slightly offset if the self-employed firm expected to invest in 2020 as seen in the second column where interaction effects between size and investment expectations are included. The sector effects (reported relative to the manufacturing sector) are in line with our expectations from the descriptive statistics with considerable higher expenditure in the most customer facing activities such as retail, hotels and restaurants and human health.

4   Conclusions

This research has focused on a particular aspect of the impact of COVID-19 on enterprises, the expenditure on health compliance measures to ensure the can operate safely and within public health guidelines. In the research, we use a bespoke survey module to consider investment in health-related measures by SMEs following the onset of the COVID-19 pandemic in Ireland. This bespoke survey was designed to capture expenditure on public health measures and we use it to explore the heterogeneity in expenditure across firms and explore its determinants using traditional models. We find that 86 per cent of SMEs invested in health measures with a mean investment of €15,500 and a median of €3,500, which equals to approximately €500 (€250) per employee. Nearly all investment was financed by internal funds.

Possibly one of the most striking features of the regression analysis is the extent to which the expected standard drivers of firm investment do *not* have any association with spending on health compliance measures. Neither profit per employee of the debt to asset ratio are statistically significant in any of the specifications. Cash per employee is marginally significant in only one instance but even there the effect is extremely small with each €1000 in

cash reserves linked to €1.70 of extra investment. These findings lead us to include that health investments are uncorrelated with economic performance and financial factors, in contrast to traditional models. This highlights the random nature of the COVID-19 shock. Major differences are evident across sectors: the sector effects (reported relative to the manufacturing sector) are in line with our expectations from the descriptive statistics with considerable higher expenditure in the most customer facing activities such as retail, hotels and restaurants and human health services. These results suggest targetted policies addressing specific sectors are the most appropriate in terms of providing support for effected firms. This should be born in mind by policymakers when calibrating any remedial instruments.

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Table 3: Tobit regression

	(1) Baseline	(2) Interatctions	(3) All vars	(4) No FEs	(5) Only FEs
Profit per empl.*	0.431	0.442	0.418	0.169	
	(0.310)	(0.309)	(0.310)	(0.310)	
Mean monthly wage*	19.427*	20.119**	20.243**	9.545	
	(7.685)	(7.790)	(7.831)	(7.672)	
Cash per empl.*	1.673*	1.310	1.368	1.095	
	(0.807)	(1.164)	(1.167)	(0.806)	
Debt/Assets ratio	23.709	-16.714	-19.581	5.132	
	(37.091)	(53.917)	(53.717)	(37.487)	
Dublin dummy			-10.884		
			(35.361)		
Exporter dummy			9.520		
			(41.611)		
Expected to inv. 2020	178.455***			166.597***	
	(31.572)			(32.438)	
Expected×Self-empl.		252.973*	252.656*		
		(121.315)	(121.512)		
Expected×Micro		152.506**	189.847**		
		(56.206)	(62.819)		
Expected×Small		125.990**	72.839		
		(48.637)	(53.115)		
Expected×Medium		88.504	105.851		
		(63.778)	(103.554)		
Expected×Cash		0.656	0.595		
		(1.508)	(1.508)		
Expected×(Debt/Asset)		73.497	76.176		
		(73.122)	(72.924)		
Self-empl.	-173.081**	-230.786**	-283.973**	-231.071***	
	(64.782)	(83.635)	(89.286)	(65.957)	
Micro size			-90.857		
			(50.645)		
Medium size			-70.223		
			(92.819)		
Agriculture	-37.101	-34.908	-28.887		-98.414
	(90.459)	(91.046)	(91.576)		(86.269)
Construction	82.674	83.034	94.725		62.024
	(66.287)	(66.433)	(70.927)		(64.968)
Wholesale	46.518	46.298	50.035		29.712
	(65.651)	(65.989)	(68.340)		(60.893)
Retail	162.582**	164.779**	167.859*		105.954
	(61.390)	(61.775)	(66.305)		(59.976)
Motor trade	169.889*	162.504*	164.607*		176.743*
	(78.379)	(78.553)	(83.174)		(73.531)
Hotels & restaurant	302.359***	305.003***	312.834***		184.005**
	(67.640)	(68.447)	(74.650)		(61.783)
Transport	10.636	13.314	14.920		20.315
	(80.461)	(81.105)	(81.446)		(78.567)
Real estate & finance	84.117	78.084	98.771		33.624
	(92.840)	(93.383)	(99.276)		(86.160)
Professional services	-41.015	-43.721	-28.608		-88.644
	(60.077)	(60.542)	(65.031)		(61.036)
Admin. services	32.268	28.799	39.162		-7.641
	(86.240)	(85.521)	(88.539)		(81.027)
Human health	362.999***	368.314***	369.171***		309.462***
	(78.544)	(79.508)	(84.286)		(69.141)
Constant	63.467	87.937	135.466*	226.921***	263.234***
	(55.397)	(58.601)	(67.281)	(33.821)	(47.428)
Var(Inv. per empl.)	2.6e+05***	2.5e+05***	2.5e+05***	2.7e+05***	2.6e+05***
	(1.4e+04)	(1.4e+04)	(1.4e+04)	(1.6e+04)	(1.4e+04)
BIC	14698	14730	14755	14683	18828
Pseudo R2	0.008	0.009	0.009	0.004	0.003
N	1124	1124	1124	1124	1444

