The Economic Effects of an International Student Levy Under Alternative Price Elasticity Assumptions

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The economic effects of an international student levy under alternative price elasticity assumptions

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Abstract

We investigate the economic consequences and tax efficiency of a 5% international student levy (ISL). Like any tax, ceteris paribus, an ISL will reduce certain economic activities. At the industry level, the negative effects on activity will be largest for sectors involved in the export of education services. At the regional level, the negative economic consequences will be largest for regions that have relatively large export education sectors. Due to limited empirical evidence on the price elasticity of demand for export education, we test the sensitivity of our results under a range of elasticity estimates. For sufficiently inelastic demand for export education, an ISL improves the terms of trade and increases real consumption. By evaluating and comparing the marginal excess burden of an ISL with other hypothetical service export taxes, we demonstrate that these results stem from imposing an export tax at a low rate on a commodity that is generally tax-exempt and carries a low foreign export demand elasticity, rather than being a unique feature of the ISL. If the policy objective is to assist the education sector, our results draw into question the suitability of the ISL.

JEL Codes: C68; H2; H5; H72

Keywords: Taxation; International Student; CGE modelling; Excess Burden.

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Executive Summary

- The recent Australian Universities Accord Interim Report raised the possibility of a levy on international student fee income. We refer to this as an international student levy, or an ISL.
- From an economic perspective, an ISL is a federal indirect tax on purchases of Australian education services by international students.
- Viewed simply as a tax, the economic effects of an ISL can be evaluated using the type of multi-sectoral economic model that is typically used in evaluation of tax policy reform proposals.
- We undertake an investigation of an ISL using VURMTAX, a dynamic multi-regional, multi-sectoral model of the Australian economy with tax detail. VURMTAX has been used in previous studies to investigate the economic effects and efficiency characteristics of over 30 state and federal taxes.
- Using VURMTAX, we evaluate the effects of an ISL on national and regional macroeconomic variables, evaluate its economic efficiency, and compare it to some other taxes.
- An ISL, like most other taxes, has adverse macroeconomic consequences. Depending on how ISL revenue is recycled, these consequences are potentially larger for regions (like Victoria) that have relatively large export education sectors.
- We explore alternative assumptions for the price sensitivity of international student demand for Australian education. Across the range of elasticities we study, we find that an ISL adversely affects the export education sector, and regions that are intensive in the provision of tertiary and higher education services, with the degree of impact dependent on the assumed elasticity. In contrast, for sufficiently inelastic export education demand, an ISL may improve the terms of trade and increase real consumption.
- We estimate a 5% ISL's "marginal excess burden", a measure of tax efficiency, to be 16c per dollar of tax revenue. This figure is favourable when compared to the efficiency of some other federal and state taxes such as GST and stamp duty. However, by comparing with other hypothetical service export taxes, we note that this efficiency stems from three factors: (i) the ISL is levied at a low-rate as an export tax; (ii) the tertiary and higher education sectors are corporate and personal income tax exempt; and, (iii) university and TAFE fees are GST-free. They therefore carry similar tax exemptions as health services, and contrasting tax treatments to other types of services, e.g., professional services.
- Our study represents an initial exploration of an ISL using an existing tax analysis framework. Avenues for future work include: (i) exploring alternative assumptions for how ISL revenue will be used; (ii) modelling the ISL with higher levels of regional and institutional detail; and (iii) further disaggregating the export education sector.

Contents

1 Introduction

The recent Australian Universities Accord Interim Report raised the possibility of a levy on international student fee income (hereafter, international student levy, or ISL). The interim report noted that an ISL: *"could provide insurance against future economic, policy or other shocks, or fund national and sector priorities such as infrastructure and research"* (p. 23) (Australian Universities Accord Review Panel, 2023). Elsewhere, the report noted *"various submissions support establishing a specific fund that could be used for future infrastructure needs, as well other national priorities. This could include consideration of a levy on international student fee income. The use of this revenue for sectoral-wide priorities could reflect the collaborative nature of the sector in building a strong and enduring system."* (p. 143).

Funding for these aims could be provided from public revenue generated from any number of sources, including redirecting other expenditures or raising an existing or new tax. In this regard, the ISL can be viewed as a policy proposal for a new tax, specifically, a federal tax on purchases of Australian education services by international students. Hence, the economic effects of an ISL can be evaluated using the type of economic model that has traditionally been used to assess other taxes, like the GST. Similarly, the economic effects of an ISL can be evaluated against the same criteria used for other taxes, like impacts on macroeconomic variables and measures of tax efficiency.

In this paper, we investigate the effects of an ISL using a multi-regional dynamic computable general equilibrium (CGE) model designed for tax policy analysis. We implement a permanent 5% ISL on fees paid by international students for tertiary, technical and vocational education. Our paper is structured as follows. Section 2 describes the tertiary and higher education sectors in Australia, and highlights parameters of influence in our analysis. Section 3 describes the methodology and model applied herein, and is followed by our results discussion in section 4. We study the sensitivity of our results to variations in model parameterisation in section 5. Section 6 concludes.

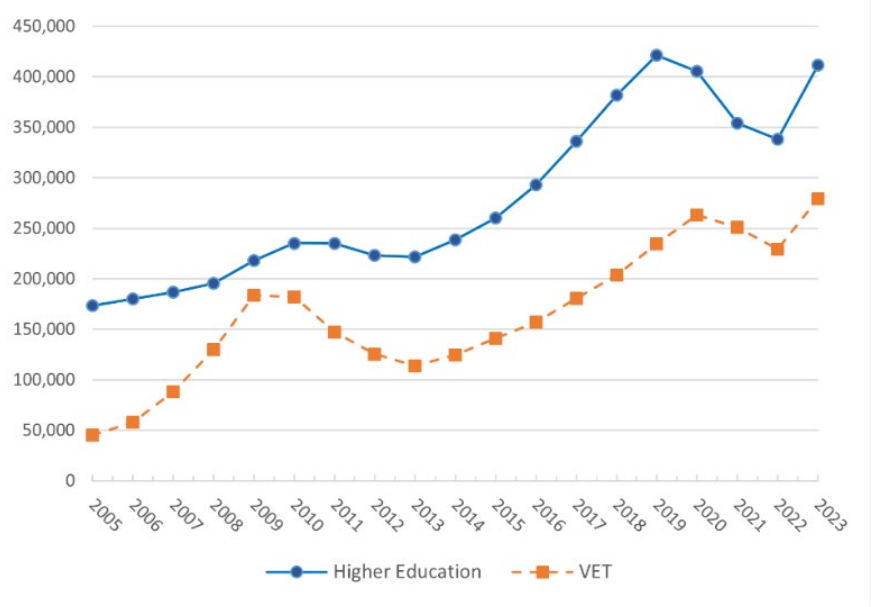
2 Literature review

International education is an important component of Australia's education system and its broader economy (Universities Australia, 2022). Enrolments of international students in Australia's tertiary education and vocational education and training (VET) sectors have grown over the last decade (Figure 1). In 2019, international students constituted 30% of total student enrolments in Australian universities (Universities Australia, 2022). The growing trend was temporarily interrupted by COVID-19 in 2020, but there has been a rapid recovery in enrolments post-pandemic.

The economic effects of international education are not limited to the tuition fee revenue received by education providers. International students also contribute to the economy via their spending on living expenses, like housing, food, and entertainment. Figures 2 and 3 illustrate the growth of education export income from international students in higher education and VET respectively. Fees payable to education providers comprise a significant portion of the total expenditure by international students studying and living in Australia. For example, in 2019, tuition fees comprised 47% of total expenditures by international students in higher education, and 28% for those in VET.

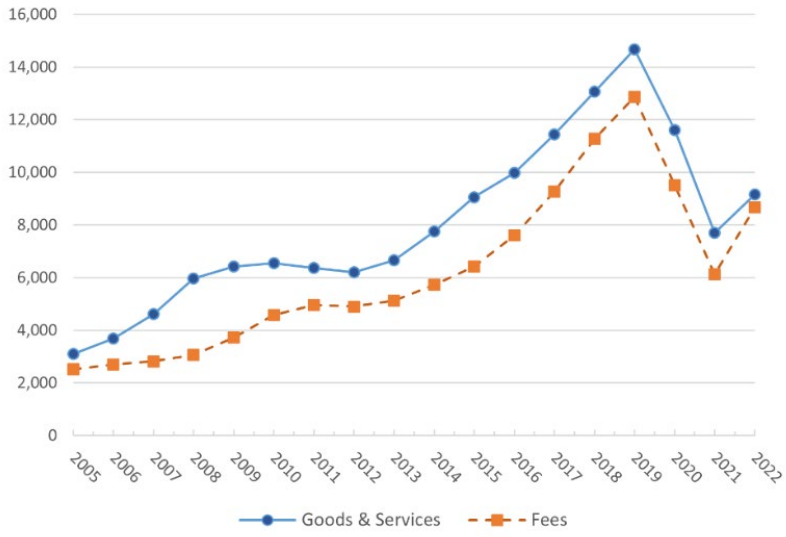
The economic implications of Australia's export education sector extend beyond the effects of student expenditures. For example, Min and Falvey (2018) find that current international student enrolments lead to increased bilateral trade flows for Australia. Their research underscores the trade-creating potential of international education, thus opening another possible source of economic benefit via expansion in opportunities for Australian exports and sources of reliable low-cost imports.

