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Government financial assistance as catalyst for private financing

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Abstract

This paper investigates whether financial assistance from Australian state and federal governments to firms facilitates firms' access to external financing. Findings show that government assistance affects firms through increasing their propensity to seek financing and further by increasing their propensity to obtain the financing. The former is the larger effect. Besides, the largest additionality accrues to young and innovative firms. The form and the number of assistance packages received from the government also affect the type and strength of the impact. The findings suggest that government financial assistance can have much broader impact than just supplying firms with direct cash.

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Key points

- Government financial assistance makes firms more likely to apply for financing
- Government financial assistance also makes firms more likely to obtain financing once they apply
- The former effect is larger
- Small and young innovative firms show the largest additionality
- Subsidies and rebates increase chances of financing. Tax concessions only increase chances of financing for innovative firms
- Receiving multiple forms of government assistance increases the likelihood of obtaining financing, but receiving too many forms of government assistance undermines that chance

1. Introduction

Government financial assistance to firms is a form of intervention intended to overcome market imperfections and to foster an environment fertile for innovation and growth. In theory, if government assistance is scarce and merit based, the mere reception of the assistance by a firm sends a positive signal about the firm's capabilities. More generally, firms receiving government assistance have more liquidity, hence, are less risky. In an asymmetric information market for financing, private investors take notice and are more willing to lend to a firm with government assistance.

Anticipating this change in the behaviour of potential investors, firms with government assistance will also apply for financing more confidently. This change in the behaviour of both sides leads to what Buisseret et al. (1995) call the *behavioural additionality* of the policy. This additionality can be especially beneficial to small and young firms where credit history or sizable collateral is lacking.

In this paper, I explore the behavioural additionality of government financial assistance on both the firm and the investors using a panel of Australian firms. Australian state and federal governments offer financial assistance to firms in various forms including grants, subsidies, tax concessions, rebates, and in some cases an on-going aid.¹ Firms can also apply and receive multiple forms of government assistance simultaneously. I further test whether all or certain forms of government assistance are conducive to behavioural additionality and also whether the number of simultaneous forms of assistance matters.

Overall, the results support the notion that receiving government financial assistance makes firms more likely to secure debt or equity financing. This

¹ See <http://www.business.gov.au> for the full scope of programs currently available from the Australian government to firms.

improvement is achieved in two ways: firms with government assistance are more likely to seek external financing. Once seeking financing, these firms are also more likely to obtain financing. The former is behavioural additionality on the part of the firm; the latter is behavioural additionality on the part of investors. The former is a much stronger effect.

Small firms seeking financing to invest in innovation are especially disadvantaged. The findings show that government assistance substantially improves the chances for young small firms to secure financing for innovation.

It also turns out that not every form of government assistance is conducive to behavioural additionality on the part of investors. Subsidies and rebates appear to have a positive effect. Tax concessions also have a large positive effect but only for firms intending to invest in innovation. Firms receiving a larger number of simultaneous assistance from government are also more likely to obtain financing. However, receiving too many different forms of assistance diminishes those chances.

The remainder of the paper is composed as follows: in the next Section, I review some background on the topic. The data is described in Section 3. Section 4 reports the descriptive statistics for the analysis sample. In Sections 5, I explain my modelling strategy and then report the estimation results in Section 6. I conclude the paper in Section 7.

2. Background

The notion that government financial assistance to firms paves the way for debt or equity financing is not completely new and has both theoretical and empirical precedences. At least as early as Akerlof (1970), the connection between asymmetric information and market failure has been contemplated. Uncertainty breeds speculations that one side is offering *lemon*. In the market for financing, in particular, investors may decide not to participate at all or to demand extraordinary concessions to compensate for the perception of a risky investment. Observing the challenges, firms might decide not to seek external financing in the first place (Myers & Majluf, 1984).

Small and young firms are the most susceptible, where the operation is riskier and credible information and history is lacking. Compounded with a lack of sizable collateral to protect investors, the obstacles to acquiring financing can become too daunting for most small firms to overcome. The problem is especially acute for small firms seeking investment to carry out risky research and innovation projects. The existing evidence in other countries shows a pattern of discrimination against such ventures (Westhead & Storey, 1997; Freel, 1999, 2007; Carpenter & Petersen, 2002).

Awarding of R&D tax incentives or R&D grants can partly remedy the market failure in these cases. Egger & Keuschnigg (2015) present a theory of equity versus debt financing, in which government offering R&D subsidies improves the financial standing of a firm and makes it possible for innovative firms to attract debt financing and to avoid the more demanding venture capitalists. A series of works provide substantial evidence that receiving R&D tax subsidies improve the likelihood and amount of external financing available to a firm,

especially when the firm is small and high-tech (Lerner, 1999; Feldman & Kelley, 2006; Takalo & Tanayama, 2010; Meuleman & De Maeseneire, 2012).

In this work, I do not confine myself to the impact of R&D tax incentives. Instead, I investigate the broader range of government assistance in the form of grants, subsidies, tax concessions, cash rebates, and other temporary or on-going forms of assistance. The results will provide a broader understanding of the role government assistance is playing in the debt or equity markets.

3. Data

The main source of data for this study is the Business Characteristics Survey (BCS). This survey is conducted by the ABS annually on a rolling panel of firms randomly selected from the ABS Business Register. The data report many aspects of business operation such as turnover and employment as well as innovation, business challenges and business plans.²

The BCS starts in 2006 and has been conducted each year since. Firms with 200 employees or larger are a permanent part of the data. Every year, the ABS selects a new panel of firms smaller than 200 employees to be surveyed. Each panel runs for five years, which means several panels could be running in parallel. The samples for simultaneous panels are non-overlapping.

