FACULTY OF
BUSINESS &
ECONOMICS

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Melbourne Institute Working Paper Series

Working Paper No. 6/15

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Vocational Education and Training Voucher Scheme

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Document tendered by

M. Minto, NSW Business Chamber

Received by

L. Race

Date: 22 / 9 / 15

Resolved to publish   Yes / No

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If You Get What You Want, Do You Get What You Need? Course Choice and Achievement Effects of a Vocational Education and Training Voucher Scheme*

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Abstract

Outside of apprenticeships, allocations of public funds across vocational education and training (VET) courses are often made on the basis of government forecasts, with limited competition between (mostly public) colleges. This centralised model is often blamed for stifling responsiveness to skill demands and training quality. However, little is known about whether moving to alternative funding models improves outcomes. In this study, we exploit a natural experiment and population data to estimate the effects from the introduction of a broad-based voucher in VET in Australia. We show the voucher is associated with large increases in private college enrolments, improved match between course choice and employer demand, and higher student achievement, including in incumbent public colleges. Unlike studies in the school voucher literature, we find widespread benefits with no adverse impact on equity.

2

1. Introduction

Policy makers allocating public funds to support post-secondary vocational education and training (VET) – often justified on the basis of externalities and capital market failures (Stevens 1999; McCall and Smith 2009) – face the twin challenges of ensuring students receive both high quality training and training that is relevant to the needs of the labour market (e.g. DBIS, 2009; European Commission, 2010; OECD, 2010; US Department of Education, 2012). This is most acute for 'classroom-based' VET programs where, instead of funding being linked to the attainment of employment (apprenticeships), allocations are often made on the basis of government skill forecasts, with little competition between (mostly public) colleges. In English-speaking countries, where classroom-based programs dominate, these characteristics of VET funding models have been implicated in measures showing persistent skill shortages and poor quality training (DBIS, 2009; US Department of Education, 2012).

In response, several countries have recently introduced reforms designed to make funding of these programs more responsive to skill needs. In the United States, under the *Educating Tomorrow's Workforce Act 2014*, community colleges will be required to annually evaluate and plan to meet local skill needs in order to receive federal funding.[1] In contrast, the approach in Australia and England has been to replace centralised funding models with voucher schemes that link public funding with student choice. Under the new Australian model, the voucher also covers VET courses offered by private colleges, further boosting competition between providers. It is these Australian reforms we examine here.

This paper is the first to estimate the effects of replacing a centrally administered funding model with a broad-based and untargeted voucher scheme in post-secondary VET against a defined counterfactual. Earlier VET voucher studies have been more limited in scale and

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[1] Under section 5 of the bill, this means both identifying the types of programs needed to meet local skill demands and appropriate program content. Recipients will be required to do this by annually assessing local skill needs and setting tailored training plans.

scope. For example, Schwerdt et al. (2012) examined the outcomes of increasing adult participation in classroom-based VET in Switzerland by randomly allocating vouchers to around 2500 individuals (20-60), but little can be drawn from this on the likely outcomes from wholesale switching of funding models. In this paper we examine the effects of the introduction of a broad-based voucher scheme known as the Victorian Training Guarantee (VTG) in the Australian state of Victoria. We study impacts on alignment of course choice with skill demand (*relevance*) and on educational achievement, a proxy for training quality. We restrict the analysis to 15 to 19 year-olds because this is the age when a large part of engagement in post-secondary VET occurs and because younger students are likely to have less information on labour market needs than their older counterparts, so this sets a higher bar.

Effects are estimated using a difference-in-differences approach, exploiting the fact that Victoria was the first Australian state to implement these reforms – agreed nationally but rolled-out state by state – in July 2009. Other states retained their supply-driven funding models until at least 2012, with the neighbouring state of New South Wales (NSW) delaying reforms until 2014, mainly for political reasons. Thus NSW, which has a similar population, economic and institutional structure to Victoria, but which administers and funds VET separately, provides the counterfactual.[2]

In thinking about both course choice and educational achievement we have in mind an underlying discrete-choice human capital framework in which potential students make enrolment decisions, and decisions to stay the course given initial enrolment, based on their perception of the expected course benefits and costs. Such a framework suggests several mechanisms through which the VTG might impact on course choice and achievement,

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[2] Australia has six states and two territories. Victoria and NSW are the two largest states, with populations of 5.8 million and 7.5 million respectively, out of a total Australian population of 24 million (Australian Bureau of Statistics 2014a). Populations of both states, physically separated by the Murray river, are concentrated in the capital cities of Melbourne (Victoria) and Sydney (NSW), which are 880km apart.

including compositional changes in the student body, compositional changes on the supply side (e.g. Friedman, 1962; Anderson, 2005; Blochliger, 2008; Demming et al., 2012; Rosenbaum and Rosenbaum, 2013), differences between students and government in the information used to assess labour market needs (e.g. Lavy, 2006; Jensen, 2010; OECD, 2010; Productivity Commission, 2012), excessive student weighting of consumption benefits of VET (e.g. Oreopoulos & Salvanes, 2011), competition impacts on quality and other aspects of provision (e.g. Friedman, 1962; Hoxby, 2003; Anderson, 2005), and, for achievement, knock-on effects of VTG-induced changes in course choices and match quality (e.g. Bound and Turner, 2011).

