Financial Health and Employment in the Business Sector: A Non-linear Relationship

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Abstract

This article examines how increased financial stress in the business sector negatively impacts employment through the behaviour of firms. It highlights the non-linearity of the relationship between firms' financial health and employment and identifies thresholds that can serve as useful reference points when assessing the resilience of the business sector and risks to macrofinancial stability. Using data at the individual business level, this article finds that employment outcomes are significantly worse for firms with a profit margin below 5 per cent or with a cash surplus (i.e. cash assets plus cash profit) of less than 10 per cent relative to sales.

Introduction

It is important to understand how financial stress affects the employment decisions of individual businesses; if many firms experience and respond to stress at the same time, this can have implications both for the broader economy and macrofinancial stability. Firms typically respond to a fall in sales by scaling down their operations, resulting in job losses. These job losses are likely to be larger for firms that are constrained by their financial position. Accordingly, if a greater share of firms are in a vulnerable financial position, an economic downturn could lead to worse aggregate employment outcomes than otherwise. This could mean higher rates of unemployment, placing stress on households via a loss of income.[1]

Previous work on Australian business sector resilience has mainly focused on the risk of business failure (Kenney, La Cava and Rodgers 2016; RBA 2020). However, business failure is only one way financial stress can lead to job losses. In many cases, the ability of a firm to scale down its workforce in a downturn may actually help it avoid insolvency.

This article explores how financial stress affects employment using firm-level microdata from the Australian Bureau of Statistics. It ultimately finds that poor financial health negatively affects

employment, and that this relationship is non-linear – the effect on employment is much stronger when financial health indicators are below certain thresholds. Monitoring where businesses are relative to these thresholds is useful for assessing broader risks to macrofinancial stability.

Methodology and data

To undertake this research, I first modelled the dynamics between changes in nominal sales and changes in headcount and examined how they differ across industries and firm size. Then, I extended this model with indicators of financial health – namely, the profit margin and the cash surplus (cash assets plus the cash profit) – and observed how the relationship changes.

The analysis was based on annual data from the Business Longitudinal Analysis Data Environment (BLADE), which includes comprehensive financial information on Australian businesses sourced from tax and administrative records. The data cover the financial years 2006–2019. The analysis was limited to non-financial companies with at least five employees and more than $1 million in annual sales. On average, the analysis covered 28,138 firms with a total of 3.3 million employees per year and captured roughly 35 per cent of non-financial private sector employment.

The relationship between falling sales and job losses

The first part of this analysis focuses on understanding the relationship between falling nominal sales and employment. This can then be used as the foundation on which to explore the additional effect of financial stress.

A simple way to illustrate the relationship between changes in sales and changes in headcount is to plot a smooth curve through the data. To estimate this curve, a generalised additive model (GAM) framework was used as it does not impose a specific model for the relationship and allows for lagged interactions – that is, the relationship between changes in sales in a given year and changes in headcount in the following year (see Appendix A). The estimated curves are plotted in Graph 1.

These curves capture the correlation between the two variables, rather than the causal effect of one variable on the other. From this, three key characteristics of the relationship between sales and headcount could be identified:

1. *The slopes of the curves are relatively flat.* Changes in headcount tend to be smaller relative to changes in sales. For example, a 20 per cent fall in sales is associated with an 8 per cent fall in headcount within the same year and a further 4 per cent in the following year. This suggests that most firms do not adjust employment fully in line with annual fluctuations in sales.[2]

2. *The horizontal intercepts are positive.* On average, firms hold their workforce constant if sales grow by around 5 per cent. This can be thought of as the effect of firm-level inflation (given the data measure nominal rather than real sales) and productivity growth, both of which increase sales without the need for a firm to expand its workforce.

3. *The relationship is approximately linear.* Job losses at the firm level tend to increase broadly in line with declines in sales, irrespective of how large that decline is. There is no general threshold for a fall in sales after which job losses intensify.

These observations are not overly surprising. However, they are useful in providing a verified baseline for the remainder of the analysis.

