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Abstract

In 2001, $13 million were invested in various grape and wine R&D programs via the Australian Grape and Wine Research and Development Corporation. Half of the funds come from compulsory levies from grape-growers and winemakers, and the other half from Commonwealth government matching grants. These funds are then allocated to research projects across broad areas such as grape production R&D, wine production R&D and grape and wine quality R&D.

The benefit of R&D in one sector of an industry will be distributed across the production and consumption chain. On the other hand, when a levy is charged nominally to one producer group, the real burden of the cost will also be shared among all involved producer and consumer groups. In the case of the Australian grape and wine R&D investments, the net impact will be determined by the distributions of both the benefits and the costs across grape-growers, winemakers, marketers and retailers, and domestic and overseas consumers. In an ideal situation, if every dollar is invested at exactly the point where it is collected, the percentage distributions of costs and returns coincide. Under this system, presuming R&D projects are successful, all groups will gain in dollar terms, and they will receive benefits in exactly the same proportions as how the burdens of the R&D costs are shared. However, the distributions of costs and benefits will diverge if a levy collected at one point of the production is used to fund research at a different point of the chain. Indeed, in practice, producers often pool levies together to fund R&D programs at places that are not necessarily where the funds are raised. A significant amount of the public funds are also invested in the Australian agricultural industries that substantially involve foreign processors and consumers. In these situations it is important to note the real incidence of both costs and benefits.

The objective of the paper is to examine the distributions of both costs and returns from the Australian grape and wine R&D investments, using results from a multi-sectoral equilibrium displacement model of the industry. The real shares of total R&D costs are estimated and compared with the nominal shares. For example, while the total R&D costs in 2001 for the industry are paid nominally 18.9% by grape-growers, 31.1% by winemakers, 50% by the government and taxpayers, and 0% by overseas consumers, the real burdens are shared by the four groups in the proportions of 14.3%, 20.6%, 57.7% and 7.4% respectively. Divergence between the distributions of costs and benefits is also studied for the three major areas of R&D. Grape-growers, winemakers and overseas consumers are shown to receive bigger proportions of the gains than their proportions of costs, but the Government and other domestic parties as a group bear a much higher proportion of costs than returns. The paper discussed implications of the results to the equity issue between premium and non-premium wine producers, the free-rider issue for overseas consumers, and the issue of justifying government funding of grape and wine R&D.

Who Bears the Burden and Who Receives the Gain? – The Case of GWRDC R&D Investments in the Australian Grape and Wine Industry

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1. Introduction

The Australian grape and wine industry has undergone substantial changes and expansion in the last thirty years. It has become one of the most technically advanced wine producing nations in the world and a successful exporter of good quality wines to the world wine market. In 2001/02, $2 billion[1] of wines were exported from Australia, exceeding the value of wines sold domestically (AWEC 2002). The industry is conscious of the importance of keeping a competitive technological edge and there have been significant increases in the investments into research and development (R&D) of the industry.

The Australian Grape and Wine Research and Development Corporation (GWRDC) is the industry statutory body responsible for investing in grape and wine R&D on behalf of the industry and the Australian government. In 2001, $13 million were invested via GWRDC on various R&D programs (GWRDC 2001). Half of the GWRDC funds come from compulsory grape and wine levies and the other half from Commonwealth government matching funds. The Australian government matches the industry expenditure on agricultural research on a dollar-to-dollar basis, up to 0.5% of the gross production value. Over the past eight years there have been two increases in the grape and wine R&D levies. Currently, the grape producers pay $2 per tonne for wine grapes grown and delivered to wineries, and the winemakers pay $3 per tonne for grapes crushed for winemaking. With this levy rate the total R&D expenditure is still below 0.4% of the gross industry value, so the industry is contemplating another increase in the levy rate before the 2004 vintage (GWRDC 2002) in order to take advantage of the government matching funds.

[1] All dollars refer to $(AUS) in this study. $1(AUS) equals about $0.52(US) during 2001/02.