Together these potential mechanisms point to VTG impacts of uncertain sign on both outcomes, hence the importance of credible empirical evidence here. Under standard difference-in-difference assumptions of common trends and no relevant asymmetric change in the composition of the student and college body not itself caused by the VTG, we interpret unconditional difference-in-differences estimates at the mean as measures of the overall effect of the VTG on the outcomes in question. By sequentially introducing controls for student characteristics, provider characteristics and course choices, we are then able to partially relax these assumptions and to tentatively assess the degree to which the resulting conditional estimates are consistent with particular causal mechanisms, including increased competition, as outlined above.

Further, by estimating heterogeneous impacts across groups of students and providers, this study presents new evidence on the equity implications from the introduction of broad-based vouchers. Previous school voucher studies have identified two equity concerns. The first is that people from disadvantaged backgrounds may not benefit to the same extent from the greater choice afforded under broad-based vouchers because of an inability to access and utilise information (e.g. see Levin, 1991; Ladd, 2002; Hastings and Weinstein, 2008). In this

5

study, by examining whether students from different backgrounds make choices that are less in tune with employer demand signals, we provide evidence on whether such concerns should extend beyond the use of school vouchers. The second concern is that selection effects (by schools and families) may increase segregation and stifle achievement among disadvantaged groups, as occurred with the introduction of private school vouchers in Chile (Hsieh and Urquiola, 2006). Results presented in this study are estimated under conditions where there is limited scope for selection, due in part to college restrictions on cream skimming and fee caps. Therefore, our study may shed light on the use of regulatory safeguards to promote equitable outcomes from vouchers.

The remainder of the paper is set out as follows. Section 2 provides institutional details for the VET sectors of NSW and for Victoria pre and post-reform. Section 3 describes our data and defines our outcome measures. Section 4 discusses our empirical approach and related identification issues. Sections 5 and 6 discuss the findings relating to course choice and educational achievement, respectively. Section 7 discusses sensitivity analysis and Section 8 concludes. Additional data details and results are presented in an accompanying appendix.

2. VET in Australia and the Victorian Training Guarantee (VTG)

Post-secondary VET courses in Australia lead to nationally recognised qualifications at the International Standard of Education Classification (ISCED) 1997 level 2C, 3C, 4B and 5B. To attain qualifications, students must demonstrate minimum competency in performing general and job-specific tasks that are prescribed in national training packages. National training packages are assembled by national skills councils that comprise representatives from government and employer groups. Except for apprenticeships and traineeships (that require an employment contract) there is no requirement in training packages for competencies to be met through workplace learning. At present, there is no grading of students to gauge the level of skill proficiency attained. Although minimum training

6

standards are set at a national level, each of the six states and two territories is responsible for funding and administering their own VET sector.

Historically, states used a centrally-planned model for funding VET, one where fixed budget allocations were made at the course level across public providers (Technical and Further Education colleges (TAFEs), Adult and Community Education (ACE) centres and dual sector universities) based on historical enrolments and skill forecasts. As part of national reforms in 2008, all Australian states agreed to introduce demand-driven models where funding follows student choice. Victoria was the first state to implement such reforms from July 1 2009 for 15-19 year-olds by introducing the VTG. Until January 2012 when South Australia introduced its own reforms, all other states continued to operate their centrally-planned funding models.

In essence, the VTG triggered three changes: the uncapping of the number of publicly-funded places available to 15-19 year-olds, the linking of funding to student choice rather than government priorities, and the introduction of competition for funding from private colleges. The VTG did not affect public funding of the classroom component of *apprenticeships* and *traineeships*, which from 1998 had operated under a separate demand-driven system, including the freedom for employers to choose training with private colleges.[3] During the period of analysis (2008-2011), all other arrangements remained much the same for 15-19 year-olds in Victoria (and elsewhere), including the course subsidy levels.[4]

The outcomes of the VTG examined in this study are likely to be affected by regulatory safeguards in Australian VET that are aimed at ensuring equity of access. First, during the period of analysis, the ability of providers to raise prices in response to increased demand was limited by fee caps for publicly-funded VET courses that typically restrict fees charged direct

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[3] In 2008, 27% of Victorians aged 15-19 in publicly-funded courses were undertaking apprenticeships or traineeships (National VET Provider Collection).

[4] In July 2012, the Victorian government partially unwound the 2009 reforms by making course subsidies more targeted towards perceived employer demand for graduates.

to students, over and above the publicly-funded vouchers, to less than A\$1000 per year for a full-time course.[5] A potential downside of the price caps is that they may have dampened the incentive for colleges to innovate in response to increased competition and instead encouraged cost cutting and reduced training quality, although not to a level below minimum training standards. Second, colleges have limited ability to cream skim because there is little personal information made available to providers on which to select students – open access is a defining feature of the Australian VET sector – which means that admission is typically made on a first-come first-served basis. Further, the incentive to cream skim is reduced by registration requirements that compel colleges, including private colleges, to comply with equity principles.[6] Depending on the circumstances of the student, extra subsidies are also available to colleges to meet the extra cost of catering for 'high needs learners', such as Indigenous students.