A panel typically includes about 3,000 firms, with the sample size varying between 2,000 and 5,000 from panel to panel. The sample is randomly drawn from the ABS Business Register using a stratification over firm size and industry. In a typical panel, about one-third of the sample is selected from food industry, whereas the remaining two-thirds are selected from other industries. This emphasis on food industry is typical in Australia and reflects the over-sized contribution of this sector to manufacturing and to the Australian economy.³

In one section of the survey, firms report whether they sought debt or equity financing (see Appendix A for the survey questions)s. If so, they also report whether the requested financing is obtained, in-progress, or rejected. Firms also respond whether they received any form of financial assistance from the Australian state or federal governments, and if they did then which form(s) of assistance they received. This set of questions constitute the basis for the analysis that I will carry out.

I further supplement the BCS with firms' financial information from the Business Income Tax (BIT) reports and Business Activity Statements (BAS). These data along with the BCS are part of the current Business Longitudinal Analysis Data Environment (BLADE) in the ABS. The linkage further furnishes the analysis with reports of total and current assets, and total liabilities.

² See ABS Cat.No.8168.0.55.001 for the full list of variables and other details about the data methodology and coverage.

³ In 2015–16, Food and beverages manufacturing accounted for almost 28 per cent of total manufacturing income in Australia (ABS Cat.No.8155.0).

4. Descriptive Statistics

The total count of firms in the BCS are listed in Table 4.1. I will be looking at the effect of government assistance in t on the propensity to apply for and to obtain financing in $t+1$. The time lag is essential to reduce reverse causality.

Table 4.1: The count of firms with government assistance and seeking external financing

Year	Number	Seeking Financing		Not seeking financing in $t=1t$	
		All	Government Assisted (t)	All	Government Assisted (t)
2006	7,328	1,902	692(36.4%)	5,426	1231(22.7%)
2007	10,354	2,438	937(38.4%)	7,916	1774(22.4%)
2008	8,917	2,062	841(40.8%)	6,855	1656(24.2%)
2009	10,080	2,276	913(40.1%)	7,804	1821(23.3%)
2010	8,516	1,924	803(41.7%)	6,592	1582(24.0%)
2011	7,571	1,783	765(42.9%)	5,788	1440(24.9%)
2012	9,332	2,044	849(41.5%)	7,288	1706(23.4%)
2013	8,864	1,949	775(39.8%)	6,915	1,603(23.2%)
All	70,962	16,378	6,575(40.1%)	54,584	12,813(23.5%)

Source: ABS Business Characteristics Survey 2005–2014

Putting all panels in the BCS together provides an average of 9,000 firms per year for the analysis. Only a portion of all these firms seek financing or have received government assistance. Of all the observations, about 23 per cent indicate they are seeking financing. On average, close to 40 per cent of observations seeking financing have also received government assistance the prior year. Of the observations not seeking financing, only 23.5 per cent of them indicate having received government assistance the prior year.

Firms that seek external financing additionally report the status of their financing application as either obtained, in progress, or rejected. Table 4.2 shows the percentage of firms by outcome separately for those having received government assistance the prior year and those who have not.

Table 4.2: Status of financing request in $t+1$ by the type of firm

Year	Government Assisted (t)			Not Government Assisted (t)		
	Obtained	In Progress	Rejected	Obtained	In Progress	Rejected
2006	94.5%	3.8%	1.7%	92.9%	2.7%	4.4%
2007	96.5%	2.7%	0.9%	92.0%	4.9%	3.1%
2008	93.0%	5.1%	1.9%	89.0%	6.2%	4.8%
2009	93.6%	5.3%	1.1%	89.3%	5.8%	4.9%
2010	93.3%	5.7%	1.0%	89.2%	6.5%	4.3%
2011	92.7%	4.7%	2.6%	88.2%	6.8%	5.0%
2012	93.6%	4.2%	2.1%	90.3%	5.1%	4.6%
2013	92.3%	5.5%	2.2%	88.3%	7.1%	4.6%
All	93.7%	4.6%	1.7%	90.0%	5.6%	4.4%

Source: ABS Business Characteristics Survey 2005–2014

As the numbers show, the majority of firms seeking financing do obtain it. Among firms that received government assistance, 93.7 per cent report that they obtain financing, whereas among firms with no government assistance the prior year the percentage stands at 90.0 per cent. A larger proportion of firms without government assistance also report their financing request being rejected as opposed to those that received government assistance. On its face, the numbers suggest a positive correlation between having received government assistance and obtaining financing and a negative correlation with financing request being rejected.

The increased propensity to obtain financing by government assisted firms could be driven by the positive perception of such assistance. Alternatively, if more credit-worthy firms are also more likely to receive government assistance, the difference can be purely a selection effect. Whether firms receiving government assistance are systematically more or less credit-worthy than other firms can be inferred by comparing their overall performance. I use a few different measures of performance that reflect a firm's capabilities and report those in Table 4.3.

The numbers in the table make it evident that government assisted firms lag behind other firms in many areas. In the first instance, I look at young firms. For this purpose, and in the remainder, I define young as being two years old or younger and assign them as mature otherwise. Bakhtiari (2017) shows that young firms in Australia start to behave very similar to mature firms by the age of three in terms of job creation and destruction, which serves as the basis for this classification. In the table, mature firms are more likely than young firms to receive government assistance.