Funds are allocated by GWRDC according to the R&D priority areas set up in consultation with industry bodies. As a statutory body, GWRDC is also required to ensure the broader social, environmental and economic benefits in recognition of the government contribution[2]. In 2001/2002, the total R&D funds were allocated across five broad R&D areas based on the GWRDC's five-year R&D Plan 1997-2002. These include programs on technology adoption, grape production R&D, wine production R&D, grape and wine quality, and industry information and R&D management.

The benefit of a technical advance due to R&D in one sector of an industry will be distributed across the production and consumption chains. An equilibrium displacement modelling approach is often used to estimate the distribution (Alston, Norton and Pardey 1995). On the other hand, when a levy is charged to one producer group, the real burden of the cost will also be shared among all producer and consumer groups via the incidence of the levy. In the case of the Australian grape and wine R&D investments, the net impact will be determined by how the benefits as well as the costs are distributed across grape growers, winemakers, marketers and retailers, and domestic and overseas consumers. These distributions can be estimated based on the information on how the total R&D funds are spent across different parts of the chain, and who pays for each of these investments.

There are a few issues particularly of interest for the Australian grape and wine industry R&D. First, the majority of the Australian R&D programs are targeted at commercial premium wines. The implications of these investments for non-premium wine producers in comparison to the premium wine producers will be important, as non-premium growers and winemakers also pay levies on the basis of tonnage. This also raises the question as to whether the current gravimetric levy system is disadvantageous to producers of lower quality wines and whether at least it should be moved to an *ad valorem* levy system so that

[2] There is a government representative in the GWRDC board.

premium producers pay more. Second, two-thirds of Australian premium wines are currently sold overseas (ABS 2002). Consequently, returns from any technical advance and quality improvement in Australian wines will be spilt over to overseas retailers and consumers. By the same token, the cost of R&D levies to the Australian producers will also be borne partly overseas. Alston and Mullen (1992) examined the same question for the Australian wool industry. A third issue could be raised regarding the justification of public funding of grape and wine R&D. While the grape sector is made up of small growers (7,000 vineyards in 2002, GWRDC 2002), the Australian wine sector is rather concentrated; the top four wine companies, namely, Southcorp, BRL Hardy, Simeon and Orlando Wyndham, accounted for 61% of the total production and 70% of the total export in 1999. In fact, the top nine companies accounted for 81% of the total wine production (Harris 2001). As more and more wine R&D are carried out by large wine companies, the usual notion of underinvestment in agricultural R&D due to market failure is challenged. Information on the incidence of the public R&D expenditure will be important for the discussion to help justify or refute government funding of grape and wine R&D.

The objective of this paper is to study the distributions of costs and benefits of the Australian grape and wine industry R&D, using the results from a multi-sectoral equilibrium displacement model. I concentrate on the GWRDC R&D investments for 2001/02, and examine the divergence between the distributions of costs and the distributions of returns across various industry groups for broad areas of R&D programs. The paper is planned as follows. In the next section, I present a multi-sectoral model of the Australian grape and wine industry and report the distributions of the benefits among industry participants from technical progress in grape production, wine production and grape and wine quality. These results are used in section 3 to estimate the incidence of R&D costs across GWRDC programs borne by each of the various groups. The incidence of costs is then compared with

the incidence of benefits for the GWRDC funded R&D in Section 4, and implications are discussed in the final section.

2. A model of the Australian Grape and Wine Industry

The Australian grape and wine industry is represented by a multi-sectoral partial equilibrium model (Zhao, Anderson and Wittwer 2002). The industry is disaggregated into vertical sectors of grape production, winemaking, marketing and final consumption. Horizontally, the industry is modelled as producing premium and non-premium wines. As most of the grape and wine R&D investments are directed towards premium wines, this distinction will allow for the investigation of separate impacts on the premium and non-premium sectors. Following Wittwer, Berger and Anderson (2002), the premium wines are defined as those in bottles of 2 litres or less and non-premium wines otherwise.

