Centre for Transformative Innovation

Global Prosperity Through Knowledge and Innovation

SWINBURNE UNIVERSITY OF TECHNOLOGY

Impact of the Victorian Trade Missions Program 2010-12 on Export Revenue

A Report prepared for
State of Victoria Department of Economic Development, Jobs, Transport and Resources

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Executive Summary

Introduction

The Department of Economic Development, Jobs, Transport and Resources (DEDJTR) commissioned the Centre for Transformation Innovation, at Swinburne University of Technology (in partnership with the Australian Bureau of Statistics, ABS) in October 2015 to develop a method to evaluate and quantify the effect of trade promotion programs on export outcomes. Our method utilises the Business Longitudinal Analytical Data Environment (BLADE) at the ABS and links program participants via their Australian Business Number (ABN) to the ABS Business Activity Statement (BAS) and Business Income Tax (BIT) information in the ABS' BLADE database.

The objective of this evaluation was to estimate the impacts on exports of participation in DEDJTR trade missions program over the period of 1 December 2010 to 30 June 2013.

- Under the trade mission program, DEDJTR takes Victorian targeted businesses/organisations to key overseas markets to showcase Victoria's capabilities in key industries and to introduce the participants to potential buyers, investors and trading partners.

- Trade missions programs include over 100 Victorian businesses/organisations but normal trade missions typically comprise 20-100 Victorian businesses. Eligible businesses and organisations are supported with grant between $2,000 and $3,000. Since 2010, 3401 trips have been supported (although some businesses participated multiple times).

- The evaluation comprised 1192 program participants of which 843 businesses had complete information on Australian Business Number (ABN) or business characteristics at the ABS database.

- The methodology employed was a robust quasi-experimental methodology known as matched difference-in-difference analysis which compared the change in export performance before and after program participation of the 843 participants to the change in the performance of matched/similar non-participants. The matched control group was drawn from 597,091 Victorian businesses.

Key finding 1

The main finding from the evaluation was that the trade missions program has statistically and economically significant positive impacts on participants' export performance (export revenue). The finding confirms the notion that Victorian firms face significant informational barriers and/or

barriers in establishing contacts when trying to enter the export market and that government funded trade mission programs can serve as an effective solution (as is the case with this program) to reducing the impacts of these barriers faced by potential exporters. More specifically:

- Trade mission participation increased participants' total export sales by an average of 219% within 12 months and 345% within 24 months.
- With an average total export sales of $809,662 in the base year (the year before participation), these relative increases are equivalent to average increase in export sales of around $1,773,160 and $2,793,333 per program participant respectively.
- Accounting for sample variability, the approximated 95 per cent confidence interval of the within 12 month estimate shown above is between 117% and 321% or approximately between $947,304 and $2,599,015 in dollar terms.
- These findings are robust to variation in the main assumptions underlying the empirical model. The evaluation estimated eight different models and found that all of the estimates produced as statistically and economically significant positive impacts of the program. For all eight models, the 95 per cent confidence intervals for the within 12 months estimates of the impact on export sales range from 51% to 535% or approximately from $412,928 to $4,331,692.

Recommendation 1

Based on the key finding of positive program impacts, we recommend a continuation of the trade mission program, particularly if it is targeted toward businesses which are similar to past program participants (e.g., in terms of industry, international engagement through past export, import or foreign ownership, size and productivity). In order to identify each potential program participant or set the similarity parameters (e.g. the range of sales or turnover values of past participants), the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) could collaborate with the ABS to use the latter's detailed, ABN level Victorian business population database within BLADE.

Key finding 2

According to trade program participants self-reported impact data collected by DEDJTR, the average increase in export sales within 12 months is $565,592. This estimate is low compared to the analysis based on the ABS BLADE data. However, it is still within two of the estimated confidence intervals

(our lowest lower bound is $412,928). This suggests that the self-reported data is informative and can provide a quick and reasonably reliable impact estimate.

Recommendation 2

DEDJTR should continue collecting the self-reported impact data (e.g. increase in export sales within 12 months, 24 months and 36 months) from program participants. If it is possible, DEDJTR should ask participants to also identify the increase of export to the destination country/region of the trade mission in which they participated. The information collected can be used until more objective export destination country information is available in BLADE in the future.

Key finding 3

The evaluation found that trade mission participation increased the probability of non-exporters becoming an exporter. In the base year, only around 50% of participants were exporters. After participation, the proportion of participants who were exporters increased to 76% within 12 months and 85% within 24 months.

Recommendation 3

Based on the finding that the program increased export market participation among the non-exporters, we recommend the continuation of the current policy which allows firms without any past export experience to participate (around 50% of past participants were non-exporters).

We also recommend further analysis on the characteristics of non-exporters which become exporters. Once this analysis is done, we recommend comparing the findings to those existing studies based on developing country data as the finding that trade mission participation can help non-exporters to enter the export markets is more commonly found in studies of non-exporters from developing countries than from developed countries.

Key finding 4

There were businesses (442 out of 1192) which participated in two or more years. On average, the program participation impact on exports performance is larger in the first year of participation than in subsequent years. In other words, there appear to be diminishing returns from participating in subsequent years.

Recommendation 4

We recommend the issue of diminishing returns from repeat program participation to be analysed further before any decision to limit program participation for new participants only is made. The reasons for this are as follows:

- First, we do not know whether the drop in the estimated impact of subsequent participation is statistically significant, and
- Secondly, we do not know, for example, whether or not all kinds of repeat participation show diminishing return. Some firms may be classified as repeat participants because they participated in two missions to Indonesia and Viet Nam. Other firms may become repeat participants because the participated in two missions to Indonesia and Saudi Arabia.

Lessons for future 1

The evaluation approach applied to the trade program using administrative program participation records linked with Australian Bureau of Statistics (ABS) tax record data (the ABS BAS-BIT database) is found to be a robust methodology enabling reliable conclusions on program outcomes to be reached.

Recommendation 5

Implementation of a similar methodology with similar databases to assess program outcomes of other business support program can provide valuable insights for policy makers on the effectiveness of the program. Furthermore, these similar program databases can be consolidated to identify firms participating in multiple programs administered by different sections/departments in order to refine each specific program impact estimate further.

Lesson for future 2

A literature review conducted showed that this is a first of its kind study in Australia. Furthermore, existing evidence is often based on aggregate (industry-level) trade data. In contrast, this evaluation used firm-level data which allowed us to identify the direction of causality. That is, we were able to ensure that the estimated difference in export performance between participants and non-participants was a result of program participation and not because better performing firms in terms of export were more likely to be participants. Industry-level data could not distinguish firms which actually participated in trade missions from firms which did not. As a result, any factor that causes

one industry to perform better than others in terms of export can be incorrectly attributed to the impact of a trade missions program which targeted that industry. It is possible, for example, for the program administrator to select better performing industry as a target. In this case, the direction of causality does not run from trade mission program to export performance; instead, it runs from export performance to trade mission program. Without firm-level data, it is significantly more difficult to rule out such possibility.

Recommendation 6

This evaluation provides a significant contribution to the literature on the effectiveness of government trade programs and trade promotion. Therefore, we recommend publication of the findings of this evaluation to wider audiences in Australia and abroad.

1. Introduction

1.1 Objective, scope and deliverables

The key objective of the evaluation was to assess the impact of State of Victoria Government supported trade missions program on participating firms' revenues, managed by the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), covering the period from 1 December 2010 to 30 June 2013.

DEDJTR has engaged the Centre for Transformative Innovation, at Swinburne University of Technology (in partnership with the Australian Bureau of Statistics, ABS) to develop a method that can be used to assess the effect of trade missions program and quantify the effect using DEDJTR's program participants database linked to ABS' Business Longitudinal Analytical Data Environment (BLADE). Specifically, business performance information within the Business Activity Statement (BAS) and Business Income Tax (BIT) databases of BLADE is linked with program participation using participants' Australian Business Number (ABN) as the key linking variable. The linked DEDJTR program participation data and BLADE databases provide objective information on, for examples, sales, wages, exports and assets of both participants and non-participants collected from businesses' taxation records. The objective nature of the information is crucial for obtaining a robust and unbiased estimate of the effects. The ABS held BLADE BAS-BIT data are brought into the ABS under the Census and Statistics Act 1905 and are subject to the same confidentiality requirements as directly collected ABS data.

Due to the small number of participating firms in the trade missions program, the scope of the evaluation is limited to estimating the combined treatment effects (the effects on participants' export performance). It is not possible, at this stage, to obtain disaggregated treatment effects by industry or destination or other characteristics of the trade missions program. Furthermore, while in theory, the BLADE contains the population of economically active Australian organisations, it is possible that some participating firms are not found in the BAS-BIT databases within BLADE. This evaluation is limited to the evaluation of participants with known ABNs which are also found in the BLADE. Furthermore, the evaluation is also limited by the availability of required information such as export revenue across the relevant years in the BLADE. Finally, there will be no analysis of what may lead to the variation in the estimated treatment effects across different participating firms. Thus, an analysis of detailed firm characteristics such as firm age, size and industry as potential determinants of successful trade missions program in order to provide detailed firm targeting criteria given the estimated impacts is also out of the scope of the evaluation, but would be important to conduct in the future when there are enough participating firms to analyse.

This evaluation is one of the first attempts in Australia for evaluating the impacts of government program using a large-scale administrative data such as the BLADE linked to program administrative data. The access to previously unavailable unit record tax information within the BLADE represents a watershed moment for empirical research into Australian firm performance and policy evaluation. Without the newly linked, longitudinal administrative databases, it is virtually impossible to obtain robust and unbiased estimates with clear inference on the direction of causality of the impacts of government policies. The time dimension of the longitudinal data set panel data allows for the identification factors that precede others in time; and the cross-sectional dimension allows the identification of factors that are associated with one unit and not another. Past policy evaluation studies often had to rely on small databases, typically containing only a single cross-section and collected from subjective reports of the respondents. Thus, they rarely produced results with high degree of robustness demanded by policy makers.

1.2 Report outline

The remainder of this report is structured as follows. Section 2 provides an overview of Victorian Government trade missions program and briefly describes the 2010/11 – 2012/13 program implementation and participants. Section 3 provides a literature review of the economics rationale for such programs and existing evidence of the impacts of the programs from other countries. Section 4 introduces the methodology (with more technical discussions provided in Appendix 1) and describes the main database to measure export performance and evaluate the program impacts: the Australian Bureau of Statistics BAS-BIT databases within BLADE, based on which a summary of select economic characteristics of Program's participants and non-participants is presented. Section 5 presents and discusses the main empirical estimation results (with more detailed results provided in Appendix 2) and their robustness and limitations. Section 6 summarises the key findings and recommendations.

2. Victorian Trade Missions Program[1]

2.1 Trade missions program

The Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR) has a range of trade programs to help Victoria based companies build their export capabilities. The programs' activities have been designed to strengthen and diversify Victoria's export base. An important program among these is known as the trade missions program.[2] This program is the focus of this impact evaluation study.