Firms in the BCS report whether they had to abandon some project or process during the year.⁴ I look at these firms in the next part of the table. Again, among

⁴ see Appendix A for the specific survey questions

those firms that had to abandon some project, a larger proportion is receiving government assistance.

Table 4.3: The performance of government assisted firms compared to other firms using a few measures of performance

	Government Assisted		#Firms
	Yes	No	
Young			
Yes	10.2	89.8	7,971
No	20.6	79.4	129,756
Projects Abandoned			
Yes	29.5	70.5	8,086
No	19.4	80.6	129,641
Business Unhampered			
Yes	18.9	81.1	125,669
No	30.6	69.4	12,058
Exporting			
Yes	16.2	83.8	44,336
No	21.7	78.3	93,391
Average Labour Productivity	422.4	2,297.2	
Number of Firms	27,499	110,228	137,727

Notes: Business Unhampered means that the business does not report its operation being hampered by lack of financing, access to skills, etc.

Source: ABS Business Characteristics Survey 2005–2014

Firms in the BCS also report whether their business is hampered by the lack of funding, skills, low profits, etc. I use this information to build a dummy variable that indicates whether business in the firm is unhampered. Once more, firms whose business is hampered by some factor are more likely to be receiving government assistance.

Existing theoretical and empirical evidence maintains that exporting firms are more productive and better performing than other firms. The numbers in the table indicate that exporters are less likely to receive government assistance.

Finally, I compute the labour productivity of firms as the ratio of turnover (deflated by consumer price indexes) over total employment. The averages reported in the table also confirm that firms assisted by the government are less productive.

As a whole, a typical firm receiving financial assistance from the government appears under-performing, hence, somewhat suffering in credibility. Using this evidence, one can rule out that the positive effect of government assistance observed in Table 4.2 is driven by the firms' creditworthiness. If anything, the effect is in fact being under-estimated owing to the selection towards the less

credit-worthy firms. In the end, the positive perception of such assistance remains the only force to account for the impact.

5. Modeling

So far, I have been able to establish a positive correlation between receiving government financial assistance and the propensity to apply and obtain financing. In this section, I add more rigor to the argument by estimating a Probit model of the form

$$Prob[Obtain_{ji,t+1} = 1] = \Phi(\alpha_0 + \alpha_1 Gov_{jit} + X_{jit}\beta + \iota_i + \tau_t). \quad (1)$$

In this equation, Φ is the standard normal cumulative distribution function. *Obtain* indicates whether firm j from industry i obtains financing in $t + 1$. The main covariate of interest is the dummy *Gov*, indicating whether a firm received any form of government assistance. ι and τ are industry and year dummies, respectively, controlling for different levels of risk across industries and macro-economic conditions.

As mentioned earlier, independent variables are lagged by one year relative to the independent variable to strengthen causality. In this way, a firm's financial leverage, for instance, is not affected by the firm having already obtained the financing.

X_{jit} is a series of control variables that also affect a firm's credit-worthiness. One is the firm size measured in log of total assets. The firm's level of liquidity (*Liquidity*), constructed as the ratio of current over total assets, is another and measures a firm's cash flows and its ability to repay short-term obligations. The other control variable is leverage, which is constructed as

$$Leverage_{jit} = \log\left(1 + \frac{Liabilities_{jit}}{Assets_{jit}}\right). \quad (2)$$

Finally, I include the dummy variable, *Young*, from the previous section which indicates whether the firm is two years old or younger. Young firms are often discriminated against for being too risky, and this last variable controls for the risk.

There are two issues with the modelling in (1). First, only a fraction of firms seek financing (Table 4.1). One would expect firms that seek financing to be systematically more credit-worthy than other firms. The bias introduced as a result of this selection causes the effect of government assistance to be underestimated. To remedy this problem, I rely on the selection model of Van De Ven & Van Praag (1981). This approach estimates equation and a selection model simultaneously using maximum likelihood.

The selection model in this case is the probability that a firm applies for financing as a Probit function of all the right-hand side variables in and an extra variable for exclusion restriction. I use the firm's report of whether the development of any project is abandoned (*Abandon*) as the exclusion restriction. A firm having abandoned a project is more likely to apply for financing to start over. However, this information is invisible to banks, hence, cannot be internalized in the decision for financing.

Apart from compensating for selection biases, the selection model also serves as a test for the behavioural additionality on the part of firms. This additionality occurs when government assistance increases the propensity to seek financing.

Second, the selection of firms into receiving government assistance is not random. Table 4.3 has already shown that a larger proportion of firms receiving government assistance are below the average credit-worthiness. Such self-selection introduces a negative bias into the estimates relative to a situation where firms with government assistance are randomly selected.

Following Hirano, Imbens, and Ridder (2003), I address this last issue by using inverse propensity weighting to reduce the selection bias. For this purpose, I estimate a Probit of the form

$$Prob[Gov_{jit} = 1] = \Phi(\beta_0 + \beta_1 Hamper_{jit} + \beta_2 Export_{jit} + \beta_3 Young_{jit} + \iota_i + \tau_t). \quad (3)$$

In this specification, *Hamper* indicates whether the firm's operation is hampered by any factor, *Export* indicates whether the firm is exporting. Set of industry and time dummies are indicated by ι and τ . I am not using an explicit indicator of productivity, since labor productivity is not fully comparable across industries. However, productivity is implicit in this model, as more productive firms tend to be exporters (Melitz, 2003).