For students who miss out on a subsidised place in training there is the option of enrolling in an unregulated and unfunded 'fee-for-service' VET course, for which private colleges compete alongside public colleges, although few 15-19 year olds take this route.[7]

3. Data

The aim of this study is to examine the effects of introducing a broad-based voucher scheme in post-secondary VET on course choice and training quality, both on average and for various groups of students and providers. The main dataset used in the analysis is the VET Provider Collection (VETPC), an annual administrative dataset containing records of the population of

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[5] In practice, direct tuition fees were regulated according to course level in each state, with a prescribed hourly rate and a minimum and maximum total annual fee. In Victoria, hourly fees for lower-level courses (certificates I and II, equivalent to ISCED2) were up to \$1.51 per hour in 2011, with a minimum total fee of \$187.50 and a maximum total fee of \$875. The highest fees were for Diploma level courses – up to \$3.79 per hour, minimum total fee of \$375 and a maximum total fee of \$2000. Many students were also eligible for reduced fees, e.g. on the grounds of receiving Income Support (welfare).

[6] Relevant requirements for registration included to make reasonable adjustments to accommodate people with disability (under the Disability Discrimination Act 1992) and to abide by access and equity principles under the Australian Quality Training Framework, i.e. to adopt policies and approaches aimed at ensuring VET colleges respond to the individual needs of clients whose age, gender, cultural or ethnic background, disability, sexuality, language skills, literacy or numeracy level, unemployment, imprisonment or remote location may present a barrier to access, participation and the achievement of suitable outcomes.

[7] Currently, data on fee-for-service enrolments is only available for public providers. In Victoria in 2008, fee-for-service enrolments accounted for around 2% of all 15-19 enrolments with public providers (National VET Provider Collection).

publicly-funded VET students in Australia. The sample of analysis is all new enrolments among 15-19 year-olds (on January 1st in the year of enrolment, which determines VTG eligibility) who are no longer in secondary school and who commenced study in 2008 (pre-reform) or 2010 to 2011 (post-reform).[8] The VETPC contains detailed course, student and college information, and a unique student-course identifier that allows us to track enrolments across time and, in most cases, through to completion.

Table 1 summarises new enrolments in our sample. Note that some students enrol in more than one course, and in what follows, the unit of analysis is the course enrolment rather than the student. We see dramatic growth in enrolments in Victoria – a 29% increase between 2008 and 2010 and a 38% increase between 2008 and 2011 – due mainly to growth in enrolments with private colleges. In contrast, there was no enrolment growth in NSW over this period, and the share of enrolments with private colleges actually fell because of a decline in new apprenticeships in NSW related to the global financial crisis. These increases translate to an estimated 10 percentage point increase in the overall proportion of 15-19 year-olds not in school and participating in post-secondary VET in Victoria (from 26% in 2008 to 36% in 2011), with no proportional change in NSW.[9]

Table 2 presents sample means for student, college and course controls used in the analysis (see Appendix Table A1 for more information). Note there are only minor differences in student characteristics between Victoria and NSW in 2008. Also note that the huge increase in enrolment in Victoria over this period was not drawn disproportionately from any one group. The only asymmetric observable compositional change of note over the period is a small increase in prior education levels and socio-economic advantage of students in Victoria compared to NSW. The fact that expanding the accessibility of publicly-funded

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[8] Apprentices and trainees are initially included in the analysis despite operating under a user-choice system prior to the VTG, although we later test sensitivity to their exclusion. We exclude enrolments in foundation courses.
[9] Estimates based on the number of 15-19 year-olds not in school from the Australian Bureau of Statistics (2014b).

places under the VTG had little impact on the characteristics of students in training suggests that pre-reform rationing on a first-come first-served basis was not heavily biased against students from any particular group. A final point is that there were only minor changes in mean student characteristics in Victoria between the pre-announcement period (January to July) and post-announcement period (August to December) in 2008, suggesting no major compositional anticipation effects.[10] Any possible post-announcement but pre-VTG anticipation effects are tested in the sensitivity analysis.

Outcome variables

We examine the impact of the VTG reforms on two key outcomes: the alignment of course choice with skill demand and academic achievement, a proxy for training quality. For course choice, we derive two measures of 'fit' with labour market needs using external data sources that are linked to course choices in the VETPC. The first is a binary indicator for whether the occupation the course is designed to prepare students for is on a national skills shortage list.[11] Skill shortage lists are prepared annually by the federal government, based primarily on employer surveys and skill forecasts (see Table A2). When using this measure, we exclude around 10% of enrolments that are in general courses, such as numeracy and literacy and employment skills courses, and that are not designed to prepare students for any particular occupation.