The trade missions program sits under the Victorian International Engagement Strategy (VIES) developed in 2010. The Government integrated strategy was developed so it can deliver a new set of coordinated programs including trade missions in order to face economic challenges and capitalise on global opportunities. The overarching objective of the strategy is to secure the path towards sustained economic growth through deep international engagements including exports and outward internationalisation. To achieve that, the strategy focuses its interventions on high growth and high market failure areas including sectors in which barriers to entry are high and sectors in which high growth international markets still show low awareness of Victorian capabilities.

VIES has four strategic goals, all of which determined the design and objective of the trade missions program:

1. Internationalise Victorian industry – by helping Victorian businesses, particularly small and medium enterprises, in understanding and accessing international markets.

2. Develop knowledge and expertise – by helping companies gain a deeper understanding of market-specific knowledge and knowledge on international business process and 'going global'.

3. Build strategic relationships – by recognising the importance of government-to-government relationship, broader engagements at the Ministerial level and nurtured existing relationships for international business outcomes.

[1] Most of the discussions in this section are based on published online information at http://www.business.vic.gov.au/support-for-your-business/trade-missions (checked as of 02-Feb-2016).

[2] There are other programs which are outside the scope of this evaluation, such as the Technology Trade and International Partnering (TRIP) program. This program provides grants to assist companies in attending recognised overseas conferences and trade events and meetings with regulatory authorities overseas. The program targets companies in the biotechnology (including health, industrial and agricultural biotechnology, medical devices and diagnostics) and small technology (micro technology and nanotechnology) areas. An amount of up to $10,000 funding is available to participating companies.

4. Position Victoria globally – by forming partnerships with allied organisations in order to better expose Victoria's capabilities to high growth markets which are still unaware of the capabilities.

The evaluation aims to estimate the impacts of trade missions program implemented over the period of 1 December 2010 to 30 June 2013. The impact measure is based on the export performance of participating firms. Under the trade missions program, DEDJTR takes participating Victorian organisations to key overseas markets.[3] The goals are to showcase Victoria's capabilities in key industries and to introduce the participants to potential buyers, investors and trading partners. The larger scale activities of the trade missions typically bring more than 100 Victorian organisations at a time. The more normal activities are smaller in scale, bringing around 20-100 Victorian businesses.

The trade missions are usually led by the Premier and/or a Minister and involve high level Government to Government engagement in order to provide participating companies with platform to develop new relationships (or nurture existing ones) in the destination regions through various activities including business briefings and networking functions, site visits, trade exhibitions and business matching. By participating in the missions, organisations can improve their capability in building international connections (foster existing business relationships and identify partnering opportunities), securing international sales and attracting foreign investment, developing skills and knowledge of international markets, enhancing international profile through new export markets entry, understanding regulatory requirements in international markets, and securing local distributors and/or importers.

The destinations of the trade mission trips are countries or regions considered as high growth markets. These include China, India, South East Asia and the Middle East and Turkey. In addition, there are destination regions in which niche opportunities have been identified including Republic of Korea, Japan, United States of America and Latin America. Table 2.1 lists examples of the most recent destination of trade mission programs.

[3] The two types of trade mission programs officially commenced in their present format in March 2011.

Table 2.1: Most recent examples Victorian trade mission destinations

Period	Destination	Description
February 2015	United Arab Emirates, Saudi Arabia and Turkey	This Trade Mission to the Middle East and Turkey targets Dubai, Istanbul, Riyadh and Jeddah and various industries including food and beverage, agribusiness, higher education, defence, fashion, equine, marine, and sustainable urban development (infrastructure, transport and water).
March 2015	Japan	Trade Mission to Foodex Japan (Japan's largest trade only food show).
April 2015	Indonesia	This is a mission to attend Food and Hotel Indonesia 2015, Indonesia's leading annual food and hospitality exhibition which had attracted more than 24,000 visitors including many from the ASEAN region.
April 2015	Saudi Arabia	Higher Education 'roadshow'[4] to attend International Exhibition and Conference on Higher Education (IECHE) 2015 in Riyadh.
April 2015	United Arab Emirates, Saudi Arabia and Kuwait	This mission to Dubai, Riyadh and Kuwait is in collaboration with Austrade under the Australia Unlimited MENA Trade Mission program[5] to support Victorian Vocational Education and Training (VET) providers.

Source: Compiled from http://www.business.vic.gov.au/support-for-your-business/trade-missions (checked as of 02-Feb-2016)

For each trip, the trade missions program provides $2,000–$3,000 funding to eligible participating companies. Furthermore, an eligible company is allowed to participate in and receive funding multiple trade mission trips. However, there is a maximum limit of $10,000 per company per financial year. In order to receive this funding, organisations must be headquartered in Victoria (or have significant contribution to Victoria's exports and jobs); be directly engaged in the industry or business prioritised by the programs[6]; financially viable; be able to demonstrate a sound case for doing business in the targeted regions; be currently exporting or able to demonstrate export readiness; be (or will be) exporting Victorian originated goods or services (or with significant value

[4] Education roadshows are not permitted in Saudi Arabia. Thus, participation in IECHE provides an alternative opportunity for Victorian higher education organisations to meet with prospective students.

[5] http://www.austrade.gov.au/EventViewBookingDetails.aspx?Bck=Y&EventID=4002&M=283#.VNFRHP6KCPw

[6] This condition implies professional service firms (such as accounting and legal), chambers, municipal councils, and freight companies may apply to participate in the mission but will not be eligible for funding. However, industry associations directly representing member companies may be eligible for funding.

add taken place in Victoria); be represented on the mission by an employee or officer of the company[7]; and, not be seeking other funding to cover the same expenses of a mission.[8]

2.2 Participants between 2010/11 and 2012/13

This evaluation utilises the DEDJTR's administrative data of trade missions program participants and self-evaluation data collected from participating firms as part of the conditions of their participation. The DEDJTR database provides participant level details of the participating organisations, trade mission attended, and the reported export outcomes. Specifically, the database contains:

- Mission and opportunity descriptions including names, end date, and destination
- Participants' names and ABNs
- Whether or not the participant is a current exporter
- The main and secondary industry sector of the participants,
- Number of employees (in Victoria and across Australia)
- Post codes (physical and mailing)
- Export outcomes resulted from mission participation (Immediate, 1-12 months, 13-24 months, 0-24 months)[9]

For this evaluation, the DEDJTR database contains information on 2,094 trade mission participants (including repeat participations by the same businesses) in 59 distinct trade missions between 2010/11 and 2012/13 financial years. As shown in Table 1, there were 1192 distinct participants with known ABN; as many as 442 of these participated in more than one trade mission.[10] The average number of missions attended by a participant is 1.7; about five per cent of participants attended more than four trade missions. About half (54 per cents) of the participants indicated that they were current exporters and employed 279 workers in Victoria. Finally, in terms of destination countries, between 2010/11 and 2012/13 the trade mission participants visited a total of 31 countries. The countries receiving the highest number of participants were China, Indonesia, United Arab Emirates,

[7] Thus, funding eligibility excludes distributors, agents or other in market representatives. However, though they may be invited to participate in events, they will not be automatically entitled to all the privileges of a trade mission participant.

[8] Data on declined applicants, if any, would be useful in better understanding the selection issues.

[9] This information is collected based on the responses of participants to the following evaluation questions from DEDJTR: "Have you achieved any immediate export sales as a direct result of your participation in the Trade Mission? Over the next 1-12 months do you expect to increase sales (excluding immediate sales) as a direct result of your participation in this Trade Mission? Over the next 13-24 months, do you expect to increase sales (excluding 1-12 months and immediate sales figures) as a direct result of your participation in the Trade Mission?"

[10] There are 16 participants (not necessarily distinct organisations) with unknown ABN.

Malaysia, Singapore, India, Thailand, Viet Nam, and the Philippines.[11] The average number of countries visited by a participant is 2.6 across the period, with an increasing trend.

Table 2.1 Victoria Trade Missions participants between 2010/11 and 2012/13.

	2010/11	2011/12	2012/13	2010/11–2012/13
Number of missions	14	20	25	59
Number of participants (including repeat participation)	162	608	1324	2094
Number of participating businesses (distinct ABN)	145	162	935	1192
Number of participants with repeat missions attendance				442
Average number of missions attended per participant				1.74
Proportion of participants who are current exporters (%)	59	43	66	54
Average employment size in Victoria (persons)	565	343	283	279
Average number of countries visited per participant	1.2	1.8	3.8	2.6

Notes: Computed based on DEDJTR administrative data on Victoria Trade Missions.

[11] Other destination countries include Austria, Botswana, Brazil, Canada, Colombia, Denmark, Finland, Germany, Hong Kong, Japan, Netherlands, Qatar, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom, and United States.

3. Literature review: Economics rationale for trade missions program

3.1 Information failure

As discussed in the previous section, Victorian's trade missions program was designed to address high growth and high market failure areas in which Victorian businesses face significant barriers to respond to international market signals. Market signals (demand from consumers, the activities of competitors and the state of technology) cannot be acted upon if they cannot be read. This failure can be a result of barriers in establishing contacts and gathering information. If market signals are ignored, markets underperform and therefore many of the benefits from trade, such as specialisation and increased productivity, are lost. Supporting access to market information is a classic activity for many government agencies whose mission is to make markets work more effectively.

Whereas businesses passively garner much information in their local market, this information very difficult to acquire from foreign markets. When entering an export market, firms are presented with various barriers, one of the most important ones is a knowledge and information barrier. Volpe Martincus and Carballo (2008) argue that there is clear evidence that firms seeking to enter a foreign market are faced with significant costs of information gathering. They need to be able to identify the potential export markets and their demand characteristics, market entry procedures and marketing channels (including identifying capable, reliable, trustworthy and timely trade partners). They also need to know export procedures at home, how to ship their products and the costs to do so. The search for potential trading partners is complicated by geographical diversity and subjected to potential free-riding due to information spillovers.

Economists may well hypothesise why the private sector does not fill this information void, but the fact remains that most domestic businesses, especially SMEs, are not able to easily read overseas market signals. Governments, therefore, have a role to make international markets work better.

As information and personal contacts are of public good in nature, these activities can have positive externalities. In that case, we expect underinvestment in information gathering and contact establishment, providing a market failure rationale for trade promotion programs (Rauch, 1996). Various formal and informal solutions to reduce the significant cost of the informational barrier have been proposed. Institutions such as embassies and consulates and specially set up trade promotion organisations and their trade promotion programs (trade shows and trade missions) are considered as parts of the solution to the market failure problem. They gather and provide information about

the foreign markets to reduce the informational cost barriers to exporters and they establish contacts.

Volpe Martincus and Carballo (2010c) argue that the degree of the informational barrier is likely to be different for different export activities. The problem is likely to be more severe for firms attempting to export to a new foreign market or introduce a new product in their existing export markets than simply expanding the sales of their current product in their current export markets. This is because exporting to a new destination requires new information gathering as mentioned above. The fixed cost of doing so can be so high that it prevents firms from exporting where their productivity levels are below certain thresholds (Melitz 2003, Volpe Martincus and Carballo 2010c).