Observations receiving government assistance are weighted by the inverse of the predicted probability from (3), whereas the rest are weighted by the inverse of the complement probability.⁵

The sample I will use for the estimation of (1) excludes all firm-years seeking financing that report their application for financing to be in progress. Only firms with a finalised decision – either accepted or rejected – are included along with all observations not seeking financing.

The descriptive statistics for the control variables used in the modelling are listed in Table 5.1. The statistics show that firms in the data are quite dispersed in their size and financial standing.

The correlation coefficients between the main covariates in the model are reported in Table 5.2. The correlations mostly confirm the prior observations in Table 4.3 that most firms receiving assistance are mature, large and with little liquidity. The only highlight is that these firms are not over-leveraged. However, as the correlation between size and leverage is negative, the former observation could be simply because the firms receiving government assistance are larger on average.

⁵ I also experiment with bootstrapping over a randomly selected subsample of the existing data with about half the total number of observations and a stratification over a number of key variables, excluding government assistance. The exclusion is intentional and is meant to reduce the bias. The results are almost identical to those with inverse propensity weighting, therefore, I am not reporting them.

Other correlation coefficients show a bit of inter-dependence between the covariates. However, none of the correlation coefficients is large enough to raise collinearity concerns.

Table 5.1: Descriptive statistics for the key variables

Statistic	<i>log(Assets)</i>	<i>Liquidity</i>	<i>Leverage</i>
Mean	14.17	0.503	0.595
Std.Dev.	3.344	0.328	0.550
1st Pctl.	6.413	0	0
25th Pctl.	12.08	0.204	0.360
50th Pctl.	13.75	0.488	0.562
75th Pctl.	16.03	0.809	0.693
99th Pctl.	22.39	1	2.629
<i>N</i>			83,949

Source: ABS BLADE 2005–2014

Table 5.2: The correlation table of key variables

Variables	<i>Gov</i>	<i>log(Asset)</i>	<i>Liquidity</i>	<i>Leverage</i>	<i>Young</i>
<i>log(Asset)</i>	0.316				
<i>Liquidity</i>	-0.081	-0.148			
<i>Leverage</i>	-0.049	-0.296	0.046		
<i>Young</i>	-0.069	-0.165	0.032	0.062	
<i>Abandon</i>	0.047	0.024	0.009	0.010	0.001

Source: ABS BLADE 2005–2014

6. Empirical findings

6.1 Main results

I estimate model (1) first as a Probit for benchmarking and then as a selection Probit with and without weighting. The average marginal effects for each model are reported in Table 6.1. The conditional propensities in the table account for the probability that financing is obtained conditional on having been sought. The selection propensities indicate the probability of seeking financing in the first place.

The Probit estimates in column (1) show a positive effect from government financial assistance. In these estimates, firms receiving financial assistance from government in the prior year are 1.5 percentage points more likely to obtain debt or equity financing. Once accounting for the selection bias in column (2), the effect is even larger and leads to a 2.0 percentage point increase in the propensity to obtain financing.

Column (3) adds the inverse propensity weights. In this model, receiving government assistance results in a 2.1 percentage point increase in the propensity to receive financing conditional on having sought financing, which is slightly higher than the previous estimate.

At the same time, the selection propensities point to an additional effect from government assistance. From column (3), firms receiving government assistance in the prior year are 8.2 percentage points more likely to go ahead and seek financing in the first place.

Together, the results suggest that government assistance acts through two additionality channels. First, it increases a firm's tendency to seek financing. Second, it makes it easier for firms to obtain financing. The former effect is the dominant one.

The Wald χ^2 statistic for the selection models tests whether the noise terms in conditional and selection models are uncorrelated. The statistics reject the hypothesis and further justify the use of the selection Probit.

Finally, in column (4) I re-estimate the selection model by augmenting it with interaction terms between government assistance and size and age. The interaction terms test for the possibility that government assistance is more effective for, say, small firms or young firms. I also apply inverse propensity weights in this estimation and henceforth.

Only the size interaction has a statistically significant effect and only within the selection model. It implies that the additionality effect is the largest for small firms, in terms of asset size, and mostly works through encouraging them to apply. The additionality diminishes as the size of assets increases. Young firms receiving government assistance do not show any extra additionality apart from that pertaining to their small size.

Among the other covariates included in the estimation, the size of firm measured in the log of its total assets and leverage have statistically significant effects on the propensity to obtain financing. Larger firms are more likely to secure financing. A higher leverage, on the other hand, has an adverse effect on the likelihood.

The other covariates only have a statistically significant effect in the selection models. The pattern suggests either a banking practice with insufficient screening or – since the selection effects are very strong – a very strict self-selection of firms prior to financing application.

The first theory can be refuted based on the evidence from Rodgers (2015, Figure 9). He shows that the current loss ratio – the overall current losses as a share of total loans – on business loans has been between 0.1 and 0.75 per cent over the same period, with the peak happening in the wake of the global financial crisis. These losses hardly signal reckless banking practices. Instead, firms in Australia seem to apply a strict self screening before proceeding with a financing application. The fact that more than 90 per cent of firms that seek financing do obtain financing is also indicative of the strict self screening (Table 4.2).

Table 6.1: The average marginal effects for model (1).