Assuming profit or utility maximizing behaviour for industry participants and constant returns to scale for all involved production technologies at the industry level, a thirty-seven-equation structural model in general functional form is specified. Thirty-seven endogenous variables are involved in the model representing prices and quantities of grapes, wines and other inputs at various stages of the chain and different markets. There are fifteen exogenous variables representing exogenous shocks to supply and demand conditions at various parts of the production and marketing chain. The structural model is then transformed to an equilibrium displacement form by total differentiation, relating the proportional changes of all endogenous variables with exogenous variables via a linear equation system, with market elasticities as coefficients. Details of the displacement model, the base equilibrium values and the market elasticities are given in Zhao, Anderson and Wittwer (2002). The base equilibrium values and the sectoral disaggregation are derived from the projected 2005 database used in Wittwer, Berger and Anderson (2002), with a total industry value of about $5 billion at the cellar door. Given the time lag between planting grape vines and bearing

fruits, the projected values are expected to be a reasonably robust representation of the industry in 2005. The market elasticity values are chosen to represent a medium to long run horizon, based on limited empirical studies and subjective judgement.

For the purpose of this study, three scenarios of exogenous changes are considered to approximate the impacts of three broad types of R&D investments. The premium grape production R&D is modelled as a cost reduction in the production of premium grapes and thus a downward shift in the supply curve of premium grapes. The technological advance in premium winemaking due to R&D is characterised by a downward shift in the supply curve of premium wine specific inputs. The quality-enhancing R&D is modelled as an eventual increase in the consumers willingness-to-pay for the final products and thus an upward shift in the demand curve of premium wines in both domestic and overseas markets. For each case, a one percent parallel shift of the relevant supply or demand curve along the price direction is considered via an exogenous variable. The resulted changes in all prices and quantities are estimated through solving the displacement model, and the total welfare change and its distribution among the various industry groups are calculated. The welfare results are given in Table 1, which shows for each of the three scenarios the total welfare gain in million dollars and the percentage shares of it to the three producer groups (grape growers, winemakers, and mobile factor providers and marketers), two consumer groups (domestic and overseas) and government tax revenue. Note that the percentage distribution of the total welfare change among industry groups is independent of the size of the initial shift (i.e. 1% here), as long as the shift is assumed parallel and relatively small in comparison to the equilibrium price level (p.84, Zhao *et al.* 2000).

3. Incidence of the Costs of Grape and Wine R&D

In the following, the incidence of the R&D costs in the Australian grape and wine industry will be investigated. In particular, I focus on the GWRDC expenditure in 2001/02. A total of $13 million was invested by GWRDC across its five broad areas of R&D programs. The grape growers paid about 19% of this total amount through the grape R&D levy, and the winemakers paid about 31% via the wine R&D levy. The remaining 50% was contributed by the federal government. These are the nominal shares of the total costs.

The shares of the burden among various industry groups from a gravimetric levy to the grape growers are the same as the distribution of the benefits from a research-induced cost reduction in grape production, if a parallel supply shift is assumed for the case of cost reduction. The former can be considered as an upward parallel shift in the grape supply curve while the latter is a downward shift of the same curve. In other words, the incidence of a grape levy can be analysed using the percentage shares given in the first column of Table 1 for the incidence of grape production R&D. Table 2 is a spreadsheet that calculates the real incidence of total GWRDC R&D costs to grape growers, winemakers, overseas consumers, and government and other domestic parties. We have grouped government tax revenue, domestic consumers, wine marketers and other mobile factor providers as one group in this study. The first row of Table 2 calculates how the burden of the levy initially imposed to the grape growers is partly off loaded to others. Of the $13 million total R&D costs, the grape growers paid 18.9% or $2.459 million nominally. The total incidence of the grape growers' contribution is a welfare loss of $2.508 million, which is the sum of the levy and a small dead-weight-loss[3]. This total welfare loss is then shared by the four groups according to the percentages given in the Column 1 of Table 1; that is, 35.6% or $0.893 million by grape growers, 33.4% or $0.838 million by wine makers, 14.0% or $0.351 million by overseas

[3] All dead-weight-losses of the levies in this study are calculated by running the model with the percentage supply shifts associated with the amounts of the nominal levies.

consumers, and the remaining 17.0% or $0.426 million by government and other domestic parties.