Volpe Martincus et al. (2010) argue that the nature of the goods being traded and thus the industry of the exporters can be important. Unlike homogenous goods, differentiated goods require more than prices to signal their relevant characteristics (e.g., quality). This implies information gaps reduction from trade promotion programs to have larger effects on the extensive margin of (i.e., the introduction of new) differentiated goods to the export market.

Spence (2003) argues further that the information barrier problems are more significant to small and medium businesses (SMEs) considering to enter the foreign markets. First, overseas markets are inherently riskier, and SMEs often do not have enough informational resources to assess the additional risks nor financial resources to cope with the failures in doing so. Hence, SMEs are more likely to be deterred from entering the export market because of the information barriers and stand to benefit more from trade mission programs. Therefore it is important to have a deeper understanding of the channels through which trade promotion programs help exporting firms.

3.2 Do trade missions help?

Broadly speaking, in addition to studies on the impacts of institutions such as embassies and consulates, the economic literature on trade missions focuses on two types of government export promotion programs: trade shows and trade missions. Trade shows are designed to help domestic firms to expand their export market presence in established destination markets (Seringhaus and Rosson, 1990 as cited in Spence, 2003). In contrast, trade missions aim to help domestic firms enter new export markets in which they have little knowledge and experience. In practice, a specific export promotion program may exhibit the characteristics of both trade shows and trade missions (such as the case of the DEDJTR trade missions program).

Spence (2003) argues that, while there are many evaluation studies of the impacts of trade shows on export performance, studies that focus on the impacts of trade missions are more limited. There are two opposite views of how trade missions affect trade. According to the first view, trade missions can improve the required social capital such as business contacts to initiate and complete new trade transactions subsequent to the program activities. This argument is based on the idea that informational barriers and networks are important in international trade.

In contrast, citing Hart (2007), Head and Ries (2010) argue that there is another view which looks at trade missions and similar programs as often linked to deals and agreements which would have occurred regardless of the existence of the programs. Head and Ries (2010) study the impact of Canadian trade missions, often lead by the Prime Minister, using industry-aggregated bilateral trade data over the 1993-2003 period. Contrary to the claim of the Canadian government that such missions "generated tens of billions of dollars in new business deals", once potential determinants of trade are controlled for, the study finds statistically insignificant, small and negative effects of the trade missions on Canadian trade flows. Thus, the observed above normal exports and imports between Canada and trade missions destination countries appeared to be due to reverse causality.

However, Head and Ries (2010) cite a number of studies that support the informational barrier and network hypothesis with the findings of positive correlation between trade and the visits of heads of state and other politicians (Nitsch 2007), presence of consulates/embassies (Rauch 1999; Gil et al 2008), and ethnicity (Rauch and Trindade, 2002) and country of immigrants (Gould 1994; Head and Ries 1998; Gil et al 2008).

Spence (2003) finds positive impacts of overseas trade missions on export performance because they facilitate relationship-building between participating businesses and their foreign partners. This means the success of trade missions depends on firms' knowledge, characteristics and behaviour in foreign markets following their participation in the program. Therefore Spence (2003) recommends governments diversify the strategy according to the new export destinations. He also suggests participants gather specific knowledge about the targeted export markets and establish communication and business relationships prior to the mission. Regular contacts including face-to-face meetings with foreign partners after the mission are needed to cultivate the business relationships.

Using cross-section country level data, Rose (2007) finds a positive correlation between the number foreign mission institutions of exporting country in the destination country with the amount of exports between the two countries. On average, the presence of foreign missions is associated with

an increase of six to ten per cent higher exports. Gil et al. (2007) find that regional export promotion is associated with 74 per cent higher exports, an effect that is larger than the effect of national level foreign mission presence. They explain that this is because regional export promotion is more focused on trade promotion for firms located in the region, unlike national embassies and consulates which are more concerned with bilateral affairs at the national level and unable to provide regional specific information.

Wilkinson and Brouthers (2000b) note that existing studies[12] show positive effects of trade shows on both immediate exports sales and increased information about the potential market. However, they state that these shows are more likely to attract foreign direct investment with the best results come from focusing the state's trade missions to attract additional foreign direct investment (FDI) and trade shows to increase export of industries targeted by those FDIs (in their U.S. studies, that is basically the high-tech sectors). In their words, "trade missions and trade shows are more effective when they are strategically matched with the pattern of business development taking place within a state's boundaries". Specifically, "the more a state favours FDI, the more effectively state sponsored trade shows promote high tech export". They explain this is the case because states in which trade shows are positively associated with exports are also more attractive to FDI. Trade shows signals the extent of international support by the state, and this is valued by foreign investors. The authors note that this finding is consistent with the findings of Kotabe (1993) and Shaver (1998).

Volpe Martincus and Carballo (2008) investigate the effectiveness of export promotion program in developing countries, paying particular attention to two possible channels: the intensive margin and the extensive margin, a distinction that had rarely been studied. Based on detailed firm-level data of Peru exporters over the period 2001–2005, they estimate the impacts of export promotion on exporters who chose to participate in the program. They find that export promotion participation leads to increase exports, but primarily along the extensive margin (new export market entry or new product introduction to existing export markets). This finding is consistent with that of Álvarez and Crespi (2000) who find the impact of the activities performed by Chile's export promotion agency to be positive in terms of the number of markets of 365 Chilean firms over the period 1992–1996. However, the finding is opposite to the findings of studies using developed country data. Bernard and Jensen (2004, as cited in the study) show that export promotion does not appear to have any significant influence on the probability of exporting (the extensive margin) of US manufacturing plants over the period 1984–1992. Similarly, the study cites Görg et al. (2008) who find that

[12] These studies include Bonoma 1983; Reid 1984; Denis and Depeltau 1985; Seringhaus and Rosson 1989; and Wilkinson and Brouthers 2000a.

government grants to Irish manufacturing firms over the period 1983–2002 were effective in increasing export revenues of existing exporters (intensive margin) but ineffective in encouraging firms to become new exporters (extensive margins).

Volpe Martincus and Carballo (2010b) study the effects of different export promotion activities (trade agenda, counselling, and trade missions, shows and fairs) in Colombia during 2003-2006. They implement multiple treatments matching difference-in-differences method on highly disaggregated export data of Colombian exporters. By comparing different activities, they aim to identify the importance of program targeting. Certain export promotion activities may work better than their alternatives and certain activities are always the best. They find the use of a combination of services to be associated with better export outcomes, primarily along the country-extensive margin, than the use of basic individual services. Firms that simultaneously receive counselling, participate in international trade missions and fairs, and get support in setting up an agenda of commercial meetings exhibit higher growth in terms of export revenues and the number of countries they export to than firms who only receive one type of service. This finding suggests the existence of complementarities among services.

Volpe Martincus et al. (2011) study the role of diplomatic foreign missions and export promotion agencies on export at both the intensive and extensive margins. They use bilateral export data of Latin American and Caribbean countries over the period 1995 to 2004. They find that these institutions, particularly the export promotion agencies, have positive impacts on export at the extensive margin.

Volpe Martincus et al (2010a) is similar to Volpe Martincus et al (2011), except they look further into the potential effects of trade promotion organisations to vary across the degree of differentiation of the exported groups. They find that the presence of export promotion agencies abroad are associated with increased export at the extensive margin for differentiated goods. However, increased presence of diplomatic representations abroad is associated increased export at the extensive margins for homogeneous goods. They explain the difference in the relationships arises from the fact that export promotion agencies located abroad are likely to have better/more specific information to solve the more severe informational problems arising from the export of differentiated goods. In contrast, embassies and consulates are in many cases lacking specific export information. Hence, they are more likely to perform better as a facilitator to exporters of homogeneous products.

The informational barrier problem is likely to be more acute in the case of exports of differentiated goods than that of homogeneous products. Hence, Volpe Martincus and Carballo (2012) investigate how the impact of export promotion activities varies by degree of product differentiation. They examine Costa Rican exporter data over the period 2001–2006 and find that trade promotion leads to an increase in exports along the extensive margin (increased number of export markets) of participating firms who are already selling differentiated goods. They do not find any effect in terms of encouraging exporters to start exporting these goods and in terms of homogeneous goods.

Volpe Martincus and Carballo (2010c) study the effects of trade promotion on the probability of entering a new market and the probability of introducing new differentiated products. They found a positive effect on both for differentiated goods. However, if goods are all pooled together regardless of degrees of differentiation, the effect disappears. Their intuition is that informational barrier varies by goods differentiation level. So, pooling them all together eliminates this variation and thus limits the likely role of trade promotion.

4. Evaluation method and data

4.1 The evaluation problem

This evaluation aimed to assess the impact of trade missions program on participating firms' export revenues. To achieve this objective requires the ability to identify the direction of causality from program participation to outcomes instead of just identifying correlation. Hence, we need to ask what would export revenues of participating firms have been had they not participated in the programs. This is the goal of this program evaluation: to estimate the average improvement in outcome (say, exports) for firms which participated in the program when the counterfactual outcome in the absence of the program is taken into account.

The problem confronting program evaluation based on observational data such as this evaluation is that the counterfactuals (what would have happened to the observed outcomes if the program were not implemented or if the participants did not participate) are never observed. The best we can do is to infer the counterfactuals from observed non-participating firms: a control group of non-participants. If the program participation is not random, this control group needs to consist of non-participants which are as similar as possible to the treatment group of participants. In this evaluation, we use difference-in-difference (DID) analysis to address the above evaluation problem, with a further refinement that the control group is selected by matching participant and non-participants economic characteristics. A more technical discussion of the methodology and its implementation is provided in Appendix 1 and 2.

4.2 Data

ABS BLADE and the BAS-BIT databases

It is clear from the above brief discussion that to solve the evaluation methodological problem and obtain unbiased estimates of the impacts of trade missions program we need data of both participants and non-participants. The DEDJTR's administrative and evaluation database discussed in Section 2.2 provides the list of participants to the trade missions. However, this database still needs to be amended since it lacks historical characteristics of the participating firms. For that purpose, this evaluation uses the Australian Bureau of Statistics (ABS) Business Activity Statement and Business Income Tax (BAS-BIT) databases within the Business Longitudinal Analytical Data Environment (BLADE). The BLADE contains integrated financial and business characteristics data for more than 2 million active businesses in Australia based on linked databases such as the Australian Taxation Office (BIT and BAS), ABS Business Characteristics Survey database and IP Australia

intellectual property rights protection data.[13] The BAS-BIT component that is used in this report contains all annual tax records provided by businesses with Australian Business Numbers (ABN) in Australia since 2001/02.[14]

The BAS-BIT database within BLADE includes a number of indicators of business performance including Business Activity Statement (BAS) component's records of exports of goods and services from Australia that are GST-free; and sales and turnover. Sales and turnover information is particularly valuable for small firms that are heavily reliant on export revenues. For the main purpose of the evaluation, in many ways the identified GST-free exports from the Business Activities Statements (BAS) is the most direct measure of export performance.[15] Exported goods are GST-free if they are exported from Australia within 60 days of one of the following, whichever occurs first: the supplier receives payment for the goods or the supplier issues an invoice for the goods. Other exports generally include supplies of things other than goods or real property for consumption outside Australia, such as services, various rights, recreational boats, financial supplies and other professional services.