Variables	(1)		(2)		(3)		(4)
	Probit	Conditional	Selection	Conditional	Selection	Conditional	Selection
Gov_t	0.015*** (0.004)	0.020*** (0.005)	0.069*** (0.004)	0.021*** (0.004)	0.082*** (0.007)	0.013 (0.025)	0.234*** (0.081)
$Gov_t \times \log(Assets_t)$						0.001 (0.002)	-0.010** (0.005)
$Gov_t \times Young_t$						-0.009 (0.030)	-0.018 (0.038)
$\log(Assets_t)$	0.005*** (0.001)	0.007*** (0.001)	0.028*** (0.001)	0.005*** (0.001)	0.023*** (0.003)	0.004*** (0.001)	0.028*** (0.001)
$Liquidity_t$	-0.001 (0.005)	-0.001 (0.007)	-0.048*** (0.006)	-0.001 (0.009)	-0.046*** (0.014)	-0.001 (0.009)	-0.050*** (0.013)
$Leverage_t$	-0.001 (0.003)	-0.003 (0.005)	0.081*** (0.004)	-0.026*** (0.004)	0.012 (0.017)	-0.025*** (0.004)	0.006 (0.017)
$Young_t$	-0.003 (0.007)	-0.005 (0.009)	0.023** (0.009)	-0.012 (0.017)	0.014 (0.022)	-0.007 (0.009)	0.026** (0.011)
$Abandon_t$			0.051*** (0.007)		0.056*** (0.020)		0.056*** (0.020)
Weighting	No		No		Yes		Yes
Log Likelihood	-1,438.3		-26,625.3		-57,937.5		-57,847.7
χ^2	196.5***		707.6***		392.1***		479.7***
χ^2 Selection			15.17***		5.04**		4.60**
N	11,794		48,960		48,960		48,960

Notes: Numbers in parentheses are robust standard errors. *** and ** indicate 1 and 5 per cent significance levels, respectively, Industry and year dummies are also estimated but not reported.

Source: Dept. of Industry, Innovation and Science (2018)

In Table 6.2, I report the total marginal effect of government assistance that simultaneously accounts for the conditional and selection effects. Overall, government financial assistance leads to 12.5 percentage point increase in the propensity. The last column, again, shows that the largest additionality accrues to small firms, but it is mostly through giving them the incentive to seek financing.

Table 6.2: Full average marginal effect of government assistance on the propensity to obtain financing.

Variables	(2)	(3)	(4)
Gov_t	0.116*** (0.013)	0.125*** (0.023)	0.212 (0.140)
$Gov_t \times \log(Assets_t)$			-0.006 (0.008)
$Gov_t \times Young_t$			-0.040 (0.093)

Notes: Numbers in parentheses are robust standard errors. *** indicates 1 per cent significance level. A set of control variables and industry and year dummies are also estimated but not reported.

Source: Dept, of Industry, Innovation and Science (2018)

Note that most of the findings in this part and later are driven by firms seeking debt financing and much less by those seeking equity financing. In the BCS, firms indicate the status of their application separately for debt or equity financing. Using these indicators, it is possible to infer whether the firm sought debt financing or equity financing or both. However, only eight per cent of all firms seeking financing are only looking for equity. About 19 per cent are seeking both debt and equity financing. Estimating the same model as for debt financing generates very similar results to what has already been shown. Estimating it separately for firms seeking equity financing does not generate statistically significance results for the key variables due to the small sample size.

6.2 Financing innovation

There is one group of firms which find it especially more difficult to obtain financing. The existing evidence shows that high-tech firms and firms embarking on research and innovation projects are disadvantaged when seeking financing (Westhead & Storey, 1997; Freel, 1999, 2007; Carpenter & Petersen, 2002). The disadvantage reflects the perception that innovation and research are risky ventures with uncertain yields and a high probability of failure.

Government financial assistance could signal capability or share in some of the risk for these firms. In this part, I explore whether Australian innovative firms suffer from the same disadvantage and whether government assistance plays any role in mitigating the problem.

In one question in the BCS, firms seeking financing respond whether the reason they do so is to develop new goods, services, operational/managerial process, or marketing methods. I take a positive answer to this question as the firm's intention to seek financing for innovation (*FinInn*). In the BCS, firms also report whether they are *innovation focused* regardless of whether they are carrying out an innovation at the time or not (*InnFocus*). The proportion of firms in each group is shown in Table 6.3. As the numbers in the table show, there is some overlap between the two indicators. However, not all firms with innovation focus are seeking financing for innovation, and not all firm seeking financing for innovation are innovation focused.

Table 6.3: The number of firms seeking financing for innovation and the number of firms with innovation focus

<i>FinInn</i>	<i>InnFocus</i>	
	No	Yes
No	11,163 (69%)	2,904 (18%)
Yes	1,262 (8%)	789 (5%)

Notes: Only firms seeking financing are used

Source: ABS Business Characteristics Survey 2005–2014

I first explore whether these firms have a lower than average chance of obtaining financing. To do this, I re-estimate using a selection Probit where I am dropping government assistance and adding a generic variable *Innov* to the conditional model, where *Innov* can be set to either *FinInn* or *InnFocus*.

The marginal propensity of seeking financing for innovation in the conditional model is reported in column (1) of Table 6.4. The effect in this case is both economically and statistically insignificant. What if size and age affect the firm's ability to finance innovation? I test for this hypothesis in column (2) of the table by adding interaction terms with age and size.