Our second course choice measure is a continuous variable constructed from estimated wage premia associated with each national qualification level and field of study combination.[12] These are estimated using earnings data from the *Student Outcomes Survey* (SOS), a large and nationally representative survey of VET graduates conducted in the year

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[10] These minor changes may also be due to differences in the characteristics of students who enrol in the first and second halves of the year in Victoria, rather than anticipation effects.

[11] These occupations are at the Australian and New Zealand Standard Classification of Occupation (ANZSCO) 6-digit level.

[12] Grogger and Eide (1995) and Avery and Turner (2012), for example, do something similar to estimate returns to different college majors in the US. Where there are sparse cells, we use results estimated with course level and 2-digit field of study combinations. Field of study is 4-digit Australian Standard Classification of Education (ASCED).

following course completion.[13] The sampling frame for the SOS is the population of VET

completers in the preceding year drawn from the VETPC dataset described above, and

includes updated information on student characteristics and current labour market status

including weekly earnings for those employed.[14] Specifically, we use these data to estimate a

log wage regression for completers aged 15-25 years at the time of survey on dummies for

course-level and field-of-study combinations, with resulting coefficients interpreted as the

average return for different course choices, conditional upon observed student controls and

on finding employment in the year after study. Results from this regression are presented in

Table A3.

When linking these course measures to student choices in the VETPC data, we take course

information available at the time of enrolment, i.e. wage-premia and National Skill Shortage

lists from 2007, 2009 and 2010 for the enrolment years 2008, 2010 and 2011 respectively. In

using information available at the time of enrolment, we implicitly assume that students make

naïve forecasts of course outcomes based on current course information (see Ryoo and

Rosen, 2004; Heckman et al., 2006).

Turning to achievement, we use the VETPC data to construct two measures of *completion*

which, given VET qualifications in Australia are pass/fail, we interpret broadly as measures

of educational achievement. Our first completion measure is a binary indicator equal to 1 if

the student has passed the course by the end of the year following entry, and 0 otherwise.[15]

For those who enrol in the first half of the year (around 70% of students in both states) they

are tracked for 18-24 months, which is beyond the typical course duration of 12-18 months.

For those who enter in the second half of the year, some will be tracked for less than 18

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[13] See http://www.ncver.edu.au/sos for further details on the SOS.

[14] Earnings data are reported in bands from which we use the midpoint.

[15] There are two reasons for restricting the measure in this way. First, we want completion for the pre and post-reform entry cohorts to be measured over the same duration. Second, as far as possible we want the pre-reform (2008) entry cohort to be unaffected by the reforms introduced from July 2009. In choosing the duration over which we measure course completion we are therefore trading off right censoring for some enrolments with the possibility that some 2008 entrants could be impacted by the reforms over the latter part of their course enrolment.

months, which raises the possibility of right censoring, which we can do little about given that the data do not distinguish between those who dropped out and those who are still enrolled but yet to complete (both types of enrolments are assigned a completion value of 0). In practice, right censoring is likely to affect enrolments in both states and, and if anything, the slightly greater growth in second semester enrolments in Victoria (from 23% in 2008 to 34% in 2011, compared to 29% to 33% in NSW over the same period), would tend to negatively bias any completion effect in Victoria.

Our second completion measure is module (or *subject*) completion, which for a given course enrolment is the proportion of module enrolments that a student passes from the time of enrolment to the end of the following year. This is designed to reduce the right censoring problems discussed above, given that most students enrol in multiple modules in a semester typically lasting less than 6 months. But this variable also helps to address the argument that some students enrol in a course only to learn a set of skills linked to a specific subset of modules, for example, to meet current job needs (see Mark and Karmel, 2010).

Table 3 presents sample means and difference-in-differences comparisons of means for all four course choice and completion measures. All measures are positive and highly statistically significant, whether we compare 2008 with 2010 or 2011.

4. Identification and estimation

In common with many previous school choice studies, we exploit differences across space to identify impacts. In particular, we use differences in the timing of national reform implementation between Victoria and NSW, which occurred for exogenous political reasons. We therefore treat the Victorian reforms as a natural experiment and estimate their impact using a standard difference-in-differences approach (see Blundell and Costa Dias, 2009). Specifically we estimate linear regressions of the following form:

12

$$y_i = \alpha + \beta X_i + \gamma Vic_i + \lambda Post_i + \delta Vic * Post_i + u_i,$$ (1)

where y_i denotes the outcome of interest for individual i, Vic_i is a dummy variable taking the value 1 if the individual's enrolment was in Victoria and 0 in NSW, $Post_i$ is a dummy taking the value 1 if the individual entered VET post-reform and 0 otherwise (pooling the two post-reform cohorts), and X_i is a set of control variables. The parameter δ measures the impact of the reforms on outcomes. Estimation is by least squares (linear probability models (LPMs) for our two binary outcomes) with standard errors clustered at the local government area (LGA), college and individual level.[16] To analyse heterogeneous impacts, for each specific group, we estimate equation (1) with the binary group indicator interacted with the post-reform ($Post_i$), state (Vic_i) and the interaction term ($Vic * Post_i$) with a full set of controls.