The data also provide good coverage of a large class of service exports. Broadly, a supply of a service is GST-free (and therefore included in the data) if the recipient of the service is outside Australia and the use of the service is outside Australia. Examples include any consultancy services, contract research or business services undertaken in Australia but paid for by an overseas company. However, tourism and education services consumed in Australia are not GST free and will not be recorded in the BAS-BIT database.

Export sales on the BAS statement include:

- the free on-board value of exported goods that meet the GST-free export rules, such as consulting services
- payments for the repairs of goods from overseas that are to be exported, and

[13] The BLADE is described in more detailed on this webpage: https://www.industry.gov.au/Office-of-the-Chief-Economist/Data/Pages/Business-Longitudinal-Analytical-Data-Environment.aspx (last checked on 8-30-2017).

[14] Note that the ABS BLADE and its component BAS-BIT database is large and complex and can only be accessed by approved researchers indirectly via staff from within the ABS. The database is confidential and non-ABS analysts cannot see the data. Results are only released to non-ABS people after careful scrutiny of the output to ensure no business can be identified. These access limitations do not affect the quality of the empirical analysis due to our detailed and thorough analysis. They do however make the estimation process much more costly both financially and in terms of time.

[15] The Business income tax (BIT) component of the data also includes net foreign income. However, this measure mixes both sales and investment income making it more difficult to ascertain how much of the net foreign income represents exports performance. Therefore, we do not use net foreign income in this evaluation.

- payments for goods used in the repair of goods from overseas that are to be exported.

The BAS statement does not record:

- amounts for GST-free services, unless they relate to the repair, renovation, modification or treatment of goods from overseas whose destination is outside Australia
- amounts for freight and insurance for transport of the goods outside Australia, or other charges imposed outside Australia in the free on-board value
- amounts for international transport of goods or international transport of passengers
- health and education services that are provided to consumers in Australia, since these are GST free anyway. However, health and education services provided by Australian consultants abroad would be included.

The above discussion means that while our analysis includes firms from service industries, it is likely that measured services export sales is underestimated, at least relative to measured goods exports sales. However, the fact that service exports for a given firm is underestimated does not necessarily mean that the estimated impacts of trade mission programs is also underestimated. If the extent of underestimation stays constant before and after the program, then a comparison of (underestimated) export levels before and after the program can still produce unbiased estimates (especially when expressed as relative change) of the program impacts.

Merged DEDJTR and the BLADE's BAS-BIT databases

We merged the DEDJTR program data into a cleaned subset of the BLADE's BAS-BIT database containing only businesses in Victoria. The data cleaning steps include dropping businesses with zero values in sales revenues, business income, total expenses, or salary and wage expenses as well as those with missing values in any of the matching variables. The resulted merge databases of trade mission participants and non-participants are summarised below.

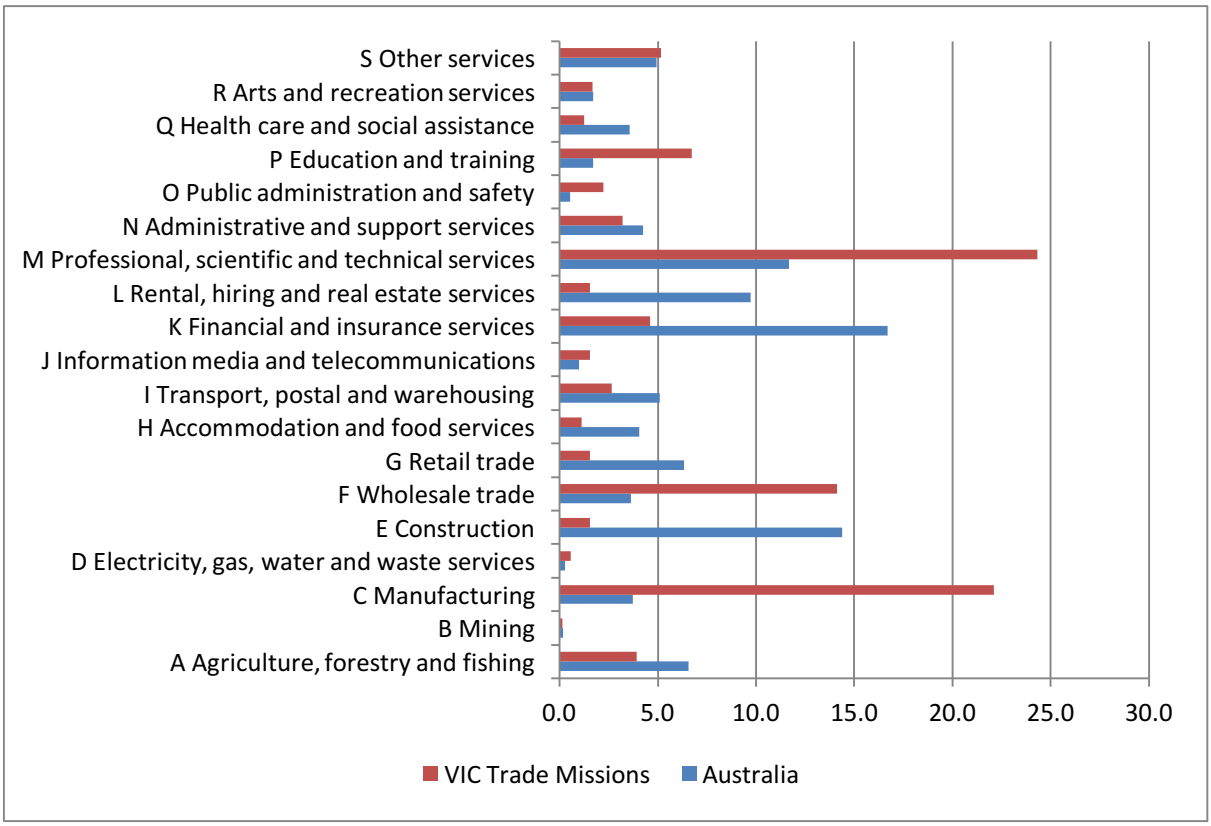
Figure 4.1 below shows the industry distribution of businesses in the financial year 2011/12 of the merged databases for all businesses in Australia and Victoria trade missions program participants. In 2011/12, the BAS-BIT database contains records of 2,465,143 businesses in Australia. After the above data cleaning, there are 1,496,613 of businesses useable for analysis. In the BAS-BIT database for that particular financial year, we identify as many as 843 businesses (out of 1192 businesses with known ABN in the DEDJTR database)[16] which participated in the Victoria Trade Mission and Super Trade Mission participants between 2010/11 and 2012/13. It is clear from Figure 4.1 that Victoria

[16] See Table 2.1 and the discussion in 2.2 on page 12.

Trade Mission programs emphasise specific industries including Manufacturing, Wholesale trade, Professional, scientific and technical services and Education and training. These industries represent Victoria's relative comparative advantage in terms of industrial capabilities. Note also that almost 75% of VIC Trade Missions businesses are from services industry.

In implementing the difference-in-difference analysis, we restrict the BAS-BIT sample further by only looking at Victorian firms. This is one way to ensure that the "common trend" assumption underlying the DID methodology is not violated. The restriction reduces the sample size of non-participating firms as the control group from around 1.5 million businesses in Australia in 2011/12 to around 660 thousand businesses in Victoria in the same year. The number of Victorian businesses remaining in the final estimating sample over 2001/02 – 2012/13 and a summary of their export performance and size is provided in Table 4.1. It is clear from the table that program participants are systematically different from non-participants. They are much larger and much more likely to be an exporter and export more. These indicate potential endogenous selection into a program and the common trend assumption. This will need to be accounted for in estimating trade mission program impacts.

Figure 4.1: Distribution of businesses by industry (%), Australia and VIC Trade Mission participants, 2011/12



Notes: Constructed based on merged DEDJTR's trade missions program administrative database and cleaned version of BAS-BIT database in the BLADE. Industry classification is as reported in the BAS-BIT database. The Australia's industry distribution of businesses may not be identical to the official ABS' estimate of industry distribution.

Table 4.1: Number of businesses and average firm characteristics 2001/2-2012/13, by trade mission participation status,

(P = VIC trade mission participants; N = Non-participants)

	Number of businesses		Proportion of exporters (%)		Exports sales ($ thousands)		Total sales revenues ($ millions)		Employment (persons)	
Year	P[17]	N	P	N	P	N	P	N	P	N
2001-02	424	397,189	41	3	20600	87	137.0	1.4	577	11
2002-03	459	440,022	43	3	15200	70	122.0	1.4	622	10
2003-04	501	488,299	41	3	15400	75	126.0	1.5	465	10
2004-05	525	493,570	43	3	17400	82	128.0	1.7	735	15
2005-06	552	548,418	42	3	16700	78	125.0	1.7	314	9
2006-07	589	613,271	42	2	11600	2	121.0	1.7	302	8
2007-08	646	666,195	43	2	14000	77	119.0	1.8	290	8
2008-09	657	676,267	40	2	13500	93	148.0	1.7	326	8
2009-10	713	626,120	43	2	7926	127	146.0	1.9	323	8
2010-11	772	646,030	44	2	8684	161	170.0	1.9	315	9
2011-12	821	661,278	44	2	7725	185	158.0	2.0	318	9
2012-13	795	656,152	45	2	6419	161	154.0	2.1	323	9

Notes: Constructed based on merged DEDJTR's trade missions program administrative database and cleaned version of BAS-BIT database in the BLADE for the State of Victoria. The total number of businesses may not be identical to the official ABS' estimate of number of businesses in Victoria in each financial year.

[17] As mentioned in the preceding paragraph, 843 business which participated in the Trade Missions program and recorded in the DEDJTR database were found in the ABS BLADE's BAS-BIT database. However, some of these have missing values in terms of the matching variables such sales revenues, wages/employment or export for various reasons. For example, some of the businesses may not exist prior to 2010/11 or they may exist under different ABNs. As a result, the figures reported in the columns with the "P" heading (that is, the number of participants) decrease as we move away from the VIC Trade Mission Years (2010-11 to 2012-13).

5. Evaluation Findings

5.1 Impacts on export revenues

We applied the difference-in-difference (DID) methodology to the merged databases from the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) and Australian Bureau of Statistics' BLADE (see Section 4.2). We obtained eight sets of DID impact estimates by comparing Victoria Trade Missions participants to different sets of non-participants produced by different matching methodologies. We refer to these eight sets of impact estimates as Model 1 to Model 8 estimates.

In Model 1, we did not perform any matching. All available non-participating firms were used as the control group. In the rest of the models we used matching.[18] In Model 2 we used the nearest neighbour based on estimated propensity scores. In Model 3 we used five nearest neighbours based on estimated propensity scores. In Model 4 we used one Coarsened Exact Matching (CEM) matched non participant for each participant. In Model 5 used all CEM matched non-participating firms. Models 6-8 are similar to Models 2-4 respectively, except for the addition of two time-varying control variables (firm age and size of employment). These eight sets of estimates of the impacts of Victoria Trade Missions on the participants export sales are summarised in Table 5.1.