The incidence of a wine levy imposed on winemakers can be similarly examined using the distributional figures in Column 2 of Table 1 for the incidence of a wine production R&D. The real costs of a nominal $4.049 million wine levy borne by the four groups are calculated in Row 2 of Table 2. The incidence of the 50% government contribution is given in Row 3 of Table 2. We have ignored the excess burden of the government expenditure of tax dollars. Alston and Mullen (1992) pointed out a study by Findlay and Jones (1982) indicating a marginal welfare loss of 23% to 65% for the expenditure of general taxation revenue.

The last two rows in Table 2 add up the total real costs due to the three sources of tax for each of the four groups and calculate the real percentage share of the total costs for each group, which is also shown in the last column[4]. Comparing the figures in the second and last columns of Table 2, we see that while the total R&D funds for the industry are paid nominally 18.9% by grape growers, 31.1% by winemakers, 50% by the federal government and tax payers, and 0% by overseas consumers, the real burden is shared by the four groups in the proportions of 14.3%, 20.6%, 57.7% and 7.4% respectively. These indicate that the grape and wine producers are in fact paying less than what they pay nominally, as they build the extra levies into their production costs or prices and thus off load the costs to downstream parties in the chain. On the other hand, the government and other domestic parties as a whole are paying more than 50%, and the overseas consumers are bearing 7.4% of the levy burden through increased wine prices even they do not contribute up front. In dollar terms, while the grape growers paid $2.459 million and winemakers $4.049 million towards the R&D costs,

[4] Given the linear system and the integrability conditions, the impacts of the two producer levies are path independent and can thus be added up for each industry group. For the small supply shifts considered here (less than 1%), the estimated distributions of welfare losses will still be rather accurate even when they are path dependent, with errors of the second-order magnitude (see Zhao, Mullen and Griffiths 2001).

the actual cost to the two producer groups are only $1.891 million and $2.716 million respectively. Almost $1 million of the $13 million R&D costs are actually borne overseas through the incidence of the producer tax.

The same exercise can also be carried out for each of the five R&D programs. GWRDC allocates the total R&D funds across projects of 5 broad areas; namely, research and technological adoption (Program 1), winegrape production R&D (Program 2), grape and wine quality R&D (Program 3), wine production R&D (Program 4), and industry information and management (Program 5). While wine R&D projects are primarily paid from the wine account, all other programs are jointly paid by both the grape levies and wine levies (all matched by government grants) on a project-by-project basis. Table 3 shows a comparison of the nominal shares and the real shares of the cost of funding each of the five R&D programs. The figures are calculated for each program in the same way the figures in Table 2 for the total expenditure are calculated, and the details of the calculation are not shown. The cost share figures in Table 2 are also shown in the bottom line of Table 3 for comparison.

The information in Table 3 shows who bears the burdens of funding for each of the programs. For example, looking at the wine R&D program (Program 4), we observe that, while the winemakers and government each contributed half of the total cost of $1.425 million nominally, the costs are eventually shared by all four groups, with grape growers, winemakers, government and domestic parties, and overseas consumers bearing 12.1%, 22.9%, 57.4% and 7.6% respectively.

4. Shares of Costs versus Shares of Benefits

The real incidence of the grape and wine R&D investments to an industry group is the net result of cost borne and benefit gained by the group. As the incidence of a 1% levy imposed at one point of the production chain is exactly the same, though with opposite direction, as the incidence of a 1% cost reduction at the same point of the production,

theoretically it would be a fair funding system if the levies were invested in the same point of the chain where they are collected. Presumably, when an R&D investment is successful, the resulted productivity gain will mean a cost reduction of more than 1%, resulting in a total welfare gain of the amount greater than the total levy dollars invested. Consequently, everyone is a winner and the benefits to all groups are multiplied in the same proportion in which the costs are borne.