Figure 1. International student enrolments



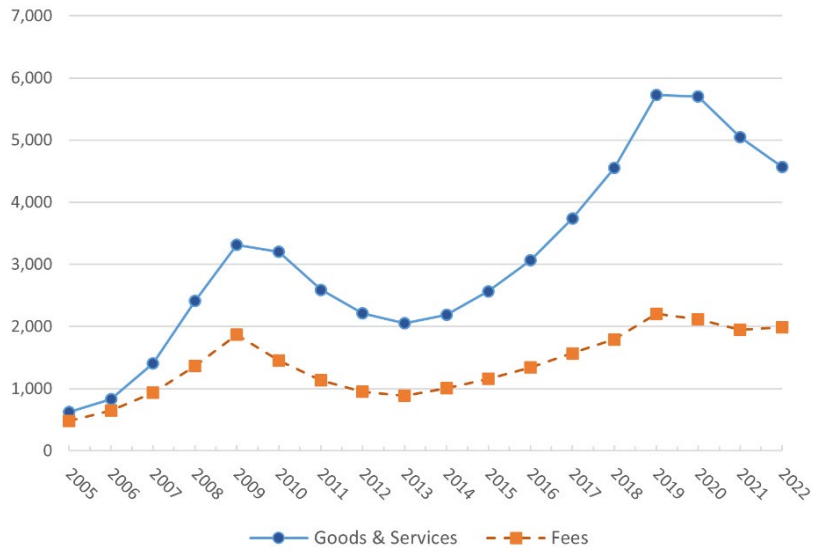
Source: Department of Education, PRISMS

Figure 2. International student expenditure: higher education ($m)



Source: ABS 5368 International Trade in Services, Credits, Education Related Travel

Figure 3. International student expenditure: vocational education and training ($m)



Source: ABS 5368 International Trade in Services, Credits, Education Related Travel

A concern surrounding the economic consequences of an ISL is how demand by international students for Australia's higher education and VET sectors would change in response to increased fees. The international competitiveness of Australia's education exports could be reduced if providers of export education pass on the ISL to international students. However, to our knowledge, there has not been an empirical study that investigates specifically the price elasticity of demand for Australian export education. Nevertheless, a closely related empirical paper is Min and Falvey (2018), who investigate the factors determining Australia's higher education international student flows. They find that a higher cost for international students studying and living in Australia compared to two of its main competitors, the USA and the UK, negatively affects international student flows for higher education in Australia, with the elasticity being -1.25.

Even in the global context, there has been little empirical research directed at estimating price elasticities of demand for export education, with most studies only indicating a negative price elasticity of demand for international education, without expressing confidence in the magnitude of the negative relationship. For example, Naidoo (2007), examines the factors influencing the choice by international students to study in UK universities. Investigating the period 1985-2003 using a pooled regression model, this study looks at international students from Asian countries, including China, India, Indonesia, Japan, Malaysia, Singapore, and Thailand. The authors find a statistically-significant negative relationship between the tuition fees for international students and their demand for higher education in the UK. Beine et al., (2018) investigate the response of foreign students to variations in tuition fees in Italy. They adopt an Instrumental Variable (IV) approach and find a negative effect of fees on international student mobility, with an elasticity of -0.8.

The more recent research by Conlon et al. (2021) involves extensive model testing using a variety of panel data estimation techniques to estimate the demand response of EU and non-EU international

students to tuition fee changes in UK higher education over 2001-2017. They find the enrolment response of non-EU international students to changes in tuition fees is not stable, with the elasticity ranging from 0 to -6.

The uncertainty in estimating the price elasticity of international education necessitates caution among policymakers when interpreting magnitudes in related empirical studies. As discussed by Beine et al., (2018), tuition fees are not exogenous in real-world scenarios. They note that a failure to properly account for the endogenous nature of tuition fees by econometric investigations can lead to biased estimates, potentially underestimating the demand elasticity or even mistakenly suggesting a non-negative impact of tuition fees on international student enrolment.

The lack of a definitive answer in the literature regarding the value of the elasticity of international education demand is, to a certain extent, mirrored in the studies investigating the effect of tuition fees on university and college enrolments. Some reviews of this literature include Heller (1997), Gallet (2007), and Havranek et al. (2018). Nevertheless, the overarching evidence indicates a weak, negative relationship between fees and enrolment. Gallet (2007) conducts a meta-analysis of empirical studies on the demand elasticities for higher education, finding that tuition elasticity estimates in the literature differ widely due to diverse estimation techniques, model specifications and varying measures of enrolment and tuition fees. In a review of 60 studies, Gallet (2007) reports a mean tuition elasticity of -0.6. We use this figure as the lower bound of the price elasticity for international education in our sensitivity analysis in Section 5. We note that this is also very close to the value for the corresponding parameter in our GTAP-based method for calculating the price elasticity of demand (see $\delta(edu,\bullet) = -0.64$ in Appendix A).

While we adopt -0.6 as the lower bound for the price elasticity of demand for education exports, we also note that caution should be exercised in assuming that demand for education from particular international sources will be as inelastic as the demand for education in general. The factors affecting the decision-making of international students seeking higher education will differ from those that influence decisions on whether to pursue higher education in general. For international students, the desire to pursue education in a particular foreign country will be affected by factors such as the relative costs of living and studying in that country versus alternatives, education quality, and immigration pathways (Beine et al., 2014; Min and Falvey, 2018). This points to the likelihood that the elasticity of demand for education exports from any particular country will be more elastic than the demand for higher education in general within the source countries for international students.

In particular, while students typically benefit from public tuition fee support and private (family) living cost support in their home countries, the decision to pursue education internationally often comes with full tuition fees and additional living costs. In this context, international students may be quite sensitive to cross-regional differentials in tuition fees and living costs. As shown in Figure 2, tuition fees accounted for more than 40% of the total cost for international students studying in Australian universities over the past decade. In contrast, domestic students are typically eligible for Commonwealth Supported Place (CSP) funding, with the government paying a significant share of tuition fees. Furthermore, under certain conditions, domestic students can access income-contingent loans under the HECS-HELP (Higher Education Contribution Scheme - Higher Education Loan Program) scheme that allow deferral of tuition fee payment. According to Yong et al. (2023), Australian domestic students are not price sensitive in the presence of such income-contingent loans.

Other than quantitative studies, there have also been qualitative studies in education literature that suggest tuition fees are an important factor in determining the demand for higher education from international students. The widely-cited study by Mazzarol and Soutar (2002) proposed a theoretical 'push-pull' model to identify factors influencing students' choices of international study destinations, among which is the cost of fees. Adopting this framework, the survey study by Yang (2007) indicates that competitive tuition fees are one of the important factors motivating mainland Chinese students to seek higher education in Australia.

It is apparent from our literature discussion that there is uncertainty regarding the price elasticity of demand for Australian export education. We benchmark the export demand elasticity in the main analysis herein (Section 4) with a central estimate of -3.5, which we derive from the theory and data of the international trade model GTAP (Hertel, 1997). See Appendix A for a description of the methodology. Our sensitivity analysis (Section 5) models the ISL under three elasticity assumptions: a lower bound of -0.6, our central estimate of -3.5, and an upper bound -6. As discussed above, our lower and upper bounds are based on the plausible range of values from our literature review.

3 Methodology

We investigate the economic effects of an ISL using VURMTAX (Victoria University Regional Model with Tax detail). VURMTAX is a comprehensive economic model of Australia with 220 industries and 8 regions, based on VURM [Adams et al. (2015)]. Herein, we use a 91-sector and 2-region (Victoria and rest-of-Australia) aggregation of the core 220-sector database, with an emphasis on education sector detail. The model is designed for detailed taxation analysis, containing individual treatment of 34 state and federal taxes.[4] For further details on VURMTAX, see Nassios et al. (2019a).

VURMTAX's theory follows standard neoclassical economic principles, in which industries operate in competitive markets and behave in a cost-minimising fashion; investors allocate capital to industries on the basis of expected rates of return; households make budget and labour supply decisions in a utility maximising fashion; and export demands are price sensitive. The model incorporates a detailed representation of government taxing, spending, and transferring activities within a fiscal-federal framework. VURMTAX's solutions involve annual equilibria linked through stock-flow dynamics, with capital stocks, net debt, and regional populations connected to past and present data. The model is solved using the General Equilibrium Modelling Package (GEMPACK). For full detail, see Horridge et al. (2019).

The model has been used for various tax policy analyses, including the goods and services tax [GST, see Giesecke and Tran (2018) and Giesecke et al. (2021)], company tax [Dixon and Nassios (2018)], efficiency of the NSW tax system [Nassios et al. (2019a)], state land tax [Nassios et al., (2019b)],

[4] When represented in its full multi-regional detail, VURMTAX models approximately 200 taxes. For example, payroll tax (one of the 34 taxes modelled in VURMTAX) is implemented by each of the 8 Australian states and territories, but state-specific implementations differ considerably in terms of tax rates, thresholds and concessions. We model these region-specific differences in the implementation of all state and territory taxes. Hence, given that 11 of the tax instruments in VURMTAX are federal, VURMTAX effectively contains modelling of approximately 200 different taxes (≈ (34 – 11) * 8 + 11)

stamp duty and other property taxes [Adams et al. (2020); Nassios and Giesecke (2022a)], personal income tax [Nassios and Giesecke (2022b)], and fuel tax excises [Liu et al. (2024)].

The model's initial solution for the year 2018/19 is calibrated using data from various ABS sources including: 2018/19 national input-output data, census data, agricultural census data, state accounts data, government financial statistics data, international trade data, and tourism satellite account data. The model's initial solution is updated via simulation to 2022/23.

Exports of education are modelled in VURMTAX via an export education sector, with data for this sector sourced from the ABS cat. No 5249.0 tourism satellite account. Sales of education exports by five education sectors are identified in the model: pre-school, primary, secondary, technical and vocational, and tertiary. In modelling terms, these sectors do not sell directly to international markets, but rather, sell to a mixing industry (hereafter, the export education sector) which also purchases accommodation, food, transport and all the other commodities that international students purchase while on-shore. The export education sector sells its output (comprising a combination of education fees and the cost of accommodation, food, transport, entertainment, and other student living expenses) to the foreign market. We model the ISL as a federal indirect tax on purchases by the export education sector of tertiary and technical and vocational education. Purchases of these types of education services by the export education sector represent 94% of its purchases of all education services (the other 6% are purchases of pre-school, primary and secondary education), but only 44% of its purchases of all commodities. The remainder of the input costs of the export education sector covers spending by international students on accommodation, food, transport, energy, entertainment, and other living expenses.

This treatment of export education recognises that when an ISL is imposed on tuition fees it affects only one (albeit large) element of all the costs that international students face when considering whether to study in Australia. As noted above, in our model purchases of tertiary, technical and vocational education by international students represent 44% of the total cost of export education. Hence, the direct effect of a 5% ISL is to raise the cost of Australian export education by 2.2% (=5%*0.44).