A pattern emerges in this case. Specifically, small firms seeking financing for innovation are at least 3 percentage points less likely to obtain one. This effect diminishes with size. Age does not have any statistically significant effect when it comes to financing innovation. It does not mean that young firms are having it easier to finance innovation. They are still being disadvantaged for being small.

Is government assistance helping these firms overcome the obstacle? I address this question in column (3) of the table. In this column, I add the dummy for government assistance and a series of interaction terms with dummies indicating innovation financing, age and size.

The disadvantage innovative firms are facing is much stronger in these estimates. Specifically, firms seeking financing for innovation are 9.6 percentage points less likely to obtain financing. The effect, again, diminishes with size; however, it is not affected by firms being young.

Table 6.4: Average marginal effects of seeking finance to invest in innovation from the conditional model

Variable	(1)	(2)	(3)	(4)
$Innov_{t+1}$	0.004 (0.005)	-0.031 (0.021)	-0.096*** (0.031)	-0.009 (0.027)
$\times \log(Assets_t)$		0.002* (0.001)	0.006*** (0.002)	0.000 (0.002)
$\times Young_t$		0.018 (0.018)	0.014 (0.019)	-0.002 (0.026)
Gov_t			0.011*** (0.003)	0.018*** (0.005)
$\times Innov_{t+1}$			0.113*** (0.038)	0.006 (0.044)
$\times Innov_{t+1} \times \log(Assets_t)$			-0.007*** (0.002)	0.000 (0.003)
$\times Innov_{t+1} \times Young_t$			0.184*** (0.034)	0.260*** (0.034)
$Innov =$	$FinInn$	$FinInn$	$FinInn$	$InnFocus$
Log Likelihood	-57,314.0	-57,310.3	-56,781.2	-57,933.1
χ^2	204.0***	213.2***	1033.5***	414.6***
χ^2 Selection	21.75***	20.64***	10.92***	5.07**
N	48,859	48,859	48,859	48,960

Notes: Inverse propensity weights are applied. Numbers in parentheses are robust standard errors. *** and * indicate 1 and 10 per cent significance levels, respectively. A set of control variables and industry and year dummies are also estimated but not reported.

Source: Dept. of Industry, Innovation and Science (2018)

Receiving government assistance offsets the negative effect from financing for innovation, such that these firms are now on par with other firms in obtaining financing. The effect of government assistance diminishes with size. Larger firms did not face much discrimination in the first place.

Importantly, young innovative firms get the largest boost in obtaining financing from government assistance. The number in the table shows that young firms embarking on an innovation project are more than 18 percentage points more likely to obtain financing if they received government assistance in the prior year. Moreover, young firms have a 30 percentage point advantage over other firms if they are also small (which is the case for most of them). This effect gives young firms a lead over other firms in obtaining financing.

In the last column, I use the indicator of whether the firm is focused on innovation. There is practically no impact on the firm's ability to obtain financing due to its being innovation focused. The only notable impact here is that young firms focused on innovation and with government assistance are, once again, much more likely to obtain financing.

Based on these results, one can argue that innovation is generally considered a risky venture by most investors and even riskier when the firm is small. Reasonably risk-averse investors would stay away from financing such ventures. However, once the government steps in and shares in some risk, investors change their views and look upon the venture as a promising opportunity. In particular, young small firms are considered more favourably than mature small firms. The distinction is possibly owing to young firms being perceived with larger growth potentials – in turn, bigger returns on investment – as compared to small mature firms.

Interestingly, firms are not disadvantaged because they are dedicated to innovation. The disadvantage only applies if the firm has the intention to start a new innovation project.

6.3 Form of assistance

In the BCS, firms that report having received government financial assistance, additionally indicate the form of financial assistance received from the state or federal governments. Firms indicate whether the assistance is in the form of grants, subsidies, cash rebate, tax concessions, on-going aid, or other unspecified type of assistance. The number of firms receiving each form of assistance is reported in Table 6.5. Note that a number of firms are receiving more than one form of assistance simultaneously.

Table 6.5: The number of firms receiving each form of assistance

	Grant	Subsidy	Rebate	Tax		
				Concession	on-going	Other
Numbers	7,652	4,636	7,593	4,846	2,484	888
	(40.4%)	(24.5%)	(40.1%)	(25.6%)	(13.1%)	(4.7%)
Total	18,920					

Notes: Only firms receiving government assistance are included

Source: Business Characteristics Survey

In this part I consider the possibility that each form of assistance could be sending a different signal, positive or negative, depending on what it represents. Accordingly, I replace the government assistance dummy in with a series of dummies each indicating one form of assistance and re-estimate the selection model. Table 6.6 reports the estimation results.

In terms of the selection additionality, that is, the added propensity to seek financing, most forms of government assistance have a positive impact. However, the largest and the most statistically significant effects belong to grants, subsidies, and cash rebates.