* in €1000. Fixed effects relative to manufacturing sector. In column (3), size fixed effect relative to small firms.
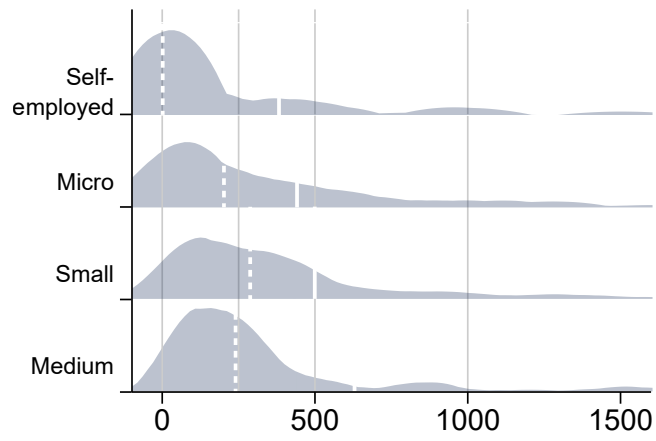
Appendix

Figure 4: Size distribution of COVID-19 measure investments
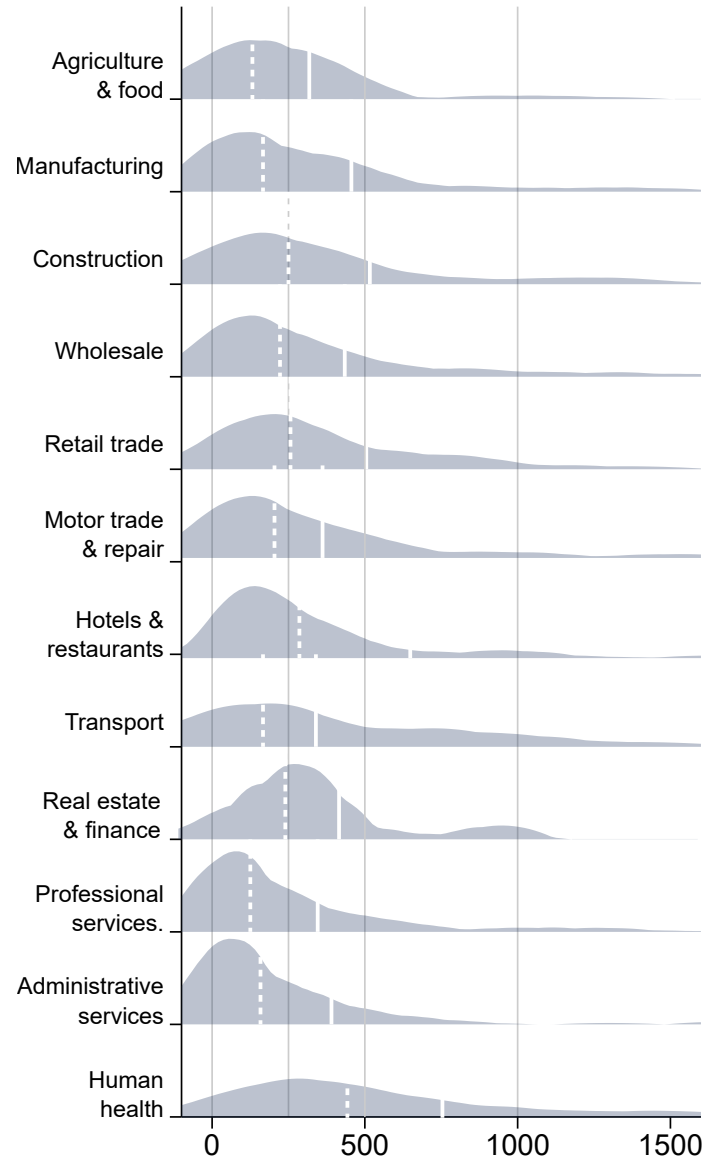Dashed line = sector's median, solid line = sector's means.

Figure 5: Sectoral distribution of COVID-19 measure investments
Dashed line = sector's median, solid line = sector's means.