However, the distributions of costs and benefits will diverge if a levy collected at one point of the production is used to fund research at a different point of the chain, unless the inputs are used in strictly fixed proportion and input substitution is not possible (Alston and Scobie 1983). Also, as pointed out by Alston and Mullen (1992), there will be free-riders if a subset of the producer group does not contribute to the costs or if the government pays R&D from general tax revenue. Indeed, in practice, producers often pool levies together to fund R&D programs at places that are not necessarily where the funds are raised. A significant amount of public funds are also invested in agricultural industries that substantially involve foreign processors and consumers. In these situations it is important to note the real incidence of both costs and benefits.

The incidence of costs and returns for the Australian grape and wine R&D investments is examined below. Estimation of actual dollar returns from these investments is not possible without technical information about the actual R&D projects indicating the resulted productivity gains or the consumers' response to product quality change. We will compare the shares of benefits with the shares of costs for various industry groups. As noted earlier, these distribution figures are independent of the amounts of the initial shifts (1% is assumed in the study) in the demand or supply curves due to R&D (Zhao *et. al.* 2000).

The distributions of nominal and real costs as well as the distributions of benefits among the four industry groups are given in Table 4 for the three major areas of R&D

programs, namely, grape production R&D, wine production R&D, and quality-enhancing R&D, using information given in Table 1. Looking at figures in Row 1 of Table 4, we observe that, for funds invested in grape R&D program, while the grape growers and winemakers pay nominally 30.6% and 19.4% of the costs respectively, they in fact bear 15.7% and 19.2% of the real cost respectively and receive 35.6% and 33.4% of the benefits respectively. Thus, both producer groups are winners in the case of grape production R&D investments where they enjoy 19.9% and 14.2% respectively in the differences between the shares of gains and the shares of costs. Overseas consumers also gain as they share 7.3% of the real costs through the incidence of producer levies while receiving 14.0% of the benefits due to more efficient grape production technologies in Australia. The government, taxpayers, Australian consumers and other domestic parties as a group lose out in terms of the percentages: they pay 50.0% nominally and 57.8% in effect in costs but only receive 17.0% of the benefits for the case of grape R&D. Note they may still gain in dollar terms if the resulted total welfare returns due to increased productivity are sufficiently larger than the total tax dollars invested in the program (about $2 million government contribution to grape R&D for the year).

Similar situations can be observed for the case of wine production R&D from Row 3 of Table 4. Grape growers, winemakers and overseas consumers all receive bigger proportions of the gains than the actual cost they bear, sharing 23%, 57% and 9% of the gains respectively but only bearing 11.6%, 28.8% and 4.5%, respectively, of the real burden of the costs. Government and domestic parties share only 11% of the returns from improved wine making technology but bear 55.1% of the costs in wine production R&D program via GWRDC. For the case of wine quality-enhancing R&D, the government and domestic parties are in a better position as the domestic consumers are able to share a larger share of the returns from wine quality R&D than from cost-reducing R&D. Still, as a group, they bear

57.5% of the real cost which is a larger percentage than the 39.8% share of benefits they receive (Row 2 of Table 4). All the other three groups have larger shares of benefits than their shares of real costs for the case of quality R&D.

It is difficult to estimate the returns from projects targeted at technology extension and adoption (Program 1) and industry information (Program 2) with the framework in this study, as such projects are likely to impact on several points in the chain. It would also be helpful to be able to estimate the distribution of returns of the total R&D expenditure across the GWRDC R&D portfolio and to compare it with the incidence of the overall costs as shown in the bottom row of Table 3. Without the technical information as to how the initial costs of investments in different R&D areas are transformed to larger total welfare gains, it is difficult to add up the total gains in dollars to individual groups across the R&D portfolio. However, as grape growers and winemakers bear only 14.3% and 20.6%, respectively, of the total costs of GWRDC R&D expenditure while they share 20.5%-35.6% and 29.2%-57% respectively of the returns (Table 4) from the three major R&D programs, overall the two producer groups are almost certainly receiving larger shares of the rewards than their shares of the costs. This will also be the case for overseas consumers.