Two standard assumptions underlying the application of the difference-in-differences method are common time trends in outcomes between Victoria and NSW and no relevant, asymmetric, unobserved changes in the composition of students between these states. How reasonable are these assumptions here? Consider the common time trends assumption first. Asymmetric shocks to either state, anticipation effects in Victoria, and pre-existing and potentially ongoing diverging trends, are all possible in principle but, we argue, unlikely in practice to adversely affect identification. Starting with the former, although NSW had previously committed to introducing national VET reforms, none were commenced before or during this period, neither were there any other major VET reforms. Neither are there any obvious candidates for asymmetric shocks to the NSW labour market over this period; the global financial crisis, for example, impacted similarly on the labour markets of both states.

Although anticipation effects between announcement (August 2008) and implementation (July 2009) seem unlikely on the supply side, they seem at least possible on the demand side.

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[16] LGAs are the jurisdictional boundaries of the smallest form of government in Australia, the municipal council, which is similar to a county in the United States.

For example, some Victorian 15-19 year olds may have waited for the VTG to get their course of choice rather than enrol in another publicly-funded or fee-for-service course. This could impact both course choice and completion, but there is little evidence for such an effect. If anything, enrolments in Victoria slightly increased in the first half of 2009 relative to NSW (see Appendix Figure A1). In any case, our main estimates omit 2009 enrolments, which would have been most affected by any such anticipation effects. We also estimate a version of the model that only includes enrolments between January and July of each year, which cannot be confounded by any anticipation effects, and to which our estimates are highly robust (see Table 9). We therefore proceed on the basis that any anticipation effects are negligible.

Following standard practice, we show that our four outcome measures have similar trends in the two states in consecutive periods prior to the VTG reforms (Figures A2-A5). In each case it is most constructive to concentrate on the figures for the first half of the year when the majority of enrolments take place. Only for the average expected wage premia measure is there any hint of diverging prior trends (Figure A3), with the position of Victoria *worsening* relative to NSW prior to the reforms. If this trend continued into the reform period then our difference-in-differences approach might *underestimate* VTG impacts on the wage premia measure of course choice. Note that for all four measures, changes in relative outcomes after 2010 are consistent with positive effects of the VTG.

Further evidence on prior trends, conditioned on observables, is presented in Table 4, which estimates (1) for enrolments taking place in the first half of 2008 (pre-VTG, pre-announcement) and the first half of 2009 (pre-VTG, post announcement). Results are consistent with our interpretation of the pre-trend data. While this is encouraging, the assumption of parallel trends during the treatment period is of course ultimately untestable. Having multiple measures, however, means that we do not put all our identification eggs in

14

the one parallel trends basket. We also present alternative estimates in a sensitivity analysis that focuses on two neighbouring towns either side of the Victoria-NSW border, for which confounding prior trends (and asymmetric shocks) are arguably less likely.

Now consider the assumption of no relevant, asymmetric, unobserved changes in the composition of each group, a necessary condition to estimate the impact of the VTG for a student body with given characteristics, i.e. the average treatment effect on the treated (ATT). We cannot test directly for this either, but we take some comfort from the stability of *observable* characteristics between 2008 and 2011 (Table 2), including stability between pre and post-announcement periods in 2008. One potential threat here is cross-border commuting from NSW to Victoria induced by the VTG. In practice, this is unlikely to be a major concern because, with the exception of the towns of Albury and Wodonga, so few people live anywhere near the NSW/Victoria border. Table 2 shows that less than 3 percent of people studying in Victoria between 2008 and 2011 have an interstate residential address, and this proportion falls over time. Nevertheless we include a control for this in (1).

5. Estimated impacts on course choice

While the popular media fixated on post-VTG enrolment increases in fitness instructor and other 'soft' courses with questionable career prospects[17] in reality there were enrolment increases across the board. Figures A6 and A7 show that Victorian enrolments increased by more in courses with higher expected returns, including large increases in engineering and related areas. But to what extent were these changing enrolment patterns driven by the VTG?

Table 5 presents estimates from three different versions of (1) (full results, including estimated parameters for controls, are in Table A4). The first set of results is unconditional estimates as in Table 3. They show that the VTG is associated with a 3.3 percentage point increase in the proportion of enrolments that were in skills-shortage courses, and a 2.2%

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[17] Match Training to Needs: Business. The Australian Financial Review (3/7/2012).

increase in the average expected wage premium associated with course enrolments in Victoria relative to NSW. Under the assumptions set out in the previous section these estimates can be interpreted as the overall impacts of the VTG – or possibly a lower bound for the measure based on expected wages, given diverging prior trends – and suggest an improvement in the responsiveness of VET enrolments to skill demands.

The second set of results contains controls for student characteristics and so can be interpreted as ATT. These are almost identical to the unconditional results, suggesting that the small compositional changes on the student side shown in Table 2 play only a minor role in explaining the overall VTG impact. This result lends support to the interpretation of the unconditional difference-in-differences estimates as overall VTG impacts, at least inasmuch as we can more confidently rule out observable changes in student composition as contributing substantially to the relevant coefficients.