Graph 1
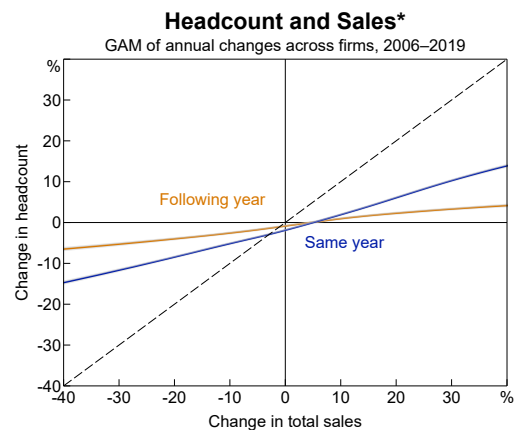
Headcount and Sales*

GAM of annual changes across firms, 2006–2019

*   Changes in headcount associated with a change in annual total sales, using a generalised additive model with year fixed effects; adjusted R² = 0.103; shaded grey is a 95% confidence interval; dashed line is where the change in sales equals the change in headcount.

Sources: ABS; RBA.

To examine which types of firms tend to have the largest decline in the size of their workforce for a given fall in sales, this model was applied to various industries and then to firms of various sizes.

By industry

Graph 2 shows the declines in headcount associated with a 20 per cent fall in sales, by industry.[3] It shows that job losses tend to be larger for firms in the accommodation and food services industry – a 20 per cent fall in sales is associated with a 17 per cent decrease in headcount over two years. Firms in the wholesale industry tend to have smaller decreases in headcount than other firms for a given fall in sales. However, more generally, the differences between industries are quite small.

By firm size

For a given fall in sales, Graph 3 shows the total associated change in headcount (i.e. over the current year and the next) by firm size. There are only slight differences in the relationship across firms of different size, and these are not statistically significant.

Financial health indicators and employment outcomes

The analysis now turns to the impact of a firm's financial health – including profitability, cash reserves, and the new metric of 'cash surplus' – on its employment outcomes.

To do this, indicators of financial health were included in the previously estimated model (see Appendix A). By using the same framework as above, it is possible to estimate how these indicators correlate with changes in headcount while controlling for changes in sales.

Profitability

To begin, the relationship between profit margins and changes in headcount was estimated. Unsurprisingly – since insufficient profitability is a common driver of financial stress – it was found that the level of profitability affects changes in employment. Graph 4 shows that firms with low or negative profit margins in the previous year tend to have larger job losses (or lower headcount growth) relative to firms with higher profit margins. For example, a profit margin of −10 per cent tends to subtract around 5 percentage points from the change in headcount, irrespective of the change in sales.

The relationship between firm-level profit margins and changes in headcount shown in Graph 4 is not linear. For firms with a profit margin below 5 per cent, a decline in profitability is correlated with a much greater effect on headcount than for those above this threshold. This suggests that if many firms are at or near this 5 per cent threshold, a further shock to profitability in a downturn could lead to an escalation in the pace of job losses. While broader business profitability is relevant for assessing risks to aggregate employment and

Graph 2

Decrease in Headcount by Industry*
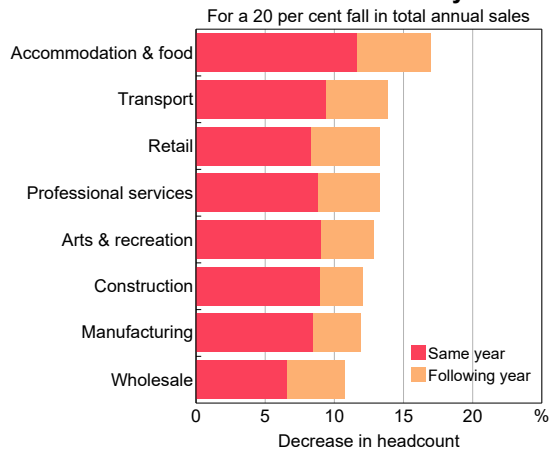
For a 20 per cent fall in total annual sales

* Changes in headcount associated with a change in annual total sales, using a generalised additive model with year fixed effects; adjusted R² ranges from 0.051 to 0.141; selected industries; 2006–2019.

Sources: ABS; RBA.

Graph 3

Change in Headcount by Firm Size*

Two-year cumulative change for a change in annual sales
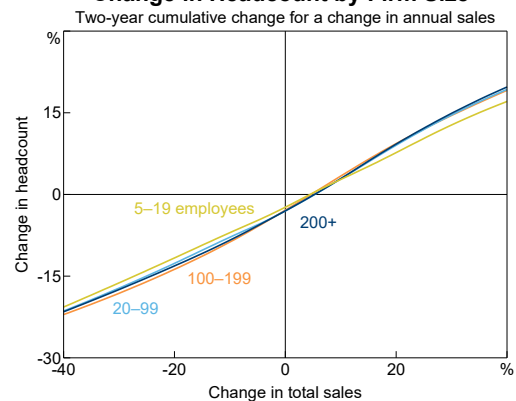
* Change in headcount (over two years) associated with a change in annual total sales, using a generalised additive model with year fixed effects; adjusted R² = 0.106; 2006–2019.