Our simulation involves two runs: a baseline forecast from 2018/19 to 2039/40, and a policy simulation introducing in 2024 a permanent 5% ISL on fees paid by international students for tertiary, technical and vocational education. Results are reported as cumulative deviations from the baseline in each year of the policy simulation. The main economic assumptions in our baseline simulation are:

[1] Regional labour supply and employment are determined via the following assumptions:

- (i) the working age population grows in each region at exogenously determined rates, which are a function of natural population growth rates and international net immigration rates;
- (ii) inter-regional population mobility is determined by maintenance of initial inter-regional relativities in post-tax income per household;
- (iii) regional unemployment rates are exogenously determined;
- (iv) regional wage flexibility ensures labour supply and employment are equated.
- (v) regional participation rates and hours per worker are exogenously determined.

[2] Regional investment is endogenous, and responds to movements in expected rates of return on regional industry capital relative to normal rates of return. This determines capital supply through the baseline forecast.

[3] Real GDP growth is exogenously determined, with the rate of labour-augmenting technical change endogenous.

[4] The supply of agricultural, commercial, industrial and residential land grows at the population growth rate. This ensures that the rental rates for these natural resources grow at rates commensurate with those of labour and capital.

[5] The ratio of the federal government deficit to GDP is determined exogenously via endogenous determination of a nation-wide lump sum tax. Similarly, the ratio of each state's government deficit to the state's gross state product is determined exogenously via an endogenous lump sum tax in each state.

[6] In our central case, we set the elasticity of demand in international markets for export education at -3.5. This means that a 1% increase in the foreign currency price of export education will generate a 3.5% reduction in the volume of international sales of export education.[5] Section 5 tests the sensitivity of the modelling results to high and low values for the price elasticity of demand for export education.

[7] Global demand for Australian exports expands at a rate that is consistent with the exogenous determination of the national terms of trade.

[8] National consumption (private and public) is a fixed proportion of national income. At the same time, we assume that the ratio of real private to real public consumption is given. Together, these two assumptions determine aggregate consumption and its division between private and public consumption.

In the policy simulation, we continue to adopt assumptions [1] (i), [1] (ii), [2], [4], [5] and [6]. In place of [1] (iii) and [1] (iv), we assume that regional labour markets are characterised by short-run wage stickiness and short-run endogenous unemployment rates, with a gradual transition to long-run regional labour market environments that are characterised by [1] (iii) and [1] (iv). In place of [1] (v) we allow labour supply to respond endogenously to movements in real post-tax wages and real post-tax non labour income via a labour/leisure choice framework. In place of assumption [3], real GDP is endogenous, and labour-augmenting technical change is exogenous and equal to its baseline forecast values. In place of assumption [7], the national terms of trade is endogenous, and foreign willingness to pay for Australian exports is exogenous and equal to its baseline forecast values. This allows export volumes and prices in the policy simulation to respond endogenously to policy shocks, holding foreign export demand schedules for all Australian exports at their baseline positions throughout the policy simulation. Regarding assumption [8], we continue to hold the propensity to consume out of national income at its baseline forecast level. However, we hold the paths of real public consumption spending in each state and at the federal level at their baseline values. This means that deviations in

[5] We base this on the latest version of the GTAP (Global Trade Analysis Project) model and database, GTAP v.11 (Aguiar et al. 2022). See Appendix A for the derivation of this elasticity.

real consumption in the policy simulation are expressed as deviations in private consumption spending.

In 2024 of the policy simulation, we implement a permanent 5% ISL on fees paid by international students for tertiary, technical and vocational education. We assume that the ISL is revenue neutral. Revenue neutrality is achieved by recycling the revenue back to Australian households as increases in lump-sum transfer payments. Note that our assumption of revenue recycling via lump sum payments to households has implications for the net regional impacts of the ISL. Under this assumption, some states (like Victoria) pay more in ISL than they receive back from the lump sum payments. As we shall find, this depresses economic activity in Victoria relative to the national average. Recycling under a different assumption (e.g., in proportion to ISL collections) would lead to a different distribution of regional outcomes than that reported here.

4 Results

4.1 Impacts of the ISL on national and regional macroeconomic variables

Figure 4 reports the impact of the ISL on export education and the tertiary, vocational and technical education sectors. The 5% ISL on tertiary, technical and vocational education raises the foreign currency price of export education by approximately 2.0% (Figure 4). This is a little less than the direct effect predicted earlier (2.2%) because part of the ISL is not passed on to students but is instead borne by the tertiary, technical and vocational education sectors via lower tuition prices. The increase in the foreign currency price of export education causes a reduction in international student demand of approximately 6.6% (Figure 1). This reduces activity in the tertiary and technical and vocational education sectors by approximately 1.1% and 0.7% respectively.[6]

Figure 5 reports impacts of the ISL on macroeconomic price measures that are relevant to understanding the levy's macroeconomic effects. The ISL is an indirect tax. Hence, it drives a wedge between the GDP deflator at market prices (which includes indirect taxes) and the GDP deflator at factor cost (which does not include indirect taxes). This accounts for the gap in the deviations between these two deflators. The ISL is a tax on exports. Hence, it reduces export volumes and raises the average price Australia receives for its exports. This accounts for the positive deviation in the terms of trade (the ratio of export prices to import prices) in Figure 5. Other things being equal, a rise in the terms of trade improves national income because it increases the volume of imports that the nation can purchase in international markets in exchange for a given volume of exports.

Figure 6 reports the impacts of the ISL on the national labour market. As reported in Figure 4, the ISL raises the national terms of trade. In isolation, a rise in the terms of trade imparts a positive influence on the national real wage. However, as reported in Figure 6, the deviation in the national real wage is

[6] This is close to the direct effect on output of these sectors via the contraction in the export education sector. In the VURMTAX database, international student fees represent approximately 14.8% and 9.5% of the output of the tertiary sector and the technical and vocational sector respectively. The direct effect on the output of these sectors of a 6.6% contraction in the export education sector is thus 0.98% and 0.63% respectively.

negative, at -0.05%. This reflects compositional differences in labour / capital ratios across sectors of the Australian economy. The tertiary, technical and vocational education sectors are among the most labour-intensive sectors in the economy.[7] When these sectors contract (see Figure 4) they release labour that, for the most part, finds re-employment elsewhere in the economy. For other sectors to expand to absorb the labour leaving the tertiary and vocational education sectors, the national real wage must fall.

The ISL causes a small, long-run negative deviation in national labour supply (Figure 6). This is caused by two factors. First, the fall in the real wage reduces the return to households from supplying labour to the job market. Second, we model the implementation of the ISL in a revenue-neutral fashion. Revenue neutrality is achieved via the federal government distributing the ISL revenue to households as a lump-sum transfer. The receipt by households of these transfers raises their demand for leisure via a positive income effect. This adds to the reduction in labour supply. Note that in the short-run, the employment deviation lies below the labour supply deviation. This represents a positive deviation in the unemployment rate during the short-run transition of labour out of the education sector and into other sectors. Over time, the deviations in labour supply and employment converge as real wage adjustment leads to a return of the unemployment rate to its long-run natural level.

The gradual absorption of the labour displaced from the education sector by other sectors of the economy with comparatively higher capital / labour ratios generates a positive deviation in the national capital stock (Figure 7). In the short-run, the negative deviation in employment causes a negative deviation in real GDP. Over time, as the positive capital stock deviation grows, and the labour market recovers, the GDP deviation attenuates. Nevertheless, by the end of the simulation period, the real GDP deviation is only a little above baseline. This reflects the negative deviation in wagebill weighted employment (Figure 7). This is caused by two factors: (i) the decrease in overall labour supply; and (ii) the contraction in the share of total employment accounted for by employment in the high wage education sector.

Export education has differing degrees of economic importance across Australia's states. For states where export education represents a relatively high share of economic activity, we might expect the ISL to have an economic impact that is larger than the national average. Figure 8 supports this, showing that Victoria's macro-economy is relatively adversely affected by the ISL. This reflects the relatively larger sizes of both the export education sector, and the underlying tertiary, and technical and vocational education sectors, in Victoria compared to the country as a whole.[8] It also reflects our revenue recycling assumption. Each region receives an equal per-capita distribution of the ISL. If instead each region received ISL revenue in proportion to its contribution to total ISL collections, or in proportion to the scale of tertiary and vocational and technical education within its borders, then the regional dispersion in economic outcomes would be attenuated relative to that reported in Figure 8.

[7] Taken together, these two sectors have a labour / capital ratio (i.e. a ratio of payments to labour relative to payments to capital and land owners) of 12:1. The economy-wide average labour/capital ratio is 1.4:1. Put another way, wages represent approximately 92% of primary factor payments in the tertiary, technical and vocational education sector. In comparison, for the economy as a whole, wages represent just under 60% of total primary factor payments.

[8] In VURMTAX, export education represents 10.7% of Victorian international exports, but only 4.2% of national exports. Similarly, the value added of the tertiary, and vocational and technical education sectors, represents 2.6% of Victorian GDP at factor cost, but only 2.2% of national GDP at factor cost.