5. Discussion

The bearing area of vineyards in Australia increased from 71,400 hectares in 1997 to 130,600 hectares in 2001, with another 18,000 hectares yet to bear (ABS 2001). All the expansion has been in premium varieties of winegrapes, with multipurpose grape viticulture in decline. So far, exports of Australian wine have expanded without price declines (AWEC, 2002). The industry has retained its competitiveness through R&D and marketing investments. It is planning to increase the total investments in R&D by raising the rate of producer levies and receiving a larger government matching funds. Hence, it is timely to

investigate the incidence of both costs and benefits for alternative ways of raising and investing funds.

The three issues raised in the introduction can be revisited regarding the Australian grape and wine industry R&D investments. The first is the equity issue between premium and non-premium producers. While almost all of the Australian exported wines are premium, more than half of the volumes domestically sold are non-premium (ABS 2002). The projected figures indicate there will still be more than one quarter of non-premium products in the total production by 2005 (Wittwer, Berger and Anderson 2002). As the current grape and wine levies are charged on a tonnage basis, non-premium grape and wine producers will still be paying a significant amount of the R&D costs nominally and even when they eventually pass some of the costs downstream. As the industry shifts its focus to its premium sectors and invests most of its R&D funds into premium sectors, the returns from such investments to the non-premium sectors are minimal (Table 1). Changing the R&D levy from the current gravimetric rate to a value-based *ad valorem* rate could see the non-premium sectors paying less and provide part of the solution. Of course, the producers in the top end of the market of super-premium wines would not support such a move as it could be argued that it is the commercial premium sector in the middle range (in the $8-$15 per bottle range) that will benefit the most from GWRDC funded generic R&D.

Australia exports two-thirds of its premium wines currently (AWEC 2002). While the overseas retailers and consumers benefit from technological advances in Australia grape and wine production, they also bear part of the costs if the R&D are funded via producer levies. The study shows that foreign consumers take much larger shares of the benefits than costs with the current funding formula. As Australian wine export continues to expand in the next couple of years, more of the rewards from Australia R&D are expected to be passed on to foreign consumers.

Related to this is the issue of public funding of R&D. While the government funding to the GWRDC R&D investments is 50%, the overall public contribution to the total grape and wine R&D costs is well beyond half. Other public sector R&D investments include research provided through federal and state research organisations. The study has also ignored the extra dead-weight-losses of general government income tax which could be as large as 65% (Findley and Jones 1982). So the actual divergence between the Australia public's share of benefits and costs would be even greater than that estimated in this study. From an Australia perspective, when R&D are funded by producer levies, part of the costs can be off loaded to overseas consumers who also receive benefits. On the other hand, the costs of public funding of R&D and the associated excess burden will be borne completely domestically, and the overseas consumers will free ride. Thus, justification for the Australian public funding to the grape and wine R&D will need to be focused more on other effects such as spillovers of new grape and wine technologies to other sectors of the economy and on the related effects of better quality Australian wines in attracting tourists and the like. The market failure argument of public funding for R&D should also be examined as the wine industry becoming more concentrated with large corporates. As stated by Alston and Mullen (1992), public funding of R&D is not the only way of correcting market failure. Indeed, the institutionalised compulsory industry funding of R&D such as the GWRDC arrangement is probably a better approach.

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Table 1. Total welfare changes (in $million) and Distributions (in %) to Various Groups