Sources: ABS; RBA.

macrofinancial stability, this analysis suggests that the distribution of firms around this 5 per cent threshold is particularly important.

Beyond profitability, the size of a firm's cash reserves is also important to its financial health. Some unprofitable firms hold sufficient cash to avoid financial stress and therefore may not need to reduce their workforce. This includes start-ups, which tend to hold cash to cover losses in the short to medium term while they attempt to grow and become profitable over the longer term. These firms are likely to increase the size of their workforce even though they are unprofitable; this might explain why the very negative profit margins in Graph 4 are not correlated with even greater job losses.

A new measure of financial stress – cash surplus

To observe the combined effect of low cash reserves and weak or negative profits, a new financial stress metric was constructed – the 'cash surplus' – calculated as liquid assets held by the firm at the start of the year plus net cash inflows (i.e. the cash profit) throughout the year (see Appendix B). A negative cash surplus signifies financial stress. That is, the firm did not have enough cash available to cover all of its expenses over a given year (including interest expenses) and was forced to finance the shortfall through at least one of the following three options:

1. increasing liabilities – for example, by drawing on credit facilities and/or extending payment times

2. liquidating non-current assets

3. receiving an equity injection – for example, via recapitalisation.

Graph 5 shows the relationship between the cash surplus and changes in headcount. As with profitability, firms with a low or negative cash surplus in the previous year tend to have greater job losses (or lower growth in headcount). It was also found that the cash surplus has little effect on headcount for values greater than 10 per cent of sales. This change in behaviour suggests that a cash surplus of 10 per cent is an informative threshold for measuring financial stress. Again, as with profitability, the distribution of firms near this threshold is important for understanding broader risks.

Conclusion

On average, firms tend to scale their workforce in line with changes in sales, but this relationship is significantly affected by financial stress. Indicators of financial health exhibit clear thresholds at which the behaviour of firms appears to change – that is, when firms become financially stressed. Employment outcomes are significantly worse for firms with a profit margin below 5 per cent and for

Graph 4

Headcount and Profit Margin*

GAM, controlling for changes in sales
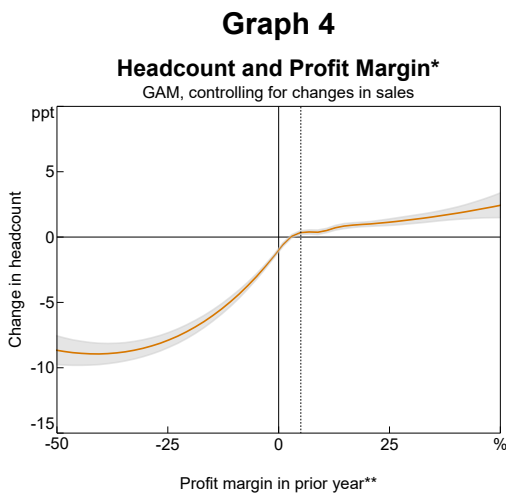
* Change in headcount associated with the profit margin in the prior year, using a GAM with controls for changes in sales and lagged sales and year fixed effects; adjusted R² = 0.105; shaded grey area is a 95 per cent confidence interval; 2006–2019.

** Profit margin calculated based on earnings before tax, depreciation and amortisation.

Sources: ABS; RBA.

Graph 5

Headcount and Cash Surplus*

GAM, controlling for changes in sales
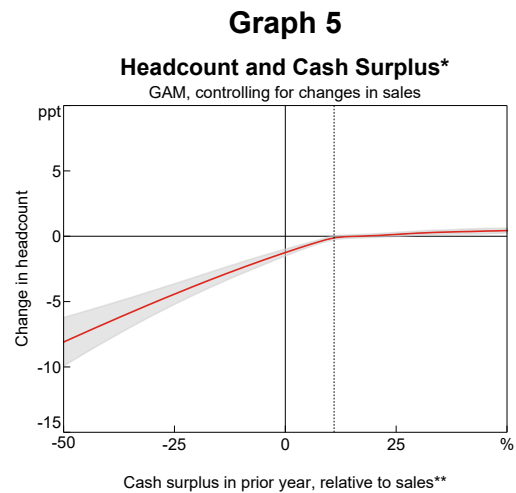
* Change in headcount associated with the cash surplus in the prior year, using a GAM with controls for changes in sales, lagged sales and year fixed effects; adjusted R² = 0.103; shaded area is a 95 per cent confidence interval; 2006–2019.