Figure 4. The export education, tertiary education, and vocational and technical education sectors

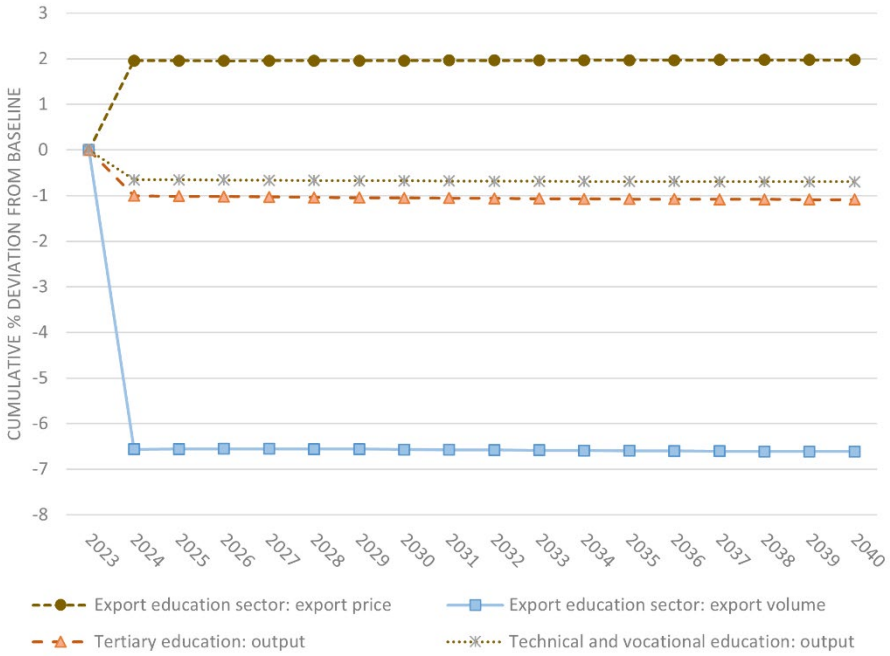


Figure 5. Macroeconomic price measures

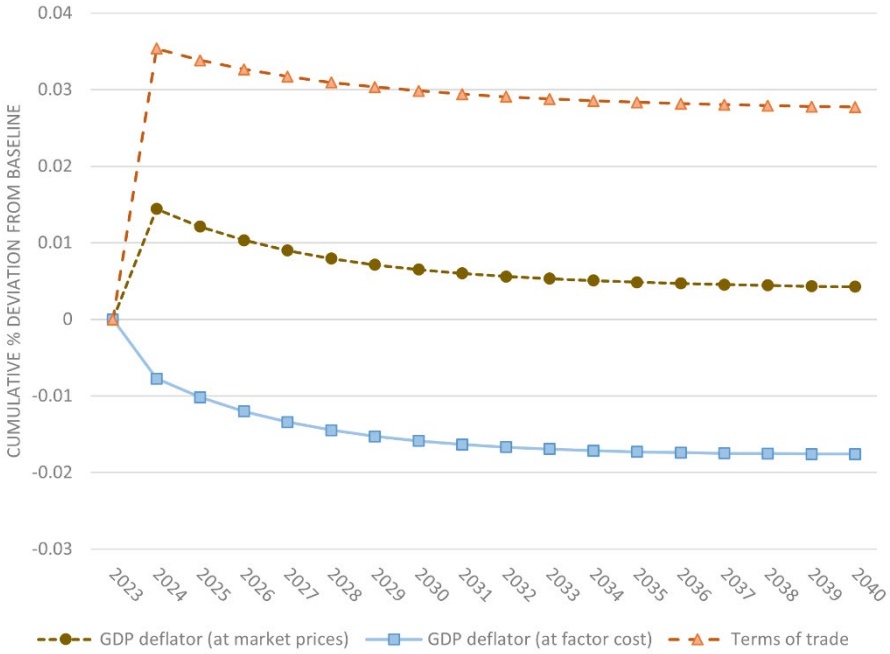


Figure 6. National labour market

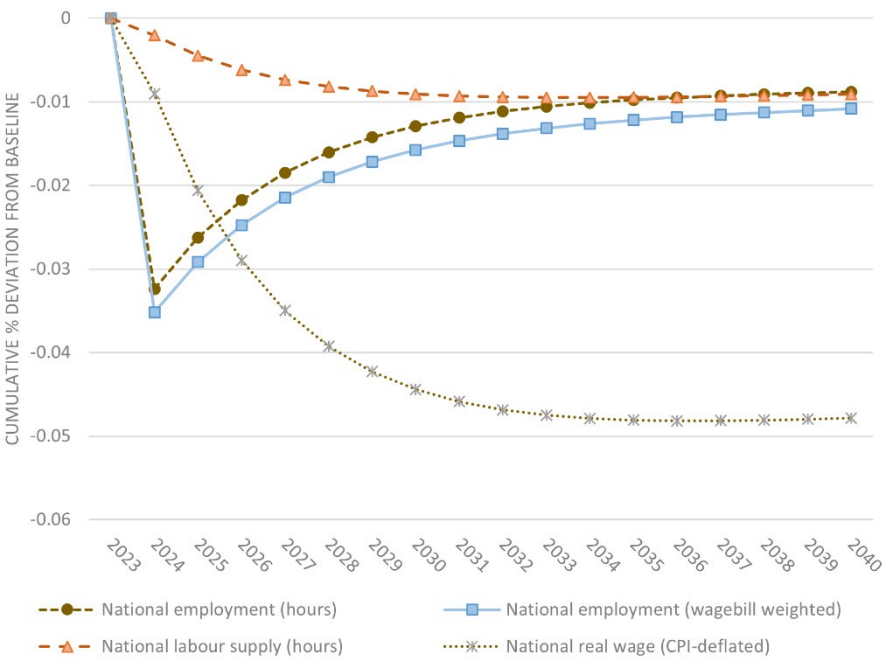


Figure 7. Real GDP, capital stock, and employment

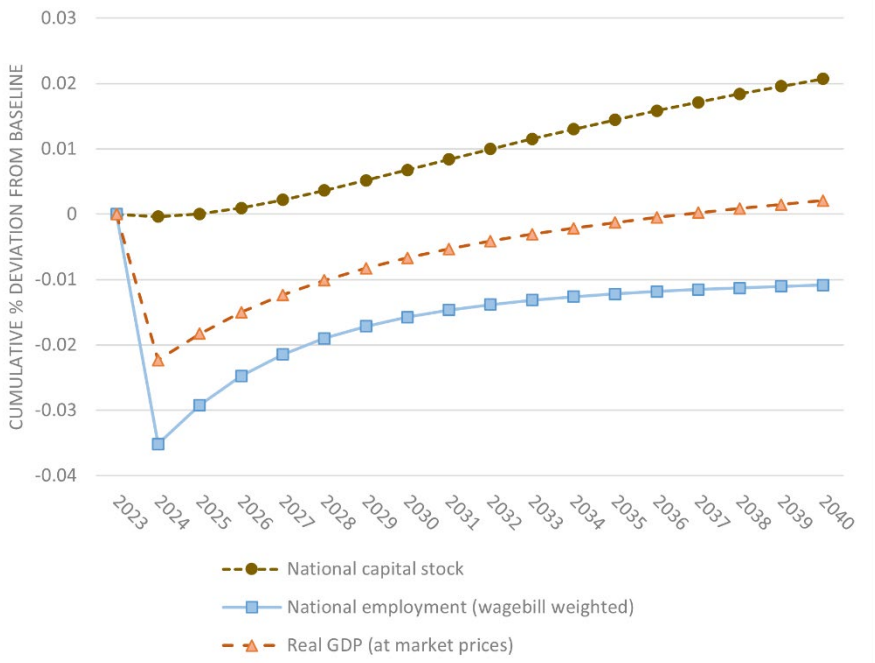
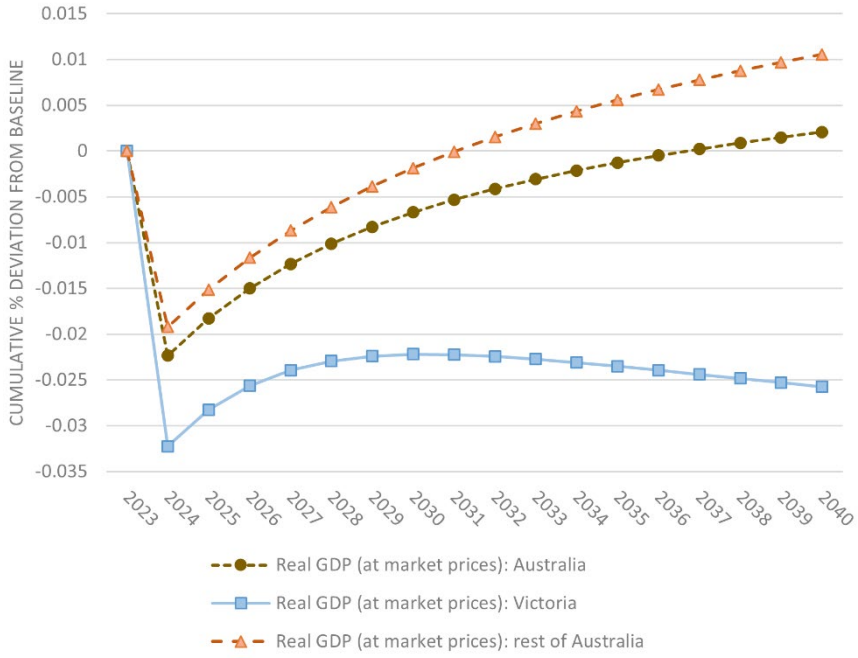


Figure 8. State and national real GDP



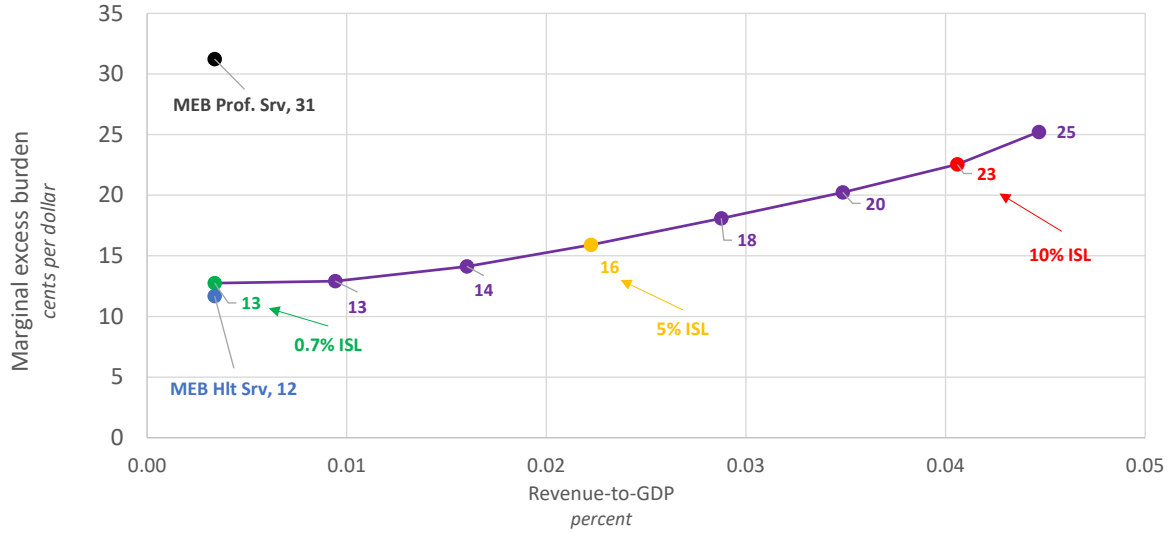
4.2 The tax efficiency of an ISL

Taxes generate economic costs, by changing incentives to supply valuable resources (like labour and capital), and by changing incentives to use commodities that are valued more highly than their before-tax costs. Economists compare the economic costs of different tax instruments by calculating their "marginal excess burdens" (MEBs). The MEB is a measure of the economic damage of a tax expressed in terms of cents of damage per dollar of revenue raised. For example, if we were to raise an extra $1 of revenue from a tax with an MEB of 20c, then we would expect that extra dollar of revenue to generate economic costs valued at 20c. These economic costs would come in the form of allocative efficiency losses (caused by tax wedges between production costs and market prices) and lost resource inputs (as households reduce labour supply and investors cut back on investment).