Table 5.1: Average increase in export sales of Victoria Trade Missions participants, 2010-2013, per cent.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
0-12 months								
Average	135	219	192	186	138	172	161	157
Lower 95%-CI	117	117	141	103	120	60	85	51
Upper 95%-CI	152	321	244	269	156	284	237	263
0-24 months								
Average	165	345	226	291	174	343	224	332
Lower 95%-CI	139	198	170	172	147	151	131	142
Upper 95%-CI	190	491	281	409	200	535	316	522

Notes: Estimates are based on difference-in-difference analysis of participating Victorian firms compared to different sets of non-participating Victorian firms Model 1 uses all non-participating firms as control group. Model 2 uses one propensity score matched non-participating firm for each treated firm as control. Model 3 uses five propensity score matched non-participating firms. Model 4 uses one Coarsened Exact Matching (CEM) matched non participant. Model 5 uses all CEM matched non-participating firms. Models 6-8 are similar to Models 2-4 respectively, except for the addition of two time-varying control variables (firm age and size of employment). Lower and upper bounds (Lower 95%-CI and Upper 95%-CI) are approximated 95% confidence intervals.

Table 5.1 shows that regardless of the methods use, the impact of the trade mission program on export revenue is positive and significant both in terms of magnitude and statistical significance. Before controlling for selection on observables, participants had on average 135 per cent (see Model 1) higher export revenue within 12 months than if they had not participated in the trade mission

[18] See the discussions in Appendix 1 and 2 for more details.

program. The corresponding approximated 95% confidence interval was 117 to 152 per cent. The estimated impact within 24 months was higher at an average of 165 per cent. However, moving from one year to two years period only added around 30 percentage points to the impact which is less than the 135 per cent initial impact in the first year. This finding suggests some diminishing returns from the trade missions.

As discussed in greater detailed in Appendix 2, we expected Model 2 (and its more robust version Model 6) to provide the most reliable impact estimates since both models used a sample of matched non-participants which showed no statistically significant difference to the participants in terms of pre-program export performance. On average, the impact estimates produced by Models 2 and 6 were actually higher at 186 and 172 per cent respectively. However, their 95% confidence intervals were also wider, suggesting that we need to take into account of the range of the impact estimates. Nevertheless, even the most conservative estimates summarised in Table 5.1 above (which is 51 per cent according to Model 8's lower bound) suggests that the trade mission participation had a significant positive impact.

The average exports sale of participants in the base year (that is pre-program participation) was $809,662. Based one of the most conservative model specifications Model 6 (which is the more restrictive version of the preferred Model 2), in monetary terms trade mission participation increased participants' exports sales by at least 60% x $809,662 = $485,797 within 12 months and 151% x $809,662 = $1,222,590 within 24 months. Table 5.2 compares the estimates found by this report and the self-reported estimates from responding participants. It is clear the increase in exports reported by participants to DEDJTR is within the range of our estimates (closer to the lower bounds of the DID impact estimates). This finding supports the notion that the self-evaluation data reported by participants can be valuable.

Table 5.2: Average increase in the value of export sales of Victorian trade mission participants, 2010-2013, as reported by participants and estimated by this evaluation

	Average increase in export sales	
	Reported by participants	This evaluation's most-conservative estimates
Immediate Export Sales	$212,476	Not estimated since our data is annual
Within 1-12 Months	$565,592	60.0% x $809,662 = $485,797
Within 13-24 Month	$1,116,893	Not estimated
Within 0-24 Month	$1,317,355	151% x $809,662 = $1,222,590

Notes: Estimates are based on difference-in-difference analysis of participating Victorian firms compared to different sets of non-participating Victorian firms (see the notes for Table 5.1). The impact elasticities used in the third column (117.4% and 139.4%) correspond to the smallest 95% confidence interval lower bounds summarised in Table 5.1.

5.2 Impacts on the probability of exporting

Approximately half of program participants were not exporters in the base year. Therefore, we could also measure the impacts of trade mission participation in its extensive form (that is, in terms of how much the program can turn non-exporters into exporters). Using the probability of being an exporter as the export performance measure, we derived difference-in-difference (DID) impact estimates using the same merged DEDJTR and ABS BLADE BAS-BIT databases. The results are summarised in Table 5.3, in which we show five sets of estimates corresponding to Models 1-5 discussed above.[19] Based on the preferred specification of Model 2, trade mission participation increased the probability of becoming an exporter by 26 percentage points within 12 months (approximately 53 per cent increase) and 35 percentage points within 24 months (approximately 71 per cent increase).

Table 5.3: Increase in probability of export of Victorian trade mission participants, 2010-2013, by empirical model specification, percentage points.

	Model 1	Model 2	Model 3	Model 4	Model 5
0-12 months					
Average	21	26	26	24	20
Lower 95%-CI	15	17	18	15	18
Upper 95%-CI	26	35	34	33	21
0-24 months					
Average	26	35	32	34	25
Lower 95%-CI	18	26	24	24	18
Upper 95%-CI	33	45	39	43	32

Notes: Estimates are based on difference-in-difference analysis of participating Victorian firms compared to different sets of non-participating Victorian firms (see the notes for Table 5.1). No results for Model6-8 due to non-convergence issues. Lower and upper bounds (Lower 95%-CI and Upper 95%-CI) are approximated 95% confidence intervals.

5.3 Repeat and multi-year participations

As discussed in Section 2.2, some businesses participated in more than one mission. In the evaluation period, there were 442 out of 1192 participating businesses which participated more than once and the average number of missions per participating business is 1.7. Thus, it is of particular interest to know if those repeat participants experience higher impacts to one-off participants. The main problem that prevented us from doing such analysis was related to the fact that repeat participation might occur within the same year. Given that the performance database we

[19] Models 6-8 estimates are unavailable due to convergence issues in estimating the conditional logit model when the two time varying variables (age and employment).

used (the BAS-BIT) contains only annual data, it was impossible to separate the impacts of repeat participations within the same year.[20]

However, for multi-year participation (regardless how many trade missions attended within each year) we could obtain separate estimates for the first year of participation and the second year of participation. These could be inferred indirectly from the 0-12 month and 0-24 month estimates. If we take the difference between the two estimates, we get an approximation to the impacts of participating in the second year. For examples, under Model 2 estimates in Table 5.1, the difference between the short run and long run impact estimates was 345 – 219 = 126 per cent. Hence, there appears to be a diminishing return to the second year participation. This is intuitive if some of the information obtained from the second year trade mission is similar to the information obtained in the first year mission.

More directly, we could estimate the impact of the first year of program participation and the second or later year (for those participating in more than one mission over more than one year). The estimates for first year participation is summarised in Table 5.3 below.[21] These estimates confirmed a potential diminishing return to trade mission participation. The increase in export sales from participation in the second year (or more) was on average around 50 per cent smaller than the increase from participating only in one year.

Table 5.3: Average increase in export sales of Victoria Trade Missions participants in the first and second (or more) year of participation, 2010-2013, per cent.

	Model 1
First year participation	
Average	248
Lower 95%-CI	136
Upper 95%-CI	359
Second (or more) year of participation	
Average	110
Lower 95%-CI	2
Upper 95%-CI	218

Notes: Estimates are based on difference-in-difference analysis of participating Victorian firms compared to different sets of non-participating Victorian firms. Lower and upper bounds (Lower 95%-CI and Upper 95%-CI) are approximated 95% confidence intervals.

[20] Technically speaking, the time invariant indicator status of participants with and without repeat participation is differenced out by the DID analysis.

[21] These estimates are based on the preferred Model 2 specification.

5.4 Robustness and limitations

In general, program impact evaluation with observational data (that is, where the analyst had no direct control on the data generation process or on how the samples whose data being observed were selected) suffers from potential selection bias due to observed and unobserved factors that affect both decision to participate in the program and the intended outcomes from the program. For examples, program eligibility, incentives and expectations may result in selected participants which are systematically different from non-participants in such a way that a naïve comparison of the performances of participants and non-participants would lead to biased estimates of the program's impact. As mentioned in Section 2, in order to be eligible for the trade missions program, firms must be financially viable; be able to demonstrate a sound case for doing business in the targeted regions; and be currently exporting or able to demonstrate export readiness. These characteristics were not observable in our database, but they determined program participation and could well likely be correlated with outcomes.

In this evaluation, we implemented difference-in-difference (DID) analysis in order to eliminate the influence of unobserved and time invariant factors (factors which do not change over time but determine whether or not a firm participated in the program and correlate with the outcomes being evaluated) by comparing the change in the performance of the participant before and after the program to the change in the performance of non-participants. Effectively, we differenced out any time-invariant confounding effects that could lead to biased estimates.

However, we still had to deal with potential bias caused by unobserved but time varying factors. Furthermore, implicit in the DID analysis is a common trend assumption: that the changes in the performance of both participants and non-participants are the same in the absence of the program intervention. In practice, we ensured that the common trend assumption was not violated by selecting only "similar" non-participants as the control group. To do this, we applied two different matching techniques (propensity score matching and coarsened exact matching) on observed pre-program businesses characteristics that were likely to be related to decision to participate in the program. To handle the first problem of unobserved time-varying confounding effects, we estimated the impacts of the program conditional on two observed time varying variables which are likely to be correlated with the unobserved time-varying factors: business age and employment size.

Therefore, we believe our estimates were robust to different potential bias sources: observed or unobserved and time-varying or time-invariant. The robustness of our findings was further evidenced by the relatively similar results exhibit by our use of different model specifications to

control these sources of bias (Model 1–Model 8) and different measures to derive impact estimates (export sales and export probabilities, 0-12 and 0-24 months, Year 1 and Year 2+, and the approximated 95% confidence interval).

There are some limitations to this evaluation, mostly related to data availability. First, while we knew the destination countries of trade missions, we did not know the export destination. One may expect that participation in a trade mission to China would be more likely to increase export to China than to other countries. Globalisation in value chains of production may temper this direct relationship partly, but it remains that if we knew export destination, we might be able to obtain a more precise estimate (in terms of its causality relationship) of the program impact. To address this limitation requires the BAS-BIT database within the BLADE to be supplemented with detailed Customs data. This can only be done if the relevant international trade information collected by Australian Customs office is incorporated into the BLADE.

Second, as shown in 2.2., the number of missions and program participants increased rapidly during the evaluation period. In 2010/11, the first year of the evaluation, there were only 14 missions with 162 participants (145 individual businesses). By 2012/13, the last year of the evaluation, these figures increased to 25 and 1324 (935), respectively. However, the BAS-BIT database is only available up to 2012/13. Thus, for a majority of the program participants, we only had data to evaluate the impact within 0-12 months. This data limitation reduced the precision of the impact estimates (that is, it widened the confidence intervals) significantly, particularly for the 0-24 months or Year 2 estimates. This limitation can be more easily addressed by incorporating newer financial years of BAS-BIT data within updated BLADE into the analysis in the future.