For the third set of results we add controls for college characteristics. This has no impact on the estimated VTG effect of the expected returns measure, but increases the magnitude of the estimated VTG impact on skills shortage enrolments to 3.9 percentage points. In other words the ATT is not being driven primarily by the entry of private colleges, and would have been *bigger* in the absence of this compositional change. If the overall VTG impact on course choice is not being driven by compositional changes on the demand or the supply side, then we are left with differences in information accessed by students and government, differences in the weight placed on the consumptive benefits of education, and government inertia and political economy factors. Of these, government inertia and political economy factors seem the most likely mechanisms to explain a *positive* impact of the VTG reforms on our course choice measures. This is our tentative conclusion.

Now turn to the question of heterogeneous treatment effects. A key motivation for estimating such effects is a concern that students from disadvantaged groups may benefit less

than more advantaged students from the introduction of a voucher scheme, possibly because of difficulty accessing and utilising labour market information. In fact, with a full set of controls, we find positive VTG impacts on one or more of our course choice measures for all of the disadvantaged groups we identify in Table 6, implying that the benefits of moving to a voucher scheme for VET are widely shared.

The estimated VTG impact on course choice, however, does vary across groups, albeit not in a way that suggests a simple equity story linked to membership of socially disadvantaged groups. Impacts are significantly smaller for females than for males, suggesting that moving to a user-choice model for VET widens the existing gender gap in course choice. Estimated VTG impacts are mixed for Indigenous students and early school leavers: positive and statistically significant for the expected returns measure, but zero for the skills shortage measure. This may reflect the fact that these groups live disproportionately outside of major population centres, where thin markets and capacity constraints are more likely, and/or that priority access given under the supply-driven system may mitigate the extent to which the VTG boosted course choice. In contrast, students with a disability, those unemployed and students living in low-SES areas – three other groups we might think of as disadvantaged – benefit no less from the VTG than their more advantaged counterparts. It may be that informational deficits faced by disadvantaged school children and their families, as found by Hastings and Weinstein (2008), do not carry over to VET. The group that benefits the most from a voucher are those who speak a language other than English at home. This group may place more weight on the investment motive for post-compulsory education than native speakers (e.g. Reitz, Zhang and Hawkins 2011; Cobb-Clark and Nguyen, 2012) or may have missed-out disproportionately under the old system.

Table 6 also shows discrepancies in course choice by college type. These estimates provide further evidence that the VTG did not primarily impact course choice through

changes in the composition of the supply side; if anything such compositional changes attenuated the overall VTG impact. In particular, for public colleges, the VTG is associated with an increase in the proportion of enrolments in skill shortage courses, whereas for private providers, the association is large and negative. Only a small discrepancy in expected returns is found and the effect for both college types is positive. Divergent course choice effects by college type can be explained by differences in opportunities available to colleges under the VTG. Established public colleges exploited their competitive advantages in delivering training in areas of persistent skills shortage, established over time under the centrally-planned system. For private providers, the VTG opened up opportunities to capture public funding in fields outside of apprenticeships and traineeships, which although not linked to identified skill shortage areas in many cases, were still in areas linked with positive student returns.

6. Estimated impacts on achievement

Table 7 presents achievement results for four different versions of (1). The first set of estimates restate those presented in Table 3, and show that the VTG coincided with a 6.4 percentage point increase in module completion rates and an 6.8 percentage point increase in course completion rates in Victoria relative to NSW. Under the assumptions set out in Section 4, these estimates can be interpreted as overall VTG impacts.

The second set of estimates is conditional on student observables. These are only slightly smaller than the unconditional estimates, suggesting, as in the course choice case, that (observable) compositional changes on the student side are unimportant in explaining impacts on academic performance.[18] Compared to the estimated coefficients on the (binary) controls, the VTG impacts are large. On average across the two measures, the estimated impact of the

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[18] Across the board the signs of the estimated coefficients of the control variables conform to our priors and are consistent with Mark and Karmel (2010). Full results are given in Table A5.

VTG is roughly the same order of magnitude as the impact of Indigenous status (but with the opposite sign) or being employed at the time of enrolment.

In contrast to the course choice case, adding college controls more than halves the estimated effects of the VTG on our completion measures. The main explanation is that the completion rate for private colleges is around 20 percentage points higher than for public colleges – this is not unique to Australia (see Rosenbaun and Rosenbaum, 2013) – and the market share of private colleges more than doubles in the two years following the introduction of the VTG.

In the final set of results, we add 71 fields of study categories and 5 course level categories to (1), which make little further difference to the estimated VTG impacts on either completion measure. This is not because completion is orthogonal to course choice; many of the course choice controls are statistically significant. Rather, VTG-induced changes in course choice, at least as captured by the set of course level-field of study dummies included here, are not impacting on completion rates. So how do we interpret the remaining significant effect of the VTG? One possible explanation is that colleges are responding to the introduction of competition for funding by improving the quality of provision (or diverting effort towards increased completion rates and away from other aspects of quality). Our results are consistent with this explanation, although we cannot rule out other as yet unspecified mechanisms.