In calculating the MEB of an ISL, we adopt the approach by Nassios and Giesecke (2022a) and use VURMTAX to calculate the MEB distribution of an ISL at various potential revenue raising loads. This approach relies on a series of counterfactual simulations performed using VURMTAX, in which the ISL is introduced at progressively higher rates (from 0.7% through to 11.25%) in order to map an MEB schedule. The collection of ISL MEB estimates is reported as the purple schedule in Figure 9. As shown in Figure 9, for very low rates (0.7%, the green dot on the purple line in Figure 9) the MEB of an ISL is small and equal to 13 cents. At the 5% level studied in section 4.1, the MEB of an ISL rises to 16 cents (yellow dot, Figure 9); at a 10% rate, the MEB rises to 23 cents, and is of similar order to estimates for the PIT and GST by Giesecke et al. (2021) and Nassios and Giesecke (2022a). This suggests that an ISL, at least at the revenue raising effort implied by the 5% rate studied herein, is more efficient than other major federal taxes at their current revenue raising levels. It also compares favourably with existing state taxes, which are, in general, more distortionary than federal taxes. For

example, previous work has estimated the MEBs of state payroll tax, insurance duties, and stamp duties at 22c, 38c and 76c per dollar of revenue [(Nassios et al. (2019a), Nassios and Giesecke, 2022b)].

Figure 9. Marginal excess burden analysis, ISL versus other service export taxes



Relative to existing taxes, the comparatively low MEB of an ISL is caused by three factors. First, as a tax on exports, it raises the terms of trade. This is a positive contributor to national income, offsetting some of the tax's adverse allocative efficiency and resource supply impacts. Second, the tax is levied at a low rate. A tax's MEB rises as its rate rises, as highlighted by the ISL MEB schedule (purple line) in Figure 9. At higher ISL revenue raising efforts than the 5% rate studied in section 4.1, the ISL's measured MEB is thus higher. Third, public universities and higher education providers are not-for-profit organisations formed for the purpose of providing public goods, specifically education and research [Universities Australia (2012)]. This pursuit of public good provision is often enshrined within the various State and Territory Acts of Parliament that established these organisations. This status grants tertiary and higher education institutions tax-exempt status, meaning they pay no corporate or personal income tax. Education services are also GST-free in Australia. This tax-exempt status means that when an ISL is introduced, it has relatively little impact on other tax revenue lines, in contrast to export taxes on other service exports.

In Figure 9, we illustrate this point by calculating the MEB for an export tax on professional service exports, which is 31 cents (see the black dot in Figure 9). This sector is not exempt from corporate or personal income tax. When the professional service tax is introduced, receipts from these taxes fall. Because net tax receipts enter the denominator of the MEB calculation, the MEB is subsequently higher. Finally, we also calculate the MEB of a health service export tax. This sector has many of the same tax exemptions as the tertiary and higher education sectors. Hence, as shown by the blue dot in Figure 9, a tax on health service exports has a very similar MEB (12 cents at a low rate) to an ISL.

5 Sensitivity analysis

As discussed in Section 2, the current empirical literature does not provide definitive evidence on how enrolments of international students would respond to a tax-induced rise in Australian tuition fees. As noted earlier, our central estimate for the price elasticity of demand for Australian export education is -3.5, which we derive from a trade-focussed global general equilibrium model (see Appendix A). In this section, we conduct a sensitivity analysis to examine how different values for the price elasticity of demand for export education affect the findings reported in Section 4.1.[9] We set upper and lower estimates of the elasticity based on the range of plausible values from the relevant literature. Specifically, we set the upper bound of the price elasticity at -6, which represents the largest estimate by Conlon et al. (2021). We set the lower bound at -0.6, corresponding to the mean tuition fee elasticity for domestic students in the review by Gallet (2007). Selected key variables are reported in Figures 10 – 19.

As Figure 12 shows, the impact of the 5% ISL on education exports varies in proportion with the export demand elasticity. The more elastic is the demand for export education, the larger is the reduction in international student demand, with the fall in real education exports being 1.3% in the lower bound case and 10.2% in the upper bound case. Similarly, the more elastic is the demand for export education, the larger the contraction in activity within the tertiary, technical, and vocational education sectors (Figure 10 and 11).

The three elasticity assumptions generate different macroeconomic consequences under the imposition of a 5% ISL. As Figure 13 illustrates, the ISL generates positive terms of trade outcomes under the central and lower bound cases, and a negative terms of trade outcome under the upper bound case. An ISL has two countervailing effects on the terms of trade. First, it raises the price of export education, improving the terms of trade. Second, it lowers the prices of other exports, lowering the terms of trade. For sufficiently high values for the demand elasticity for education exports, the impact of the second effect on the terms of trade dominates the first effect. The second effect is generated by the need to expand non-education exports to offset lost education export revenue. The more elastic is the foreign demand for education exports, the greater is the loss of foreign student numbers and associated export revenue, and thus correspondingly greater is the need to lower export prices for non-education exports to generate a countervailing expansion in other export revenue.

Figure 14 reports real consumption impacts under the alternative export elasticity values. The terms of trade are an important influence on real national income, and with it, real national consumption. Hence, the ranking of real consumption outcomes in Figure 14 follows the terms of trade ranking in Figure 13. In summary, for a given ISL rate, higher values for the price elasticity of demand for education exports generate larger negative deviations in the terms of trade, and thus larger negative deviations in real consumption. However, because the terms of trade outcome is the net of two countervailing effects, for sufficiently low values for the price elasticity of demand, the terms of trade and real consumption outcomes from an ISL will be positive.

[9] We do not report sensitivity analyses for the MEB or MEB schedule from section 4.2.

The differential responses in the terms of trade generate varying consequences for the national labour market. National wages experience a more significant decline when there is a higher elasticity in international student demand (Figure 15). This is due to two effects: (i) the larger terms of trade loss (which has a direct negative impact on the real wage); and (ii) the larger contraction in the labour-intensive tertiary, technical, and vocational education sectors, which releases more workers that need to be absorbed by other sectors. In Figure 16 we see that the greater is the price elasticity of demand for export education, the larger is the negative impact on national employment, both in the short- and the long-run (Figure 16). In the short run, this reflects the higher unemployment generated under sticky real wages by the larger negative deviation in the terms of trade that arises under more elastic demand settings (see Figure 13). In the long run, this reflects the adverse impact on labour supply generated by the larger negative real wage outcomes arising under more elastic settings (see Figure 15).

Figure 17 reports the real GDP deviation under alternative export demand elasticity assumptions. The short-run decline in real GDP (Figure 16) is attributable to varying degrees of short-run negative employment deviation under the three elasticity assumptions (Figure 16). Because the contraction of the education sector, and with it, the displacement of education sector workers, is larger the higher is the absolute value of the demand elasticity (see Figure 12), so too the short-run negative employment and real GDP deviations are larger the higher is the absolute value of the demand elasticity (see Figures 16 and 17).

The long-run attenuation dynamic in the real GDP deviation under the two cases with high elasticities is driven by capital stock accumulation, as labour that is displaced from the education sector is gradually re-employed in more capital-intensive sectors elsewhere in the economy. Because the displacement of labour from the education sector is larger the higher is the demand elasticity, so too the long-run economy-wide capital stock deviation (and with it, the real GDP deviation) is larger the higher is the demand elasticity. This accounts for the long-run positive relationship that is evident between real GDP deviations and the elasticity of demand assumptions in Figure 17.

Figures 18 and 19 compare real GSP outcomes for Victoria and the rest of Australia under alternative export demand elasticity assumptions. Irrespective of the export demand elasticity assumption, the deviation in Victoria's real GSP: (a) lies below that of the rest of Australia, and (b) is negative, i.e., real GSP in Victoria lies below the baseline forecast for all elasticity assumptions. This reflects the relative importance of the export education sector across regions, with the activity representing a higher share of Victoria's economy than the national average. The long-run positive deviations in real GDP in the rest of Australia under the central and upper bound elasticity cases reflects the re-employment of displaced education sector labour in these regions, specifically in capital intensive and trade-exposed industries.

As noted in reference to Figure 14, the price elasticity of demand assumption, via its influence on the terms of trade outcome, is a key determinant of the real consumption deviation. Given the uncertainty surrounding the true value of the price elasticity of demand for export education, we ran a sequence of additional VURMTAX simulations to map the relationship between real consumption and alternative elasticity values. The results of these simulations are summarised in Figure 20, which reports the net present value of the real consumption deviation between 2024 and 2040 under alternative price elasticity of demand assumptions. This shows that the net present value of consumption for a 5% ISL

is positive for values of the price elasticity of demand that are higher than -2.86. For example, by interpolating between the results for -1 and -2, we infer that the net present value for real consumption under an elasticity assumption of -1.25 [via Min and Falvey (2018)] is -$2800 m, or approximately -$270 (= -2800/10.4) per Australian household. Under our central elasticity estimate (-3.5), the net present value for real consumption is -$1362 m, or approximately -$131 per Australian household. If future estimates of the price elasticity of demand for Australian export education offer more certainty on the value for this key parameter, then Figure 20 can be used to calculate the real consumption gain or loss from a 5% ISL under these improved parameter estimates.