Another limitation of the current evaluation that is related to data availability is the small sample size of program participants (relative to the sample size of non-participants). There are potentially interesting aspects of different trade missions such as destination countries mentioned above and characteristics of the trade events themselves (which industry, regional or country specific, which delegates from other countries participate, which country officials were met, and many others). An analysis of the roles of these factors on the impact of trade missions would yield interesting implication to improve program design and targeting. However, such analysis is omitted due to limited sample size and information.

Finally, there are limitations in terms of empirical model specification. These include additional steps that we have not done to further improve the robustness of the analysis in terms of the propensity matching stage. Specifically, different match identification would need to be tried including the use

of kernel or radius matching. However, we do not expect we would obtain significantly different results given that our implementation of exact matching, a very different matching paradigm compared to propensity score matching, produced more or less similar results. In the coarsened exact matching method, we avoid the need to specify parametrically any propensity score equation (thus avoiding potential model misspecification) and automatically ensure covariate balance. Finally, we report approximated 95% confidence intervals derived using the delta-method. A more reliable approach would be to obtain the confidence intervals via bootstrapping due to the multiple estimation stages involved (matching followed by DID analysis). This has not been done due to high requirements on computer time and data processing. Also, the main benefit from doing it may be more valuable for academic interest rather than policy inferences since the approximated confidence intervals are likely to be adequate.

6. Summary of findings and Recommendations

Firms face many obstacles when trying to enter the export market, one of the most significant ones manifests in the form of information barriers. Firms would need to collect information in order to identify the potential export markets and the characteristics of consumers; market entry procedures and marketing channels (including identifying capable, reliable, trustworthy and timely trade partners). Markets cannot work if market signals are hard to read. If markets perform poorly, the Victorian economy misses out on many gains from specialisation and economies of scale. These gains from trade are critical in a small isolated economy distant from most global markets.

Various formal and informal solutions to reduce the significant cost of informational and contact establishment barriers have been proposed. Institutions such as embassies and consulates and specially set up trade promotion organisations and their trade promotion programs (trade shows and trade missions) are part of the solution to the market failure problem. However, existing evidence provides conflicting conclusions with regards to the effectiveness of these solutions.

This evaluation aims to provide an estimate of the impacts on export revenues firms participating in Victorian Government supported trade programs, namely Super Trade Missions and Trade Missions, over the period 1 December 2010 to 30 June 2013. The analysis is based on linked trade program data of participants and ABS tax record data (BAS-BIT). The BAS-BIT database provides objective measures of firm characteristics including export revenues from 2002-03 to 2012-13.

Key finding 1

Implementing matched difference-in-difference method in order to minimise the effect of confounding factors correlated with program participations and export performance, we found that the trade missions program has statistically and economically significant positive impacts on participants' export performance. The finding confirms the notion that Victorian firms face significant informational barriers and/or barriers in establishing contacts when trying to enter the export market and that government funded trade mission programs can serve as an effective solution (as is the case with this program) to reducing the impacts of these barriers faced by potential exporters.

More specifically, trade mission participation increased participants' total export sales by an average of 219% within 12 months and 345% within 24 months. With an average total export sales of $809,662 in the base year (the year before participation), these relative increases are equivalent to average increase in export sales of around $1,773,160 and $2,793,333 per program participant

respectively. Furthermore, accounting for sample variability, the approximated 95 per cent confidence interval of the within 12 month estimate shown above is between 117% and 321% or approximately between $947,304 and $2,599,015 in dollar terms.

These findings are robust to variation in the main assumptions underlying the empirical model. The evaluation estimated eight different models and found that all of the estimates produced as statistically and economically significant positive impacts of the program. The 95 per cent confidence intervals for the within 12 months estimates of the impact on export sales range from 51% to 535% or approximately from $412,928 to $4,331,692.

Recommendation 1

Based on the key finding of positive program impacts, we recommend a continuation of the trade mission program, particularly if it is targeted toward businesses which are similar to past program participants (e.g., in terms of industry, international engagement through past export, import or foreign ownership, size and productivity). In order to identify each potential program participant or set the similarity parameters (e.g. the range of sales or turnover values of past participants), the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) could collaborate with the ABS to use the latter's detailed, ABN level Victorian business population database.

Key finding 2

According to trade program participants self-reported impact data collected by DEDJTR, the average increase in export sales within 12 months is $565,592. This estimate appears to be on the low side, compared to the analysis based on the ABS data. However it is still within two of the estimated confidence intervals (our lowest lower bound is $412,928). This suggests that the self-reported data is informative and can provide a quick and reasonably reliable impact estimate.

Recommendation 2

DEDJTR should continue collecting the self-reported impact data (e.g. increase in export sales within 12 months, 24 months and 36 months) from program participants. If it is possible, DEDJTR should ask participants to also identify the increase of export to the destination country/region of the trade mission in which they participated. The information can then be validated once the ABS released the export destination country information (unfortunately, the ABS has not provided any expected date).

Key finding 3

The evaluation found that trade mission participation increased the probability of non-exporters becoming an exporter. In the base year, only around 50% of participants were exporters. After participation, the proportion of participants who were exporters increased to 76% within 12 months and 85% within 24 months.

Recommendation 3

Based on the finding that the program increased export market participation among the non-exporters, we recommend the continuation of the current policy which allows firms without any past export experience to participate (around 50% of past participants were non-exporters).

We also recommend further analysis on the characteristics of non-exporters which become exporters. Once this analysis is done, we recommend comparing the findings to those existing studies based on developing country data as the finding that trade mission participation can help non-exporters to enter the export markets is more commonly found in studies of non-exporters from developing countries than from developed countries.

Key finding 4

There were businesses (442 out of 1192) which participated in two or more years. On average, the program participation impact on exports performance is larger in the first year of participation than in subsequent years. In other words, there appear to be diminishing returns from participating in subsequent years.

Recommendation 4

We recommend the issue of diminishing returns from repeat program participation to be analysed further before any decision to limit program participation for new participants only is made. The reasons for this are as follows:

- First, we do not know whether the drop in the estimated impact of subsequent participation is statistically significant, and
- Secondly, we do not know, for example, whether or not all kind of repeat participation shows diminishing return. Some firms may be classified as repeat participants because they

participated in two missions to Indonesia and Viet Nam. Other firms may become repeat participants because the participated in two missions to Indonesia and Saudi Arabia.

Lessons for future 1

The evaluation approach applied to the trade program using administrative program participation records linked with Australian Bureau of Statistics (ABS) tax record data (the ABS BAS-BIT database) is found to be a robust methodology enabling reliable conclusions on program outcomes to be reached.

Recommendation 5

Implementation of a similar methodology with similar databases to assess program outcomes of other business support program can provide valuable insights for policy makers on the effectiveness of the program. Furthermore, these similar program databases can be consolidated to identify firms participating in multiple programs administered by different sections/departments in order to refine each specific program impact estimate further.

Lesson for future 2

A literature review conducted showed that this is a first of its kind study in Australia. Furthermore, existing evidence is often based on aggregate (industry level) trade data. In contrast, this evaluation used firm level data which allowed us to identify the direction of causality. That is, we were able to ensure that the estimated difference in export performance between participants and non-participants was a result of program participation and not because better performing firms in terms of export were more likely to be participants. Industry level data could not distinguish firms which actually participated in trade missions from firms which did not. As a result, any factor that causes one industry to perform better than others in terms of export can be incorrectly attributed to the impact of a trade missions program which targeted that industry. It is possible, for example, for the program administrator to select better performing industry as a target. In this case, the direction of causality does not run from trade mission program to export performance; instead, it runs from export performance to trade mission program. Without firm level data, it is significantly more difficult to rule out such possibility.

Recommendation 6

This evaluation provides a significant contribution to the literature on the effectiveness of government trade programs and trade promotion. Therefore, we recommend publication of the findings of this evaluation to wider audiences in Australia and abroad.

Acknowledgement

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Appendix 1 Methodology

A1.1 Difference-in-difference (DID) analysis

We derived average treatment effects on the treated as our estimate of the impact of the trade mission program on participants' export performance using a quasi-experimental method known as difference-in-difference (DID). To implement the method, we required observable data on the export performance of participating and non-participating firms before and after the trade mission. In the stylised diagram in Figure A.1 below, the observed data are labelled with "green" coloured labels T0 and C0 (corresponding to the average performance of participants and non-participants before trade mission, respectively) and T1 and C1 (corresponding to the average performance of participants and non-participants after trade mission, respectively).

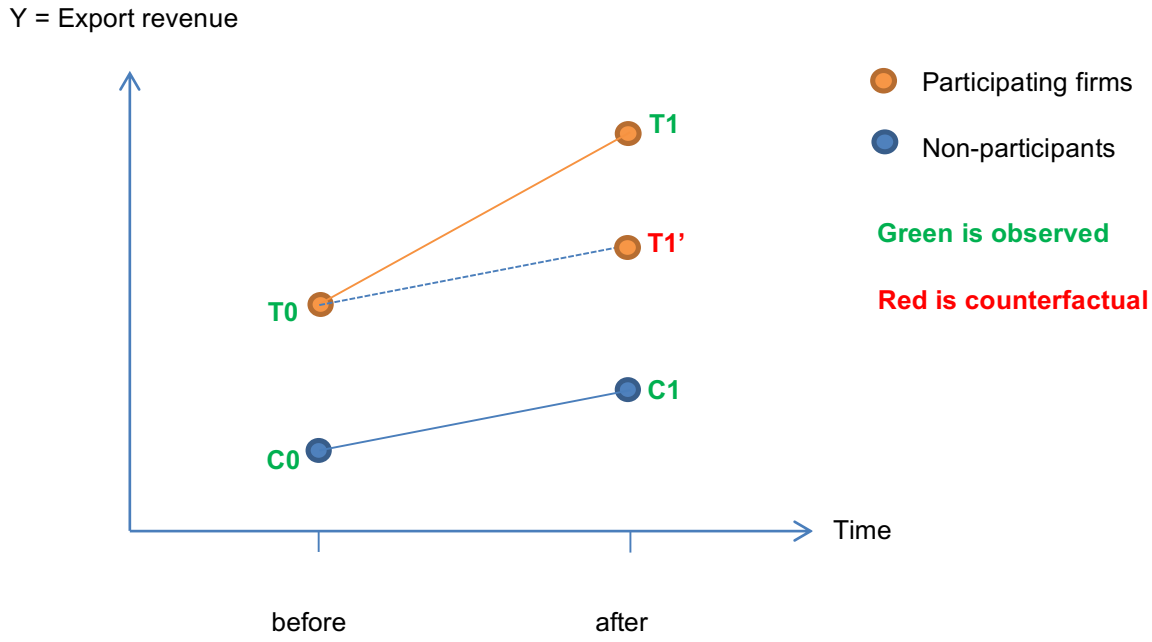

Figure A.1: Impact evaluation with before and after data

Naïve impact estimates

Given the observed data as defined above, one naïve estimate of the impact is to compare the difference in average export performance (Y) at points T1 and C1 (that is, $Impact_{Naive1} = Y_{T1} - Y_{C1}$). This naïve estimate is usually produced when we do not observe before and after data. The problem with this naïve estimate is we do not know whether participating firms are always superior to non-participating firms. Note that Figure A.1 is drawn such that $Y_{T0} > Y_{C0}$ to illustrate the possibility that participating firms may in fact have better export performance even before the program.