Now consider heterogeneous effects. A concern in the school vouchers literature is that any improvements in efficiency from the introduction of untargeted vouchers comes at the expense of equity because of rent-seeking responses by colleges (e.g. Levin, 1991; Ladd, 2002). Table 8 presents the estimated VTG effects for key groups and college types with a full set of controls. While results in Table 7 suggest that the VTG is associated with improved efficiency, measured by improvements in achievement (perhaps from the introduction of

19

competition), results presented in Table 8 suggest no clear trade-off with equity. Positive and statistically significant VTG impacts on one or both achievement measures are estimated for all groups except those with a disability, for whom we find no evidence of a VTG impact. There is also no evidence that the effects of the VTG on achievement are systematically different for disadvantaged groups. The apparent absence of an equity-efficiency trade-off associated with the VTG contrasts with findings in the school voucher literature. This could reflect general institutional differences between sectors: unlike school, VET colleges are open access, cater particularly for people who are not academic high fliers, and enrolment is voluntary. But there are other possible explanations specific to the design of the VET voucher, including tight constraints on fee increases and cream skimming, which may have allowed the Victorian government to reap achievement-related benefits from greater competition without widespread equity-related costs.

For both outcome measures, the VTG is associated with improvement in private provider and public college completion rates. If this is in part a competition effect, then the positive effect among existing public colleges suggests they are upping their game in response to the reforms. The parallel in the schools competition literature is the positive impacts on achievement in existing public schools reported by Hoxby (1994; 2000; 2003).

7. Sensitivity analyses

In this section we briefly discuss a number of sensitivity analyses that together help to reinforce the main conclusions from the preceding sections (see Table 9). Unless otherwise stated, all sensitivity results are estimated using a full set of controls, consistent with results presented in the right-hand columns of Tables 5 and 7.

First consider course choice. To examine sensitivity to possible post-announcement but pre-VTG anticipation effects in Victoria, we re-estimate (1) using only January-July enrolments in 2008, 2010 and 2011. This makes no difference to the estimated VTG impact

20

on the wage-based measure. However, it does slightly increase the estimated impact on the skills-shortage measure because students (in both states) who enter in the latter part of the year have somewhat different characteristics to those entering in the first half.

Despite encouraging signs we cannot entirely rule out the possibility of asymmetric shocks at the state level for any of our four outcome measures, nor prior diverging trends for the wage-based measure of course choice. Both potential identification problems are less likely to be an issue, however, for the twin towns of Albury and Wodonga, situated on opposite banks of the Murray River on the NSW-Victoria border. Both towns have populations of around 50,000 people and both have their own public and private VET colleges, but only colleges in Wodonga on the Victorian side were (directly) affected by the VTG. Using a similar difference-in-differences approach to estimate (1) for colleges operating in the local government areas of Albury-Wodonga we again find positive and statistically significant VTG impacts on both course choice measures, although the estimated magnitudes of these impacts (unsurprisingly) differ from those estimated at the full state level.

One possible candidate for an asymmetric state-level shock is the introduction of national requirements to be in study until age 17 in 2010, which may have had differing effects in NSW and Victoria because prior compulsory schooling ages were different – 15 in NSW and 16 in Victoria. However, results in Table 9 show that restricting the sample to those who enrolled at 18 and 19, and who were therefore unaffected by the national education requirement, makes little difference.

For conciseness, our main estimates pool the 2010 and 2011 entry cohorts, but if short term impacts of marketization reforms differ from longer term impacts (e.g. as suggested by Hoxby, 2003) we might see a difference between VTG impacts on the 2010 and 2011 cohorts. The resulting estimates do suggest a larger impact in 2011 than in 2010 for both measures. This is consistent with short run capacity constraints limiting the initial

responsiveness of the supply side, or a lack of suitable data being made available to potential students and their families until later in the reform process.

Estimates presented so far for our binary skills shortage measure of course choice are generated using LPM models in preference to non-linear alternatives. Our conclusions are robust to this too: results using a binary probit model, with treatment effects estimated using the Puhani (2011) method, are little different.

To examine whether controls for college type and other college characteristics adequately control for compositional changes on the supply-side, we re-estimate (1) adding college fixed effects. This makes little difference to the estimated VTG impacts for the expected wage measure of course choice, but it increases the estimated impact of the VTG on the skills shortage based measure. Growth in the private sector appears to have been disproportionately among colleges that specialise in courses that are unrelated to skill shortages. Our conclusions remain unchanged.

We also test the sensitivity of results presented in Tables 5 and 7 to a number of sample restrictions. One restriction is to omit general and mixed field courses that are not linked to any particular occupation when defining our skills shortage variable, which means that estimates for the two course choice measures are generated using different samples. To check whether this is an issue, we re-estimate (1) for the wage-based measure of course choice on the sample used in estimating (1) for the skills-shortage measure. Although the estimate is qualitatively robust to this sample restriction, the magnitude of the estimated impact is sensitive. This reflects two factors: that general and mixed field courses have above average returns, and that enrolments in these courses have grown more rapidly – by 90% between 2008 and 2011 – than enrolments overall.