Figure 10. Tertiary education: output

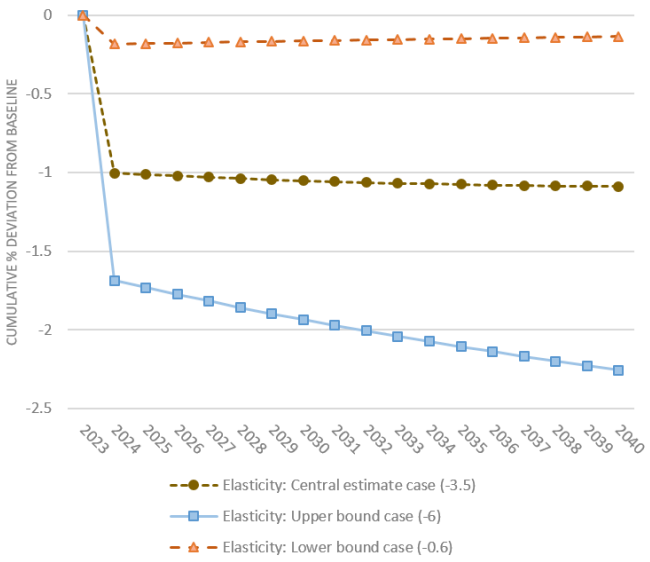


Figure 11. Technical and vocational education: output

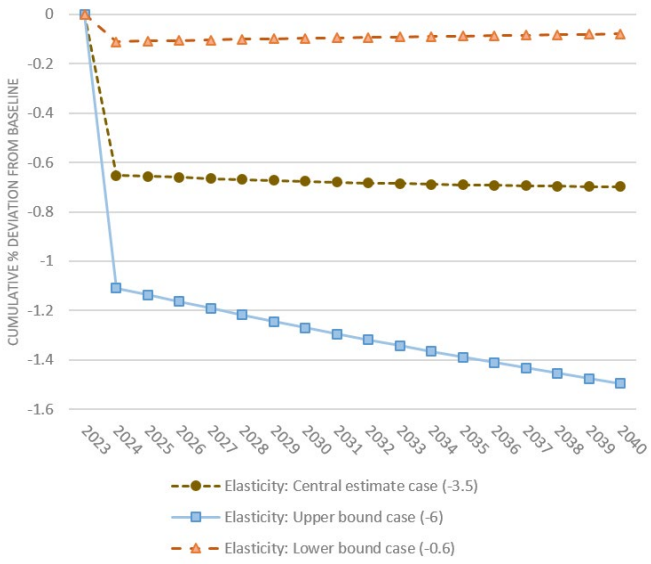


Figure 12. Export education sector: export volume

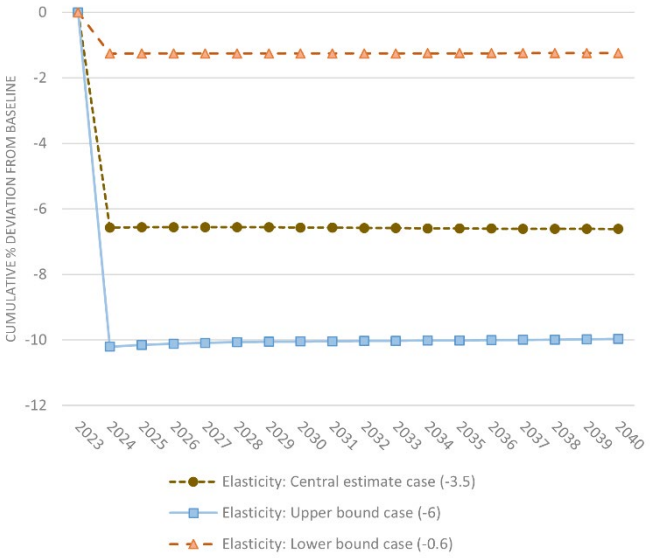


Figure 13. Terms of trade

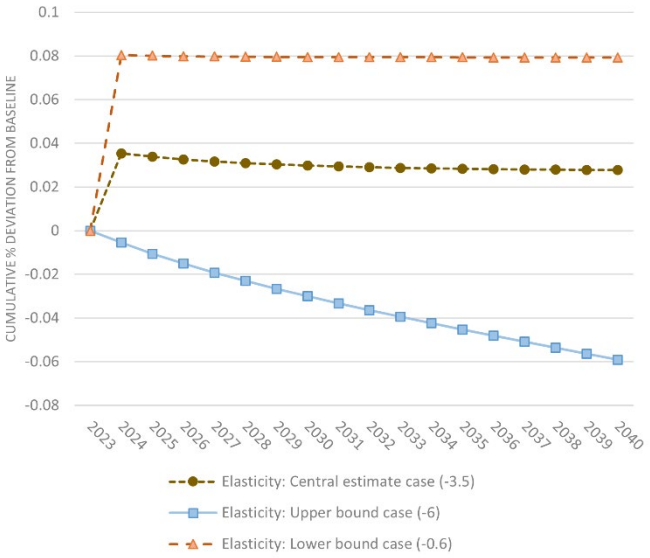


Figure 14. Consumption

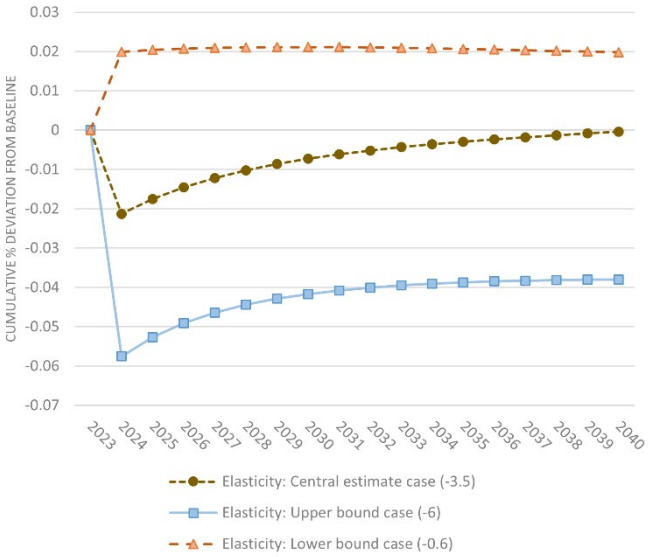


Figure 15. National real wage (CPI-deflated)

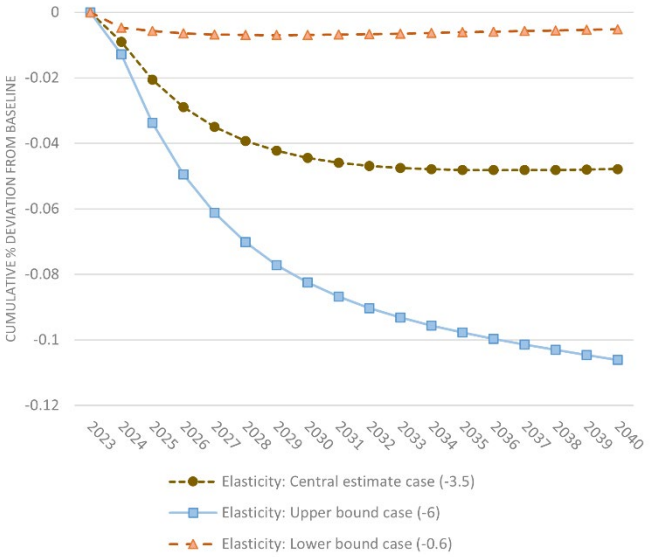


Figure 16. National employment (wagebill weighted)