Another slightly less naïve estimation method that people can use when before and after data are available is to measure impact as: $Impact_{Naive2} = Y_{T1} - Y_{T0}$. This estimate is an improvement over the previous one since it does not suffer from the "upward bias" from any pre-existing superior performance of the participating firms. That problem is avoided by making a comparison based only on the performance of the participating firms. However, there is still another problem in terms of completely attributing the change in the performance of participants ($Y_{T1} - Y_{T0}$) to the trade missions. It is plausible that some of the measured improvement in participating firms' performance comes from other unobserved reasons unrelated to trade mission participation. In Figure A.1, this possibility is illustrated by the counterfactual point T1' to denote the average export performance ($Y_{T1'}$) had there be no trade mission program. The closer T1' is to T1, that is as $Y_{T1'}$ closer to Y_{T1}, then the more severe the misattribution problem from using $Impact_{Naive2}$ measure.

DID impact estimate

To address the attribution bias problem of $Impact_{Naive2}$, we can redefine the impact measure as:

$$Impact = Y_{T1} - Y_{T1'} \tag{A1.1}$$

The problem with implementing the measure $Impact$ in (A1.1) is that it involves $Y_{T1'}$ which is an unobserved counterfactual. The difference-in-difference approach solves this problem by making a reasonable assumption that whatever unobserved factors there are which are unrelated to trade missions participation, they affect performance before and after the program for both participants and non-participants in a similar way. This assumption is also known as the common trend assumption as shown in Figure A.1 above by the common slopes of the lines C0-C1 and T0-T1'.

Under the common trend assumption, we can estimate $Y_{T1'} - Y_{C1}$ as $Y_{T0} - Y_{C0}$ such that the impact of trade mission can be measured as:

$$\begin{aligned} Impact_{DID} &= Y_{T1} - Y_{T1'} \\ &= (Y_{T1} - Y_{C1}) - (Y_{T1'} - Y_{C1}) \\ &= (Y_{T1} - Y_{C1}) - (Y_{T0} - Y_{C0}) \\ &= (Y_{T1} - Y_{T0}) - (Y_{C1} - Y_{C0}) \end{aligned} \tag{A1.2}$$

where in the third line we substitute $Y_{T0} - Y_{C0}$, which is observable, for $Y_{T1'} - Y_{C1}$ which is unobserved. Thus, $Impact_{DID}$ is essentially computed based on the difference of two observed differences and hence where the difference-in-difference term comes from.

A1.2. Basic DID

This and subsequent sections and Appendix 2 provide a more technical discussion of the implementation of the DID method in this report. Denote program participation status as D_{it} where $D_{it} = 1$ if firm i participates in the Victorian Trade Missions or Super Trade Missions in financial year t and $D_{it} = 0$ otherwise. Denote X_{it} as the corresponding vector of observed covariates of firm and program characteristics. Denote Y_{it}^1 as the observed outcome (say, export revenues) and Y_{it}^0 as the unobserved (counterfactual) outcome.

Hence, $E\left[Y_{it}^1 | X_{it}, D_{it} = 1\right]$ is the observed average outcome of participating firms conditional on X_{it} and $E\left(Y_{it}^0 | X_{it}, D_{it} = 1\right)$ is the counterfactual average outcome of participating firms had they not participated. The impact of trade promotion program is measured by the average treatment effect on the treated (ATT) denoted by τ:

$$\tau = E\left(Y_{it}^1 | X_{it}, D_{it} = 1\right) - E\left(Y_{it}^0 | X_{it}, D_{it} = 1\right) \quad \text{(A1.3)}$$

In equation (A1.3), τ measures the average change in the outcomes of participating firms as the difference between observed average outcomes after treatment and counterfactual average outcomes had the firms not received the treatments. It is clear that to obtain an unbiased estimate of τ we need an unbiased estimate of $E\left(Y_{it}^0 | X_{it}, D_{it} = 1\right)$, the counterfactual average outcome. An obvious candidate is to use the average outcome of a selected group of non-participants which we call as the control group. This control group would need to be identified by taking into account any potential non-randomness or endogenous selection in program participation.

In other words, we need to select the control group such that relevant firm characteristics are comparable in both groups. We did this in two ways. First, we implemented the basic difference-in-difference method. The main idea was to use the longitudinal nature of our linked Trade Program and BAS-BIT databases. Specifically, we used the repeated observations of the same firms across the years in order to control for time invariant and unobserved characteristics that lead to systematic selection to exporting and to the trade promotion program. Using difference-in-difference, we estimated τ by comparing the change in the export outcomes of participants before and after the treatment to the change in the export outcomes of non-participant before and after the treatment. This is shown in equation (A1.4) below:

$$Y_{it} = X_{it}\beta + \tau D_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad \text{(A1.4)}$$

Note that in specifying equation (A1.4), we assume the conditional expectation function $E(Y|X,D)$ is linear and any unobserved firm characteristics is decomposable into a time-invariant firm specific fixed effects (μ_i), common across firms year effect (λ_t) and a random component (ε_{it}). The introduction of the covariates (X) linearly may lead to inconsistent estimate of τ due to potential misspecification (Meyer, 1995; Abadie, 2005). In order to avoid this problem, we followed Volpe Martincus and Carballo (2008) and augment the difference-in-difference analysis with a matching analysis as described below.

A1.3 Matched DID

As discussed above, a key identification assumption of the DID method is the common trend assumption. To minimize the possibility that this assumption is violated, we needed to make sure that the control group, that is the set of non-participants that we compare to, are as "similar" as possible to the participants. This is particularly important when we know that program participation is not random, that is when there is any systematic selection bias into trade mission attendance. The matched-DID impact measure aims to address the problem by making a slightly weaker assumption that there is a common trend once participants and non-participants are matched on observable characteristics.

The matched difference-in-difference method can estimate treatment effects without imposing the linear functional form restriction in the conditional expectation of the outcome variable is (Arnold and Javorcik, 2005; Gorg et al 2008). The matching method part controls for any endogeneous selection into programs based on observables (Heckman and Robb, 1985; Heckman et al 1998). The difference-in-difference part of the method controls for endogenous selection into programs based on time invariant unobservables. Therefore, the matched difference-in-difference estimate of the treatment effects (τ) is the difference between the change in the outcomes before and after program participation of treated firms and that of matched non-participating firms. Any imbalance between the treated and control groups in the distribution of covariates and time-invariant effects is controlled for. Note however that we still need to assume that there is no time varying unobserved effects influencing selection into treatment and treatment outcomes (see Heckman et al., 1997; Blundell and Costa Dias, 2002).

In practice, the estimation of τ (treatment effects) was conducted in two stages. First, control group members were identified using a matching method such as the propensity score matching (explained below). Second, equation (A1.4), without the X covariates, was estimated using the treated group and matched control group as the sample.

To ensure robustness, this evaluation used two approaches to match each participating firm to non-participating firm(s). The first approach is based on parametric estimation of propensity scores for attending trade missions. The second approach is based on non-parametric exact matching. These are explained below. Appendix 2 discusses the results of the matching step.

Propensity score matching

The basic idea here is to pair participating firms to most similar non-participating firms using propensity score. The propensity score was estimated as the predicted probability of a firm to participate in the program based on observed covariates $P(X)$ which do not include the outcome measures. By doing this, we control for observable sources of bias in the estimation of the treatment effect (selection on observables bias). In order to estimate $P(X)$, we controlled for observed factors that determine firms selection into the programmes and export performance, so that programme participation and programme outcomes are independent. The similarity of two given firms was then assessed by how close their propensity scores are.

In this report, we use the following similarity criteria to select the participants and non-participants in computing the $Impact_{DID}$:

1. The nearest neighbour (NN1): For each participant, select one non-participant with the most similar propensity score.

2. The five nearest neighbours (NN5): For each participant, select five non-participants with the most similar propensity scores.

To produce relatively reliable estimates of the propensity scores, Volpe Martincus and Carballo (2008) and the literature they cite[22] suggest that we take into account factors that are correlated with different stage internationalisation. Firms at different level of internationalisation appear to have different level of awareness of available promotion programs. In addition, their needs and obstacles also vary by their degree of internationalisation, implying different requirements and expectations from export promotion participation.

In practice, our choice of matching variables was limited by how rich the database we worked with. For this report, we estimated the propensity score as the predicted probability of participating in the trade mission program conditional on:

[22] See, as cited in Volpe Martincus and Carballo 2008, Kedia and Chhokar 1986; Naidu and Rao 1993; Ahmed et al., 2002; Diamantopoulos et al. 1993; Naidu and Rao 1993; Czinkota 1996; Moini 1998; Ogram 1982; Seringhaus 1986; Cavusgil 1990; Kotabe and Czinkota 1992; Francis and Collins-Dodd 2004.

- Total sales revenue
- Imports
- Share of foreign ownership
- Industry

where we used of past values (pre-2010) in order to avoid endogeneity problem in the matching process.[23]

The propensity matching approach was implemented using the *psmatch2* command in Stata software based on the following constructed variables:

1. Identify treated and non-treated firms. $D_i = 1$ if $D_{it} = 1$ at any year t. Otherwise, $D_i = 0$. The variable D_i is the dependent variable for psmatch2.

2. For each year, the covariates vector X_{it} consists of total sales revenues, whether or not an exporter (if the outcome being considered is export sales revenue), import values, total wages paid, share of foreign ownership and one-digit industry code. Thus, X_{it} measure size and the extent of international engagement of the firms within each broad industry.

3. Using only the years before Victorian Trade supported program begun (that is, data from 2009 or earlier), compute the pre-2009 average values of each components in X_{it} across the years for each firm. Denote this average values as X_{ipre}; this covariate vectors is the independent variables for psmatch2.

4. The control group is defined as the nearest neighbour matched by psmatch2 using the variables in steps 1 and 3.

Exact matching

We complemented the propensity matching method with a non-parametric method known as exact matching. The exact matching approach is an old approach which aims to identify "similar" non-participants in a more direct way. Instead of comparing propensity scores computed as a function of the matching variables (Total sales revenue; Imports; Share of foreign ownership; Industry), with exact matching we made sure that the selected similar non-participants had the same values of total sales revenue, imports, share of foreign ownership and industry to those of a given participant. For example, if a participant had total sales revenue = $1 million, imports = $100 thousands, share of

[23] We also estimated model specifications in which we included past export values and past export status.

foreign ownership = 5% and industry = Manufacturing, then matched non-participants would have identical values in all of those matching variables.

There are however some dimensionality problems when the matching variable such as total sales revenue is continuous. To avoid this problem, we used the more recently developed coarsened exact matching (CEM) approach where the continuous matching variable has been "coarsened" or "discretised" (Iacus, King and Porro 2011a, 2011b).[24] In this case, the CEM algorithm first coarsens each continuous variable to ensure that substantively indistinguishable values (with respect to program participation) are grouped and assigned the same numerical value. Then, exact-matching algorithm is applied to each strata within the coarsened data to identify the control group (non-participants which are most similar to participants).