** Cash surplus calculated as cash assets at the start of the year plus the cash profit.

Sources: ABS; RBA.

those with a cash surplus of less than 10 per cent relative to sales.

From the perspective of monitoring risks, the profit margin threshold is particularly useful because the relevant data are timely. Administrative data on income and expenses of most Australian firms are currently available at a quarterly frequency and generally within six months of the end of the quarter. The cash surplus focuses directly on financial stress and the identified threshold is therefore informative about the decision-making process by the firm. However, the required data are generally only available at an annual frequency and

with a two-year delay, making it less useful for monitoring.

Overall, the above results provide evidence that increased financial stress in the business sector – as would be expected in an economic downturn – can negatively impact employment through the behaviour of firms. The effect of financial health on employment is non-linear and exhibits threshold effects. Monitoring the distribution of firms around the identified profitability and cash surplus thresholds is therefore important for assessing risks to employment and macrofinancial stability. ⋌

Appendix A: The generalised additive model (GAM)

The estimates of the relationship between the change in sales y and change in headcount h for firm i in period t shown in Graph 1 were produced using a GAM (see Hastie and Tibshirani 1990), where f_0 and f_1 are smooth cubic spline functions, α is a time fixed effect and ϵ is normally distributed with zero mean.

$$\Delta h_{it} = \sum_{k=0}^{1} f_k\left(\Delta y_{i,\,t-k}\right) + \alpha_t + \epsilon_{it}$$

For this analysis, headcount was measured as the number of individual pay-as-you-go statements reported by the firm for a given financial year. This measure will vary with the level of worker turnover and broader labour market factors. The time fixed effect should control for common changes in these factors.

The extended version of this model used for Graphs 4–6 added additional smooth functions of financial health indicators, such as the lag of the profit margin π.

$$\Delta h_{it} = f_\pi\left(\pi_{it-1}\right) + \sum_{k=0}^{1} f_k\left(\Delta y_{i,\,t-k}\right) + \alpha_t + \epsilon_{it}$$

These models were estimated using restricted maximum likelihood (REML). For more details on estimating GAMs using REML, see Wood (2011) and Wood (2017).

Appendix B: Cash surplus measure

The cash surplus in period t is calculated as the sum of cash assets at the start of the period (i.e. at the end of the previous period) and the cash profit over the period:

$$\text{cash surplus}_t = \text{cash assets}_{t-1} + \left(\text{cash income}_t - \text{cash expenses}_t\right)$$

Given the available data, this analysis measured cash assets as current assets less accounts receivable. Cash income was calculated as earnings before tax, depreciation and amortisation, less the change in accounts receivable. Similarly, cash expenses were calculated as total expenses (excluding depreciation or capital expenditure) less the change in accounts payable.

A negative cash surplus signifies that a firm was in financial stress during that period. This is because, by definition, the firm did not have enough cash available to cover all of its expenses over the given year and was

forced to finance the shortfall by either increasing liabilities, liquidating non-current assets, receiving an equity injection or through a combination of these.

Endnotes

[*] The author is from Financial Stability Department.

[1] Firms with a more flexible workforce will also be able to reduce total hours worked (see Bishop, Gustafsson and Plumb 2016). However, job losses have greater potential to cause financial stress for households than a marginal reduction in hours.

[2] Firms' expectations about future sales are likely to play a role here. If firms expect a downturn to be temporary, firms might retain some surplus workers to avoid a costly rehiring process once sales recover. Similarly, firms might hesitate to hire if they expect that an increase in sales will be temporary.

[3] The estimated curves at the industry level exhibited similar characteristics to those shown in Graph 1, though with slightly different slopes and intercepts. The variation across industries in Graph 2 partly reflects different behaviour, which could be due to differences in labour intensity, the number of casual workers, or the broader cost structure. But it also reflects small differences in inflation and productivity growth over the estimation period.

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