Table 6.6: The average marginal effect of various forms of government assistance on the firm's propensity to seek then obtain financing

Variables	(1)		(2)	
	Conditional	Selection	Conditional	Selection
<i>Grant_t</i>	0.012 (0.008)	0.056*** (0.021)	0.005 (0.005)	0.075*** (0.021)
<i>Subsidy_t</i>	0.027** (0.011)	0.071*** (0.011)	0.014** (0.007)	0.082*** (0.012)
<i>Rebate_t</i>	0.013** (0.007)	0.064*** (0.011)	0.012*** (0.005)	0.060*** (0.009)
<i>Tax Concession_t</i>	0.017 (0.011)	0.019 (0.012)	0.004 (0.007)	0.023* (0.012)
<i>On – going_t</i>	0.026 (0.022)	0.017 (0.033)	0.018 (0.013)	0.034 (0.033)
<i>Other_t</i>	-0.036* (0.018)	0.031 (0.023)	-0.024* (0.013)	0.037 (0.025)
<i>Grant_t × FundInn_{t+1}</i>			-0.006 (0.013)	
<i>Tax Concession_t × FundInn_{t+1}</i>			0.179*** (0.021)	
Log Likelihood		-56,012.6		-54,875.4
χ^2		316.6***		547.2***
χ^2 Selection		5.27***		16.18***
<i>N</i>		46,828		46,734

Notes: Inverse propensity weights are applied. ***, **, and * indicate 1, 5, and 10 per cent significance levels. A set of control variables and industry and year dummies are also estimated but not reported

Source: Dept. of Industry, Innovation and Science (2018)

On the other hand, subsidies and cash rebates are the only forms of government assistance, by their statistical significance, that are conducive to an added propensity to obtain financing. Firms having received other unspecified forms of government assistance (*Other*) actually are less likely to obtain financing. Based on these observations, subsidies and cash rebates improve the investors' perception of the firm, whereas there are some forms of government assistance that do the reverse.

The finding that grants and tax concessions do not influence the propensity to obtain financing is puzzling. One of the largest tax concession programs in Australia is the Research and Development (R&D) Tax Concession.⁶ Grants can also be R&D related. To investigate whether these forms of assistance

⁶ Since 2012, this program has changed into the R&D Tax Incentive Program.

might be especially helping innovative firms, I interact each of these forms of assistance with *FinInn* dummy and re-estimate. These results are in column (2) of the table.

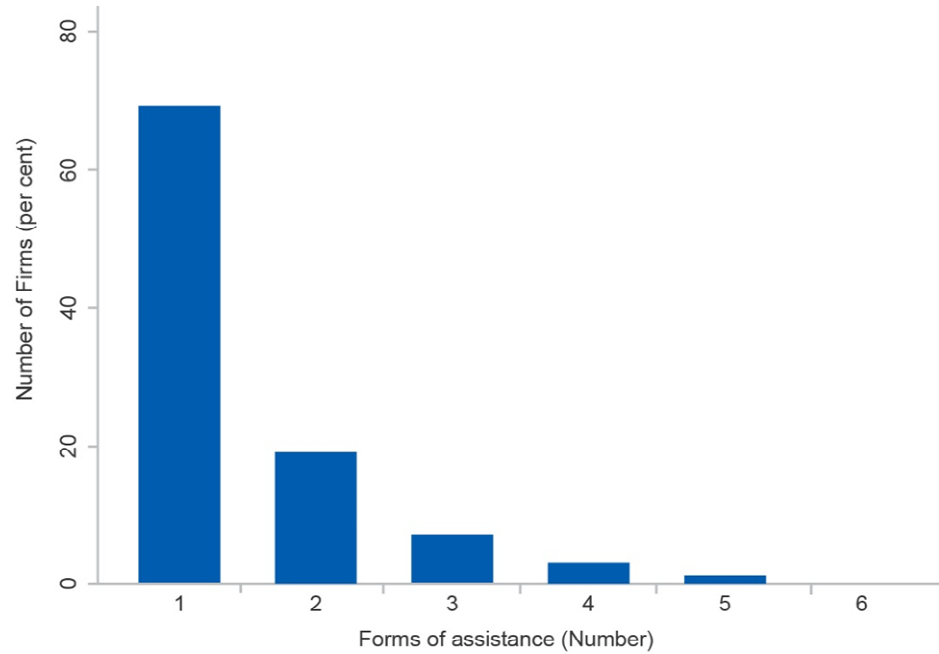
Grants are still not increasing the propensity to obtain financing. However, tax concessions have a very positive and statistically significant effect in giving innovative firms access to financing. Specifically, firms with the intention to invest in innovation are 18 percentage points more likely to obtain financing if they have received tax concessions.

Concerning this last finding, experts from the R&D Tax Incentive group of the Australian Department of Industry, Innovation and Science explained to me that investors, and banks in particular, have a preference for tax concessions over grants. Grants are project specific and are consumed before the end of the financial year. However, investors treat tax concessions as some kind of collateral. Tax concessions are awarded at the end of the financial year. If the firm runs into financial troubles during the year, the investor can step in and lay claim to the tax concessions to cover part of its losses. Consequently, apart from sending a signal about capability or credit-worthiness, government assistance can also serve as a substitute for collateral if it is paid towards the end of the financial year.

6.4 Multiple assistance

The other government-related factor affecting the type of signal sent to investors about the firm can be the multiplicity of government assistance received by the firm. There are indeed a number of firms in the data simultaneously receiving multiple forms of assistance (Figure 6.1). Few observations are even receiving all six forms of assistance simultaneously.

Figure 6.1 Proportion of firms receiving different forms of government assistance



Notes: Only firms receiving government assistance are included

Source: ABS Business Characteristics Survey 2005–2014

A firm receiving multiple forms of assistance simultaneously can be viewed as more financially secure. Conversely, it can be viewed as a firm in trouble and only kept afloat by government intervention. I investigate which effect dominates by replacing the government assistance dummy in with the number of different forms of assistance the firm simultaneously received the prior year. The estimates are listed in Table 6.7.