In defining our sample we also make three somewhat *ad hoc* decisions. First we include apprentices and trainees in our standard sample despite being already funded under a user-

choice system. Second we include fee-for-service enrolments with public colleges that are not covered by the VTG, but which may be displaced by the VTG. Third, for the field of study/course level combinations for which we observe insufficient observations in the SOS to confidently estimate an average wage premium, we use estimates generated from more aggregate field of study/course level combinations. We might equally have dropped enrolments in these courses from our estimation of the wage-based measure of course choice. With the exception of an increase in the estimated VTG impact on the proportion of enrolments linked to skill shortage occupations from excluding apprentices and trainees, our results are insensitive to these decisions.

We repeat the sensitivity tests explained above for our completion measures, except for the scenarios where we exclude general and mixed course programs and exclude graduate wage values with missing cells. In addition, we also estimate a model with around 1000 course fixed effects to better control for changes in course choice that may not have been properly captured with course fields of study and level categories.[19]

As for course choice, estimated VTG impacts are highly robust to most of these variations. One exception is the large estimated positive effect for module completion becomes statistically insignificant when we restrict the analysis to Albury and Wodonga, reflecting the small number of observations. Another marked difference is the large increase in course completion effects when we include course fixed effects. This suggests that changes in course choice, not adequately controlled for using course fields of study and level categories (Table 7), tend to under-estimate the effects explained through the remaining potential causal mechanisms, including competition effects on the quality of provision.

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[19] There are around 1000 nationally accredited courses offered in Victoria out of a total of around 1500. They are not restricted to any one provider or provider type, but can be offered by any provider. Of the 1000 courses around 700 in Victoria had fewer than 100 enrolments.

8. Conclusions

This paper exploits a unique natural experiment in Australia to demonstrate for the first time how introducing a broad-based voucher scheme can improve the relevance and quality of post-secondary VET, at least in the short term. By varying controls, we draw tentative conclusions regarding possible causal mechanisms.

For course choice, the main driver appears to be that students make 'better' choices than state government when identifying courses associated with employer demand. For achievement, increased enrolments with colleges that have relatively high completion rates (mainly private colleges) and increased competition are the channels that are most consistent with our estimated impacts. This evidence is important for countries such as the United States where central funding allocations and lack of competition for public funding are often blamed for persistent skill shortages and poor quality training. Without credible evidence that broad-based vouchers in VET work, it is difficult for governments to find the impetus to make and sustain such wholesale changes, generally against the wishes of existing colleges. In Victoria, the narrative around these reforms turned rapidly negative in the absence of credible evidence on their impacts, which contributed to the partial roll-back of the reforms in July 2012.

A further contribution is to demonstrate for the first time that overall efficiency gains from the introduction of a broad-based voucher do not necessarily come at a cost to equity. In contrast to findings by Hsieh and Urquiola (2006), we find that under conditions where there is little student selection, academic achievement gains are widespread, including among disadvantaged groups and within public colleges. To the extent that this reflects regulations that constrain cream skimming and fee caps, then our results highlight the potential role of such safeguards in realising the competition benefits of broad-based vouchers.

Also related to equity, results in this study suggest that membership of a disadvantaged group does not affect one's ability to benefit from greater agency to select preferred post-

secondary courses afforded under a voucher. This contrasts with literature that suggests people from disadvantaged groups benefit less from school choice policies because of an inability to access and assess school performance information (Levin, 1991; Ladd, 2002; Hastings and Weinstein, 2008). One explanation is that students from disadvantaged groups may respond more strongly to labour market information because post-secondary course choice may be less encumbered by resource constraints and parental attitudes, and more closely related to future job prospects, than school choice. It may also be that labour market information is more readily available and interpretable than information on school quality. Regardless, an implication of this finding is that in providing labour market information, either to improve outcomes of pro-choice policies or as part of career counselling, there is no apparent need to target labour market information directly at disadvantaged groups.

Of course there are numerous caveats to bear in mind when drawing these conclusions. It is possible that students make better course choices according to our measures but would not do so according to some alternative measure forecasting ahead to future labour market needs, where governments plausibly have an informational advantage. Our conclusions regarding potential causal mechanisms are also unavoidably tentative. The main caveats here, however, arguably concern external validity. Our conclusions are based on just two post-reform cohorts, each followed for a maximum of two years, and there is reason to suspect from our own estimates and from the wider literature that the early impacts of such reforms may differ from longer run impacts. Further, the extent to which our results might generalise to other countries with rather different institutions and labour market contexts, even to other English-speaking countries with many shared VET sector characteristics, is unclear. Nevertheless, in attempting to isolate that part of the course choice effect that does not work through compositional changes, and that part of the achievement effect that potentially works through

competition, we are homing in on relationships in the data that may be at least partly generalizable across educational contexts and across national borders.

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