As in the case of propensity matching approach, we used two "most similar" definitions in order to allow us for assessing the sensitivity of impact estimates to matching approach:

1. One exact match (CEM-K2K): For each participant, select one non-participant identified as one of the exact matches.

2. All exact matches (CEM): For each participant, select all participants identified as the exact matches.

[24] See also Blackwell et al. (2009) for further discussion on the various desirable properties of CEM as a matching method.

Appendix 2 Matching analysis results

A2.1 Propensity score matching

As discussed in Appendix 1, to account for the possibility of systematic selection into participation in trade mission program, we implemented the propensity and exact matching approaches and produce difference-in-difference (DID) estimates of the program impacts on matched control groups. For the matching variables we included the averages of pre-2010 (that is pre-VIC trade mission program) of output, import, foreign ownership and wages. In addition, we also performed propensity matching using pre-2010 average of export sales and export status.[25] Table A2.1 summarises the coefficient estimates of the propensity equations. Table A2.2 summarises the matching results.

Table A2.1: Propensity score matching coefficient estimates

Dependent variable D_i: Program participation status over 2010/11 – 2012/13
($D_i = 1$ if business *i* participated in any year in the period)

Independent variable	PSM1	PSM2
Mean pre-2010 output	1.87e-10	1.98e-10
	(1.76e-10)	(1.68e-10)
Mean pre-2010 import	3.83e-09	-5.27e-09
	(5.03e-08)	(3.97e-08)
Mean pre-2010 foreign ownership share	1.512***	0.582**
	(0.288)	(0.292)
Mean pre-2010 wages	7.90e-09***	7.20e-09***
	(1.16e-09)	(1.08e-09)
Mean pre-2010 export sales		-6.52e-11
		(9.97e-10)
Mean pre-2010 export status		2.204***
		(0.097)
Constant	-6.227***	-6.577***
	(0.185)	(0.189)
Industry fixed effects	Yes	Yes
Sample size	222,307	222,307
Pseudo-R2	0.0752	0.1405

Notes: Estimated using matched DEDJTR Victoria Trade Missions and ABS BAS-BIT databases. The notations *, **, *** denote statistically significant estimate at 10, 5, and 1% level. Standard errors are in parentheses

First, regarding sample size, the original data for matching contain 597,091 firms. However, due to missing values in one or more covariates, only 222,307 firms were included in the propensity score estimation. Second, the coefficient estimates of export status, foreign ownership share and wages are statistically significant and of the expected sign. To some extent, these seem to suggest that past

[25] These two additional variables were excluded from the first specification since they are the outcome variables. Their inclusions here assume that the pre-2010 averages can be treated as "exogenous".

international engagement and productivity (wages effect is positive once output is controlled for) are important predictors of program participation and potentially exports.

Then, based on the estimated coefficients summarised in Table A2.1, we computed the predicted propensity scores which we used, for each treated firm, to identify the most similar non-participants as the matched control group. In the propensity matching approach, we identified the nearest neighbour and five nearest neighbours from the pool of non-participants as the control group to which the export performance of participants is compered to. Table A2.2 provides a summary of t-tests of differences in the means in average export performance before program participation (that is, pre-2010) between participants and non-participants matched using the first propensity matching model (PSM1).

Table A2.2: Differences in pre-program participation average exports sales and export probability of participants (P) and non-participants (N), before and after matching; PSM1

	Nearest neighbour (NN1)			Five nearest neighbours (NN5)		
	P	**N**	**N – P**	**P**	**N**	**N – P**
Before matching						
Sample size	575	596,516		575	596,516	
Mean (export) ($)	824,559	21,249	-803,310	824,559	21,249	-803,310
t-stat (Ho: N – P = 0)			-3.285***			-3.285***
Mean (Probability[export])	0.445	0.037	-0.408	0.445	0.037	-0.408
t-stat (Ho: N – P = 0)			-51.530***			-51.530***
After matching						
Sample size	487	469		487	12,143	
Mean (export) ($)	867,536	236,962	-630,575	867,536	442,275	-425,261
t-stat (Ho: N – P = 0)			-1.715*			-0.239
Mean (Probability[export])	0.493	0.204	-0.489	0.493	0.043	-0.450
t-stat (Ho: N – P = 0)			-9.773***			-43.922***

Notes: *, **, *** denotes statistically significant estimate at 10, 5, and 1% level.

From Table A2.2, before matching, the t-statistics for the null hypothesis that the average export of the two comparison groups is not different from zero is -3.285. Thus, the null hypothesis was rejected and we concluded that participant and non-participants differed significantly before the program. After matching, the t-statistic is -1.715 for NN1 matching and -0.239 for NN5 matching. Thus, in this case, the five nearest neighbours matching performed better in eliminating pre-program differentials in average export sales between participants and non-participants. However, neither matching eliminated the pre-program differentials in terms of export probability.

Table A2.3 summarises the matching results when we use PSM2 coefficient estimates to predict the propensity scores. Note that Table A2.1 indicates that the addition of past export sales and past export status appears to improve the fit of the propensity score model significantly (pseudo-R2 increased from 0.075 to 0.140). The results for NN1 matching seem to reflect the improvement in the propensity score model fit. Pre-program differentials between participants and non-participants in terms of export sales value were no longer statistically significantly different from zero.[26]

Table A2.3: Differences in pre-program participation average exports sales and export probability of participants (P) and non-participants (N), before and after matching; PSM2

	Nearest neighbour (NN1)			Five nearest neighbours (NN5)		
	P	N	N – P	P	N	N – P
After matching						
Sample size	487	469		487	12,099	
Mean (export) ($)	867,536	9,874,928	9,007,392	867,536	448,960	-418,576
t-stat (Ho: N – P = 0)			1.001			-0.236
Mean (Probability[export])	0.493	0.496	0.004	0.493	0.089	-0.403
t-stat (Ho: N – P = 0)			0.123			-29.428***

Notes: *, **, *** denotes statistically significant estimate at 10, 5, and 1% level.

A2.2. Exact matching

For the exact matching, we used the same two sets of matching variables used in PSM1 and PSM2 propensity matching above. The differences in the program participation after matching are summarised in Table A2.4 below. Corresponding to the NN1 and NN5 matching criteria in the case of propensity matching, we produce CEM-K2K matches (1-1 match) and CEM (many-to-1) matches. The performance of the CEM matching appears to be worse than the propensity matching as shown by the statistically significant pre-program participant and non-participant differences in all cases except for the case of export probability and when the full set of matching variables (PSM2) are used.

To conclude, the matching analysis suggests that nearest neighbour (NN1) matching with the full set of PSM2 matching variables (which include pre-2010 average export sales and export status) is the only one that can reduce the pre-program differentials in both export performance measures to an amount that is not statistically significantly different from zero.

[26] Due to our inability to see the actual data of individual units, we do not know why the average export value of matched non-participants under the NN1 matching is very large ($9,874,928). We suspect this is due to an outlier being selected as one of the nearest neighbours as indicated by a similarly large standard deviation of export values of matched non-participants (standard deviation = $1.98e+08).

Table A2.3: Differences in pre-program participation average exports sales and export probability of participants (P) and non-participants (N), before and after matching; PSM2

	CEM-K2K			CEM		
	P	**N**	**N – P**	**P**	**N**	**N – P**
After matching (PSM1 variables)						
Sample size	566	566		567	541,127	
Mean (export) ($)	752,287	48,118	-704,170	752,288	10,474	-741,814
t-stat (Ho: N – P = 0)			-2.305**			-15.173***
weighted mean difference						-693,857
t-stat (Ho: N – P = 0)						-2.28**
Mean (Probability[export])	0.437	0.093	-0.344	0.437	0.039	-0.398
t-stat (Ho: N – P = 0)			-14.225***			-48.756***
weighted mean difference						-0.332
t-stat (Ho: N – P = 0)						-15.89***
After matching (PSM2 variables)						
Sample size	566	566		566	537,737	
Mean (export) ($)	753,617	94,132	-659,486	753,617	7,797	-745820
t-stat (Ho: N – P = 0)			-2.141**			-34.210***
weighted mean difference						-611,402
t-stat (Ho: N – P = 0)						-2.00**
Mean (Probability[export])	0.438	0.438	0	0.438	0.033	-0.405
t-stat (Ho: N – P = 0)			0.000			-53.460
weighted mean difference						2.93e-14
t-stat (Ho: N – P = 0)						0.00

Notes: *, **, *** denotes statistically significant estimate at 10, 5, and 1% level.

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Glossary

Confidence interval	A 95% confidence interval means that if the analysis is replicated with 100 times with possibly different samples, the true value of the population parameter of interest (the impact of trade mission) will be observed in the interval 95 times.
Control group	The control group consists of firms who did not participate in the program, but are otherwise similar to the participating firms. To obtain unbiased impact estimates, the average change in the relevant outcomes of participating firms is compared to the average change in the same outcomes of the firms in the control group.
Counterfactual	In program impact evaluation with observational data, the counterfactuals refer to the unobserved outcomes of participants had they not participated in the programs.
Difference-in-difference	An empirical technique to account for potential selection into treatment bias when treatment effect is to be estimated with non-experimental data. Instead of taking average difference in outcomes of treatment and control groups to measure treatment effect, difference-in-difference (also known as DID) takes the difference between the average change in outcomes of the treatment group and the average change in outcomes of the control group.
Economically significant	This concept concerns with the magnitude of the impacts and to be contrasted with the concept of statistical significance. An estimated impact may be statistically significantly different from zero. However, the magnitude of the impact may be too small to be considered as significant in economic terms. This is also known as importance measure.
Exact matching	An exact matching of two firms, for example, with a characteristic vector X measuring age, employment, turnover, and industry of the firms means that the two firms has the same values in all of those characteristics included in X.
Impact	In this evaluation, impact is defined as the change in the export performance (export revenue and export status) of trade mission

	program participants.
Lower bound	Lower bound refers to the lower limit of any reported 95% confidence intervals.
Matching	In this evaluation, matching is a data driven approach to ensure two given firms are "similar" to each other in the matching characteristics or in terms of the probability to be in the treatment group.
Naïve estimate	In this evaluation, naïve estimate refers to impact estimates derived from a simple difference between export performance before and after program participation or between export performance of participants and non-participants.
Probability of export	This evaluation defines a firm as an exporter in a given financial year if it reports a positive export value in its Business Activity Statement. The probability of export is probability of a firm in the sample has positive export. Empirically, this probability is approximated by the proportion of firms who are exporters.
Propensity score	Propensity score in this evaluation refers to the predicted probability of a given firm is participating in Victoria trade mission program, conditional on firms observed characteristics.
Propensity score matching	This refers to matching based on a comparison of the propensity score defined above. Two firms are matched if their propensity scores match.
Robust estimate	This concept refers that the estimates are robust to variation in model specifications.
Treatment group	In this evaluation, treatment group refers to participating firms/businesses in the trade missions program.
Time invariant factors	Factors which values are fixed/constant across time.
Unobserved factors	In this evaluation, they refer to factors which are not recorded in the data but they determine whether or not a firm participated in the program and are correlated with the outcomes being evaluated.