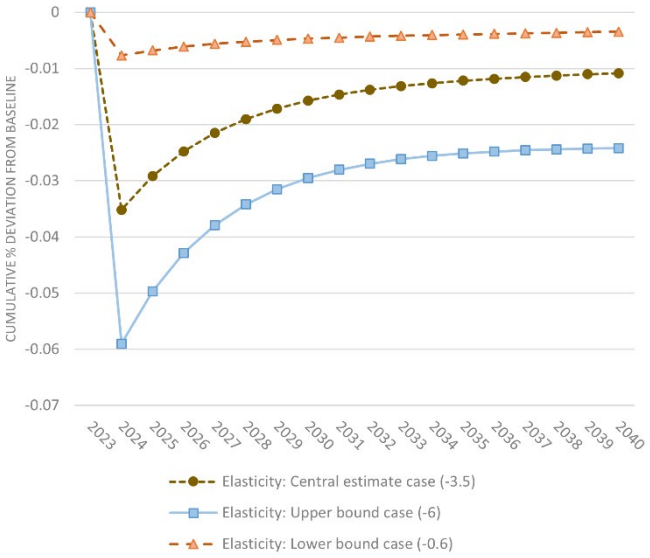


Figure 17. Real GDP (at market prices): Australia

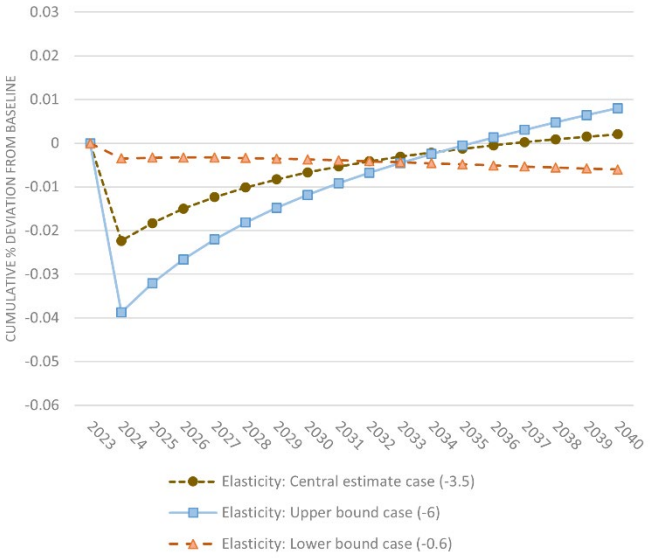


Figure 18. Real GSP (at market prices): Victoria

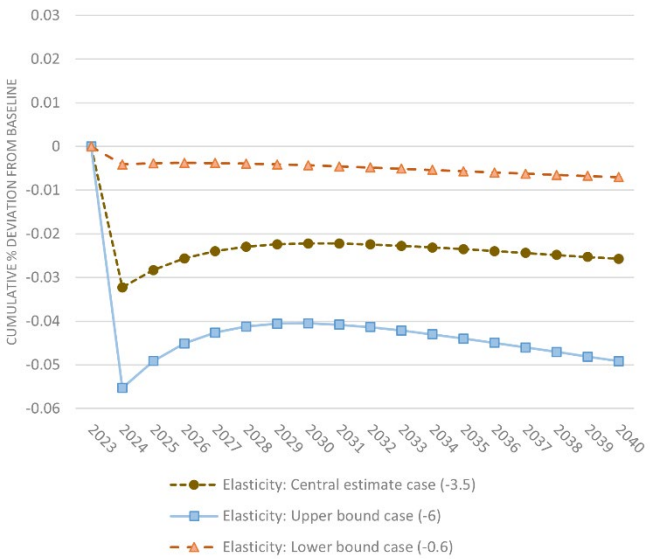


Figure 19. Real GSP (at market prices): rest of Australia

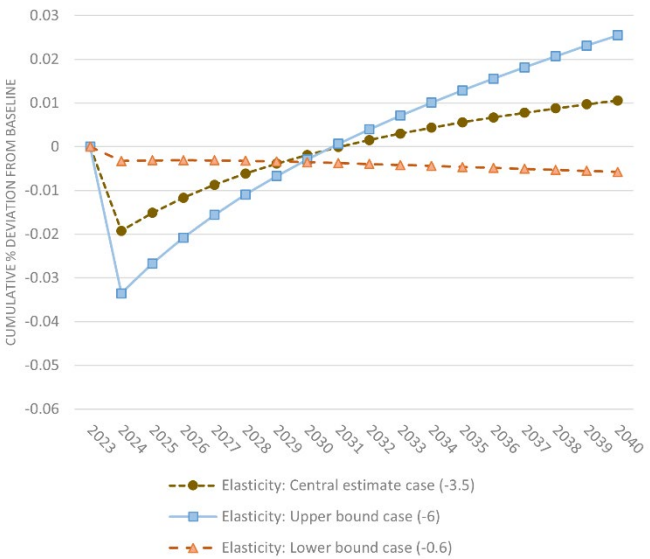
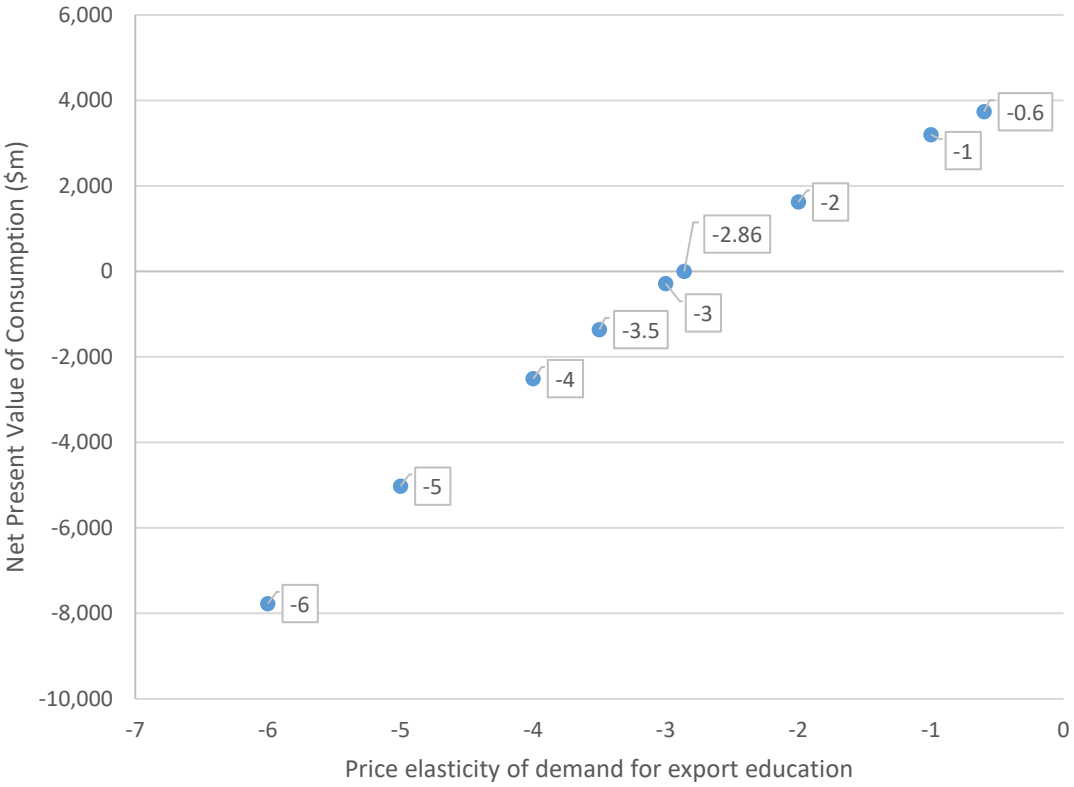


Figure 20. Price elasticity of demand for export education and NPV of real consumption



Source: VURMTAX simulations under alternative assumptions for the price elasticity of demand for export education (x-axis). The net present value of real consumption (y-axis) represents the present value of the real consumption deviation over 2024-2040 for each simulation discounted at a real rate of 4%p.a.

6 Conclusions

Using an existing economic modelling framework designed for tax policy analysis (VURMTAX), we have investigated an international student levy (ISL) implemented at a rate of 5% under alternative price elasticity of demand assumptions. Our study explores the ISL in terms of its impacts on national economic variables, regional economic activity, international student numbers, activity of the education sector, tax efficiency, and real aggregate consumption.

The key parameter determining the economic effects of an ISL is the price elasticity of demand for export education. Unfortunately, there is limited econometric evidence for this value for Australia, or indeed internationally. Our central estimate is -3.5, based on the GTAP model and database, however we acknowledge that the literature, while scant, provides a range of plausible values around this estimate. For this reason, we undertook sensitivity analysis for upper and lower bounds for the price elasticity of demand.

Activity in the education sector and international student numbers are adversely affected by the ISL for all elasticity values within the bounds of our sensitivity analysis. The adverse impact on the education sector is lowest for low absolute values for the price elasticity of demand. At the bottom of

our sensitivity range, with an elasticity value of -0.6, a 5% ISL causes export education to fall by 1.3% and the tertiary education and technical and vocational education sectors contract by 0.2% and 0.1%. At the top of our sensitivity range, with an elasticity of -6, a 5% ISL causes a 10.2% fall in export education and contractions in the outputs of the tertiary education and technical and vocational education sectors of 1.7% and 1.1% respectively.

While we find that the sign of the ISL's impact on the education sector is negative for all elasticity values within our sensitivity analysis range, this is not necessarily so for other macro aggregates. In particular, for sufficiently low absolute values for the export demand elasticity, the ISL raises the terms of trade, and with it, real consumption. We show that for absolute values for the price elasticity of demand of 2.85 or lower, the ISL generates a positive real consumption response in present-value terms. This result is not a unique feature of the ISL. Rather, it is a result of an export tax that is (a) levied at a low rate, and (b) imposed on the output of a sector that is lightly taxed in general. We show that an export tax levied at a similar magnitude and imposed on an Australian service export with similar tax-exempt status (health services) generates an MEB very close to that of the ISL. In contrast, we show that a tax on a service export produced by a sector that does not possess tax-exempt status (professional services) has an MEB more than twice as high as the MEBs of taxes of education and health exports. Exploration of export taxation is not currently part of the broader Australian tax policy debate, and proponents of the ISL itself have not advocated the levy on these grounds, but rather, as a revenue-raising instrument for funding higher education.

We see a number of areas of our modelling that could be further explored in future work.

The first relates to the modelling of budget-neutral recycling of ISL revenue. In this paper, the revenue raised from the ISL is distributed in a budget-neutral fashion to each state on an equal per-capita basis. This is consistent with the way the macroeconomic and efficiency effects of other tax instruments are modelled, and thus is a conventional tax modelling assumption. However, it is an unfavourable recycling assumption for export education intensive states like Victoria. The Universities Accord Interim Report hints at uses for ISL revenue (e.g. education infrastructure needs) that would possibly produce a regional ISL revenue disbursement profile that aligns more closely with the ISL's regional revenue raising profile. Future work could expand the investigation of the ISL to encompass how ISL revenue will be used.

The second relates to exploration of ISL impacts for states and regions beyond Victoria and the rest of Australia. We have used a two-region (Victoria, rest of Australia) implementation of VURMTAX. However, Australia has over 40 universities, and hundreds of VET and TAFE providers, distributed across diverse regions of the country. Future work could explore the regional consequences of an ISL taking into account high levels of institutional and regional detail. This would also open the possibility of exploring the effects of institution-specific differences in price elasticities of demand for education exports. This would allow the modelling to represent institutional differences in market power.

The third relates to disaggregation of the export education sector. Export education within VURMTAX is currently modelled as a single sector. Together with living costs, this sector bundles fees associated with tertiary, vocational, technical, secondary, primary and pre-school education. This treatment is suitable for an ISL that does not distinguish between student types. However, if the ISL is

to fall on one type of student only (e.g. tertiary), then VURMTAX's treatment of export education could be divided in two (tertiary education, and other education). This would also allow exploration of substitution possibilities by foreign students between types of education. This would be relevant if Australian education is valued by international students not only for the qualifications and experiences it provides, but also as a potential pathway to permanent residency.