	Scenario 1 **Premium Grape** **Cost-reducing R&D**	**Scenario 2** **Premium Wine** **Cost-reducing R&D**	**Scenario 3** **Premium Wine** **Quality-enhancing R&D**
Total Welfare Gain	**$13.7m**	**$20.9m**	**$73.7m**
% shares to:	%:	%:	%:
premium	33.3	22.5	19.4
non-premium	2.2	1.4	1.2
Grape producers Subtotal	**35.6**	**23.9**	**20.5**
premium	32.8	45.6	29.8
non-premium	0.6	-0.6	-0.6
Winemakers Subtotal	**33.4**	**45.1**	**29.2**
Mobile Factors Gains	**4.1**	**4.2**	**3.6**
Marketing Sector Subtotal	**4.3**	**4.3**	**5.6**
Domestic Consumers Subtotal	**10.8**	**9.0**	**20.5**
Overseas Consumers Subtotal	**14.0**	**15.0**	**10.6**
WET	-1.6	-1.2	6.2
GST	-0.3	-0.3	3.7
Gov't Tax Revenue Subtotal	**-1.9**	**-1.5**	**9.9**
Total	**100**	**100**	**100**

Table 2. Incidence of Total GWRDC R&D Expenditure

	Nominal Costs ($m)	**Nominal % Costs (%)**	**Total Welfare Loss ($m) (levy+DWL)**	*Borne by Grape Growers ($m)*	*Borne by Winemakers ($m)*	*Borne by Gov't & Other Domestic Parties ($m)*	*Borne by Overseas Consumers ($m)*	**Real % Cost (%)**
Grape Growers	2.459	18.9	2.508	0.893	0.838	0.426	0.351	14.3
Winemakers	4.049	31.1	4.170	0.998	1.878	0.668	0.626	20.6
Govt & Other Domestic Parties	6.508	50.0	6.508	0	0	6.508	0	57.7
Overseas Consumers	0	0	0	0	0	0	0	7.4
Total	13.016	100	13.187	1.891	2.716	7.602	0.977	100
			real % cost(%):	14.3	20.6	57.7	7.4	

Table 3. Nominal Cost vs Real Cost for the Five Programs

			Grape producers:		**Wine Producers:**		**Govt & Dom Parties:**		**Overseas Consumers:**	
	Total Nominal Cost ($m)	Total Welfare Loss ($m)	Nominal (%)	*Real (%)*	Nominal (%)	*Real (%)*	Nominal (%)	*Real (%)*	Nominal (%)	*Real (%)*
Pgm 1. *Tech. Adoption*	2.377	2.406	28.8	*15.5*	21.2	*19.4*	50	*57.8*	0	*7.3*
Pgm 2. *Grape R&D*	3.995	4.043	30.6	*15.7*	19.4	*19.2*	50	*57.8*	0	*7.3*
Pgm 3. *Quality R&D*	3.492	3.542	5.4	*12.8*	44.6	*22.2*	50	*57.4*	0	*7.6*
Pgm 4. *Wine R&D*	1.425	1.447	0	*12.1*	50.0	*22.9*	50	*57.4*	0	*7.6*
Pgm 5. *Information & Management*	1.727	1.749	21.0	*14.6*	29.0	*20.3*	50	*57.7*	0	*7.4*
Total R&D Costs	**13.016**	**13.117**	**18.9**	***14.3***	**31.1**	***20.6***	**50.0**	***57.7***	**0**	***7.4***

Table 4. Shares of Costs versus Shares of Benefits (in %)

	Grape producers:				**Wine Producers:**				**Govt & Dom. Parties:**				**Overseas Consumers:**			
	Nominal Costs	Real Costs	Returns	***Diff.***	Nominal Costs	Real Costs	Returns	***Diff.***	Nominal Costs	Real Costs	Returns	***Diff.***	Nominal Costs	Real Costs	Returns	***Diff.***
Grape R&D *(Pgm 2)*	30.6	15.7	35.6	***19.9***	19.4	19.2	33.4	***14.2***	50.0	57.8	17.0	***-40.8***	0.0	7.3	14.0	***6.7***
Quality R&D *(Pgm 3)*	5.4	12.8	20.5	***8.0***	44.6	22.2	29.2	***7.0***	50.0	57.5	39.6	***-18.0***	0.0	7.6	10.6	***3.0***
Wine R&D *(Pgm 4)*	0.0	11.6	23.0	***11.4***	50.0	28.8	57.0	***28.2***	50.0	55.1	11.0	***-44.1***	0.0	4.5	9.0	***4.5***