Table 6.7: The average marginal effect for the number of government assistance on the firm's propensity to seek then financing

variable	Conditional	Selection
1 form	0.020*** (0.005)	0.073*** (0.008)
2 forms	0.029*** (0.011)	0.116*** (0.015)
3 forms	0.009 (0.019)	0.149*** (0.024)
4 forms	0.319*** (0.039)	0.021 (0.071)
5 forms	0.285*** (0.035)	0.142 (0.102)
6 forms	0.258*** (0.023)	0.316** (0.149)
Log Likelihood		-57,850.4
χ^2		430.7***
χ^2 Selection		5.09**
<i>N</i>		48,960

Notes: Inverse propensity weights are applied. *** and ** indicate 1 and 5 per cent significance levels. A set of control variables and industry and year dummies are also estimated but not reported

Source: Dept. of Industry, Innovation and Science (2018)

On the firm's side – that is the selection model – receiving more forms of assistance raises the likelihood of the firm seeking financing. It is not clear whether this increase in likelihood is because the firm becomes more confident or whether the firm is more desperate for funds.

On the investor's side, receiving one form of assistance increases the chances of obtaining financing by two percentage points. Receiving more forms of government assistance tends to increase the likelihood. The magnitude of the effect falls when the number of different forms of assistance goes beyond four. It appears that simultaneously receiving a few forms of assistance from government projects a more positive picture of a firm. However, receiving too many different forms of government assistance undoes part of that image.

7. Conclusion

Government financial assistance to firms is effectively a risk sharing scheme, where government often supplements a firm's investment in areas where investment is considered too risky by private investors. R&D and innovation are one such area. In addition, passing the eligibility condition to receive the assistance makes a positive reflection on the firm's image. This is especially true when the eligibility criteria are restrictive. Some forms of assistance also serve as a substitute for collateral. The findings of this paper confirm that investors take notice and consider firms with government assistance more favorably. This effect amounts to behavioral additionality on the part of investors.

However, it turns out that the main influence of government assistance is confidence building for the firm itself. Many firms receiving government assistance would not have sought financing in the first place unless with the self-assurance of having government by their side. This change is behavioural additionality on the part of firms.

Interestingly, the additionality is the largest for innovative young firms. These are exactly the kind of firms that contribute to productivity and economic growth and also happen to be in the spotlight for several industry policies in Australia. In particular, the linkage from tax concessions to more accessibility of investment in innovation makes a strong case for the supportive role the R&D Tax Incentive program plays for the young and innovative firms.

Appendix A Business Characteristics Survey

The following questions and the associated variable from the BCS have been used to construct the key variables used in the analysis.

Question (*variable*) Type of Answer

Sought any debt or equity finance (<i>finance</i>)	Yes/No
Type of financing sought:	
Debt - obtained (<i>dtfin_ob</i>)	Yes/No
Debt - in progress (<i>dtfin_in</i>)	Yes/No
Debt - rejected (<i>dtfin_no</i>)	Yes/No
Equity - obtained (<i>eqfin_ob</i>)	Yes/No
Equity - in progress (<i>eqfin_in</i>)	Yes/No
Equity - rejected (<i>eqfin_no</i>)	Yes/No
Seeking finance to introduce new or improved goods, services, processes or methods (<i>finnewgo</i>)	Yes/No
Business focus is on innovation measures (<i>assinn</i>)	Yes/No
Received any financial assistance from Australian government organisations:	
Grants (<i>finasgra</i>)	Yes/No
on-going funding (<i>finasong</i>)	Yes/No
Subsidies (<i>finassub</i>)	Yes/No
Tax concessions (<i>finastax</i>)	Yes/No
Rebates (<i>finasreb</i>)	Yes/No
Other (<i>finasoth</i>)	Yes/No
None (<i>finasist</i>)	Yes/No
Did not abandoned development of goods, services, operational/managerial processes, or marketing methods (<i>abandon</i>)	Yes/No

Factors significantly hampering innovation (lack of funds, skills, knowledge, or costs, regulation, etc.): None (*hampgnon*) Yes/No

Factors significantly hampering other business activities (lack of funds, skills, demand, or costs, regulations etc.): None (*hamponon*) Yes/No

Years of operation regardless of change in ownership (*busopyr*) Number

Income from exporting goods (*incexpgs*) \$Value

Income from exporting services (*incexpsv*) \$Value

Total income from sales of goods and services (*incsalgs*) \$Value

Number of persons working for this business during the last pay period (*emptotal*) number

Disclaimer

The results of these studies are based, in part, on ABR data supplied by the Registrar to the ABS under A New Tax System (Australian Business Number) Act 1999 and tax data supplied by the ATO to the ABS under the Taxation Administration Act 1953. These require that such data is only used for the purpose of carrying out functions of the ABS. No individual information collected under the Census and Statistics Act 1905 is provided back to the Registrar or ATO for administrative or regulatory purposes. Any discussion of data limitations or weaknesses is in the context of using the data for statistical purposes, and is not related to the ability of the data to support the ABR or ATO's core operational requirements. Legislative requirements to ensure privacy and secrecy of this data have been followed. Only people authorised under the Australian Bureau of Statistics Act 1975 have been allowed to view data about any particular firm in conducting these analyses. In accordance with the Census and Statistics Act 1905, results have been confidentialised to ensure that they are not likely to enable identification of a particular person or organisation.

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