We conclude by noting that, while we have investigated the ISL's impact on a variety of macroeconomic and tax efficiency variables, the original ISL proposal was advanced as a means of assisting the education sector, not as a means of achieving macroeconomic or tax policy objectives. Our modelling suggests that the effects of an ISL appear incongruent with a policy objective of assisting the education sector. Under our central elasticity assumption, we find that the direct effect of a 5% ISL is to reduce output in both the tertiary and technical and vocational education sectors, by approximately 1% and 0.7% respectively. In part, this is a reflection of our revenue-recycling assumption, which disburses ISL revenue to the Australian population on an equal per-capita basis. The negative impact of the ISL on the education sector would be attenuated by disbursing the ISL revenue to the education sector. However, this would raise administrative efficiency questions over the otherwise avoidable tax churn associated with taxing the sector's revenue only to return the tax thus raised as some form of grant. It would also raise long-run policy commitment questions. While the levy's adverse impact on the education sector would be attenuated by a compact with the federal government that guaranteed the return of the levy revenue to education institutions in proportion to international student numbers, the education sector might find such a compact difficult to enforce, in a system-wide sense, in the long-run. That is, the federal government might agree to hypothecate the levy revenue, but then offset this over time by reducing other lines of funding to the sector.

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Appendix A: Derivation of export demand elasticities

Our central estimate for the export demand elasticity for education exports is based on implementing the approach outlined in Dixon and Rimmer (2010: 156-157) to the structure and data of GTAP (Hertel et al. 1997). Dixon and Rimmer begin by writing the percentage change form for the constant elasticity export demand schedule for Australian exports of commodity *i* as:

(1) $x(i,aus) = \varepsilon(i,aus) \cdot pfob(i,aus) + f(i,aus)$

where

$x(i,aus)$ is the percentage change in foreign demand for Australian exports of commodity *i*;

$\varepsilon(i,aus)$ is the foreign elasticity of demand for Australian exports of commodity *i* ($\varepsilon(i,aus) < 0$);

$pfob(i,aus)$ is the percentage change in the f.o.b. price of Australian exports of commodity *i*; and,

$f(i,aus)$ is a variable representing independent shifts in the position of the foreign demand schedule for Australian exports of commodity *i*.

Our aim is to find a value for $\varepsilon(i,aus)$ using the theoretical structure and data of the GTAP global trade model. In GTAP, there are three levels of decision making relevant to the determination of Australian export volumes.

First, economic agents in export destination *r* have a demand for commodity *i* undifferentiated by source. Abstracting from all sources of change in demand for *i* other than price, in percentage change form we can write the demand for commodity *i* in region *r* as:

(2) $q(i,r) = \delta(i,r) \cdot p(i,r)$

where

$q(i,r)$ is the percentage change in demand for commodity *i* from all sources by all economic agents in region *r*;

$\delta(i,r)$ is the elasticity of demand in region *r* for commodity *i* irrespective of source ($\delta(i,r) < 0$); and,

$p(i,r)$ is the percentage change in region *r* of the purchaser's price for commodity *i* irrespective of source.

Second, in GTAP, economic agents in region *r* face constant elasticity of substitution (CES) possibilities for substituting between domestic and imported varieties of *i*. The percentage change form for the import demand equations are thus:

(3) $$qm(i,r) = q(i,r) - \sigma^{(1)}(i) \cdot \left[pm(i,r) - p(i,r) \right]$$

where

$qm(i,r)$ is the percentage change in the demand for imports of *i* in region *r*;

$\sigma^{(1)}(i)$ is the elasticity of substitution between imported and domestic varieties of *i* (assumed to be the same for all regions in GTAP); and,

$pm(i,r)$ is the percentage change in the average purchasers' price of imports of commodity *i* in region *r*.

Third, in GTAP, economic agents in region *r* face CES possibilities for substituting between alternative import sources for commodity *i*. The percentage change form for the resulting source-specific import demand equations are thus:

(4) $$qm(i,s,r) = qm(i,r) - \sigma^{(2)}(i) \cdot \left[pm(i,s,r) - pm(i,r) \right]$$

where

$qm(i,s,r)$ is the percentage change in demand for imports of commodity *i* from source *s* by agents in region *r*;

$\sigma^{(2)}(i)$ is the elasticity of substitution between alternative import sources for commodity *i* (in GTAP, assumed to be the same for all regions); and

$pm(i,s,r)$ is the percentage change in the purchasers' price of commodity *i* from import source *s* in region *r*.

Substituting equations (2) and (3) into (4) we have:

(5) $$qm(i,s,r) = \delta(i,r) \cdot p(i,r) - \sigma^{(1)}(i) \cdot \left[pm(i,r) - p(i,r) \right] - \sigma^{(2)}(i) \cdot \left[pm(i,s,r) - pm(i,r) \right]$$

To apply equation (5) to infer export elasticities, we note that the price terms are weighted averages of movements in origin-specific prices. In particular, and abstracting from movements in prices from all international sources other than source *a*, we have:

(6) $$p(i,r) = S^{(M)}(i,r) \cdot S(i,a,r) \cdot pm(i,a,r)$$

(7) $$pm(i,r) = S(i,a,r) \cdot pm(i,a,r)$$

where

$S^{(M)}(i,r)$ is the proportion of region *r*'s total demand for *i* that is satisfied by imports;

$S(i,a,r)$ is the share of region *r*'s imports of *i* that are satisfied by imports from source *a*;

Substituting equations (6) and (7) into (5):

(8) $$\begin{aligned} qm(i,a,r) = {} & \delta(i,r) \cdot S^{(M)}(i,r) \cdot S(i,a,r) \cdot pm(i,a,r) \\ & - \sigma^{(1)}(i) \cdot \left(1 - S^{(M)}(i,r)\right) \cdot S(i,a,r) \cdot pm(i,a,r) \\ & - \sigma^{(2)}(i) \cdot \left(1 - S(i,a,r)\right) \cdot pm(i,a,r) \end{aligned}$$

Next, following Dixon and Rimmer (2010), we recognise that there are separating costs mediating movements in the purchasers' prices of imports of *i* and movements in f.o.b. export prices, hence:

(9) $$pm(i,a,r) = S_{fob}(i,a,r) \cdot pfob(i,a,r)$$

where

$pfob(i,a,r)$ is the percentage change in the f.o.b. price of commodity *i* exported from region *a* to region *r*; and,

$S_{fob}(i,a,r)$ is the share of the purchasers' price in country *r* of commodity *i* exported from country *a* of the f.o.b. price.

Substituting equation (9) into (8) and rearranging the expression yields:

(10) $$\begin{aligned} \varepsilon(i,a,r) = qm(i,a,r) \div pfob(i,a,r) = {} & \\ \left[\delta(i,r) \cdot S^{(M)}(i,r) \cdot S(i,a,r) - \sigma^{(1)}(i) \cdot \left(1 - S^{(M)}(i,r)\right) \cdot S(i,a,r)\right. & \\ \left. - \sigma^{(2)}(i) \cdot \left(1 - S(i,a,r)\right)\right] \cdot S_{fob}(i,a,r) & \end{aligned}$$

where $\varepsilon(i,a,r)$ is the export demand elasticity faced by region *a* when exporting commodity *i* to region *r*. Region *a*'s weighted average export demand elasticities are given by:

(11) $$\varepsilon(i,a) = \sum_r H(i,a,r) \cdot \varepsilon(i,a,r)$$

where $H(i,a,r)$ is the share of region *a*'s total exports of *i* accounted for by exports to region *r*.

Using the latest GTAP database [Aguiar et al., (2022)] to evaluate (10) and (11), we find that $\varepsilon(edu,aus)$ = -3.45. This is the basis for our setting of the central estimate for the price elasticity of demand for education in VURMTAX at -3.5. Note that under (10), $\varepsilon(edu,aus,r)$ will be more elastic: (i) the higher is the absolute value of $\delta(edu,r)$ (i.e., the more elastic is the demand for education in region *r*); (ii) the lower is $S^{(M)}(edu,r)$ (i.e., the smaller is the proportion of region *r*'s total demand for education that is satisfied by imports); (iii) the lower is $S(edu,aus,r)$ (i.e., the smaller is the proportion of region r's demand for imported education that is satisfied by Australian education exports); and, (iv) the higher are $\sigma^{(1)}(edu)$ and $\sigma^{(2)}(edu)$ (i.e. the more readily do economic agents substitute between domestic and imported education, and between alternative imported sources for education). To give the reader a feel for the magnitudes of the inputs to (10) and (11) from the latest GTAP database, the simple averages across *r* of $\delta(edu,r)$, $S^{(M)}(edu,r)$, $S(edu,aus,r)$ and $S_{fob}(edu,aus,r)$ are -0.64, 0.057, 0.122 and 1 respectively, and the values for $\sigma^{(1)}(edu)$ and $\sigma^{(2)}(edu)$ are 1.9 and 3.8 respectively for all *r*. Inputting these simple averages to (10) provides:

$$\begin{aligned}\varepsilon(edu,aus,\bullet) = \\ &\left[\delta(edu,\bullet)\cdot S^{(M)}(edu,\bullet)\cdot S(edu,aus,\bullet) - \sigma^{(1)}(edu)\cdot\left(1-S^{(M)}(edu,\bullet)\right)\cdot S(edu,aus,\bullet)\right. \\ &\left. -\sigma^{(2)}(edu)\cdot\left(1-S(edu,aus,\bullet)\right)\right]\cdot S_{fob}(edu,aus,\bullet) = \\ &\left[-0.64\cdot 0.057\cdot 0.122 - 1.9\cdot\left(1-0.057\right)\cdot 0.122\right. \\ &\left. -3.8\cdot\left(1-0.122\right)\right]\cdot 1 = -3.55\end{aligned} \tag{12}$$

which is close to the -3.45 that is produced from inputting the (un-averaged) GTAP data directly to (10) and (11).[10]

[10] The slightly more elastic estimate from (12) relative to that derived from direct application of GTAP database values to (10) and (11) arises from a small positive correlation in the values for *H(edu,aus,r)* and *ε(edu,aus,r)*.