Impact Project

Impact Centre
The University of Melbourne
153 Barry Street, Carlton
Vic. 3053 Australia
Phones: (03) 341 7417/8
Telex: AA 35185 UNIMEL
Telegrams: UNIMELB, Parkville

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# MODELLING THE EFFECTS OF CHANGES IN JUNIOR WAGE RATES ON TEENAGE EMPLOYMENT: HOW FAR CAN WE GO WITH AVAILABLE DATA?

by
Sheila Bonnell
B.R. Parmenter
R.J. Rimmer
and
Michael E. Scorgie
*La Trobe University*

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## I. INTRODUCTION

The effect on teenage employment of a change in junior wage rates operates via two main mechanisms. The first is an industry composition effect. If the shares of teenage wage payments in total industry costs differ across industries, then a change in junior wage rates will have different effects on the total costs of different industries. In addition, the extent to which cost changes will be matched by compensating price changes varies markedly across industries. For industries which face international competition, especially exporters, selling prices are to a large extent independent of costs. The prices of non-traded goods, on the other hand, can be expected to adjust rapidly to changes in the costs of the domestic industries producing them. For these reasons, a change in junior wage rates will cause a change in the industrial structure of the economy. This will feed back into the demand for teenage employees even if no industry alters the teenage/adult composition of its workforce.

The possibility that industries might substitute between teenage and adult workers when their relative wage rates change, is the second mechanism by which a change in junior wage rates might affect teenage employment.

Data necessary to support quantitative analysis of the importance of these mechanisms in the contemporary Australian economy are very scarce. The age composition of employment by industry is crucial for both mechanisms. For the second, we also need estimates of the degree to which industries substitute between teenagers and adults when relative wages change, i.e., estimates of the elasticity of substitution between teenage and adult employees. In this paper we have mobilized some of the data which are available and have used the ORANI model (see Dixon, Parmenter, Sutton and Vincent (1982)) to investigate the possible effect on teenage (and adult) employment of an eight per cent subsidy on teenage wage rates. According to data from the Bureau of Labor Market Research (BLMR) (1983, Table 4.2), an eight per cent subsidy would be necessary to restore the teenage/adult wage relativity to its 1972 level. New data on the workforce composition are taken from recently released tabulations of the 1981 Census of Population and Housing. To our knowledge there are no reliable estimates for the Australian economy of the elasticity of substitution between teenage and adult employees. Nor are we aware of a robust data base which would allow estimation of such parameters. For these reasons we have conducted our analysis under a number of alternative assumptions about the elasticity. Thus at least we are able to assess the sensitivity, to the value of this parameter, of our employment results as a whole and of the relative strengths of the industry-composition and the substitution effects.



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that this is an improvement. Our results suggest that attempts to single out teenagers in the general attack on unemployment are unlikely to be successful.

A final point is that our results highlight the importance of the value of the elasticity of substitution between teenage and adult employees in determining the employment outcome of the teenage-wage subsidy. We have at present no reliable empirical estimates of the value of this crucial parameter. In our view, this lacuna is not a reason for abandoning attempts to conduct the analysis in our formal framework. If the substitution elasticity is important for the outcome, we cannot avoid taking a view about its value if we wish to provide policy relevant information about the effects of such policy measures. All that a less formal method could allow would be for us to avoid taking an explicit view about the elasticity. The overwhelming advantage of the formal methodology is that it is quite clear what we have assumed about the values of relevant parameters, and where uncertainty about the values exists, we can readily test the sensitivity of our policy conclusions to variations in the values.



Followers of recent research on labour-market issues conducted by economists from La Trobe University will recognize that the present study is closely related to Bonnell's analysis of the effects on female employment of the implementation, during the 1970's, of the equal-pay decision (Bonnell, 1982). Other studies have focused on the implications for the employment of workforce groups (especially migrants) of structural changes occurring elsewhere in the economy (e.g., Cook and Dixon, 1982). In the present study we have not addressed issues of the latter type in the teenage-employment context. Nevertheless, data which we are mobilizing from the 1981 Census will provide the basis necessary for studies of that type.

The rest of the paper is organized as follows. Our analytical method is set out in section II. Section III contains a description of the sources of our data on industrial and occupational workforce composition and on wage relativities. The manipulations required in using these data are also described. The results of the analysis are reported in section IV. In section V we draw some conclusions and make suggestions for further research on the topic.

## II. ANALYTICAL METHOD

We require a method to allow us to use the ORANI model of the Australian economy to analyse the effects on teenage employment of a subsidy on teenage wage rates. The method must allow us to distinguish the contributions to the change in teenage employment of:

(i) the induced changes in the activity levels of the industries identified in the model (the industry-composition effect), and

(ii) the substitution within industries between teenage and adult employees which occurs as a result of the change in teenage/adult wage relativities (the substitution effect).

We proceed in three stages. First, we calculate the percentage change in each industry's total costs implied by the wage subsidy. That is, we begin by calculating the implied percentage change in the wage bill $(w_j)$ of industry $j$ as:

$$w_j = -\psi_j^T s \quad , \qquad j=1,\ldots,h, \qquad (1)$$

where $s$ is the percentage subsidy rate, $\psi_j^T$ is the share of teenagers in the wage bill of industry $j$ and $h$ is the total number of industries. The consequent percentage change $(c_j)$ in the total costs of the industry is then calculated as:

$$c_j = S_{Lj} w_j \quad , \qquad j=1,\ldots,h, \qquad (2)$$

where $S_{Lj}$ is the share of wages in the industry's total costs.



## V. CONCLUSION

This paper has reported some experiments in simulating the effects of a teenage-wage subsidy in a multisectoral model of the Australian economy (ORANI). Data from the 1981 Census of Population and Housing were used to provide information on the industrial and occupational composition of teenage employment. To date the analysis has been conducted distinguishing only the 12 major-industry groupings identified in the Census tabulations.

A number of extensions of the analysis are possible. Among these are, firstly, the use of Census data classified at the 60 minor-industry level. This would allow us to take greater advantage of the high level of detail available in ORANI, but the payoffs would not be great unless the data reveal significant differences in the proportions of teenagers in total employment across industries within the major-industry groupings. Secondly, the Census data would allow the incorporation of sex and occupation dimensions explicitly into the analysis. The fiscal implications of the wage subsidy are a third possible extension which could be made following methods developed by Meagher (1983).

The main empirical result of the analysis is that gains in teenage employment from the subsidy are likely to be small unless employers make significant substitutions in the teenage/adult compositions of their workforces. The employment changes generated by this substitution mechanism are in any case essentially redistributive - gains in employment for teenagers require employment losses for adults. In a situation of general unemployment it is not clear

prepared to substitute between teenage and adult workers in response to changes in their relative wages. Gains in employment via this latter mechanism, however, are essentially at the expense of losses in employment opportunities for adults.



The second stage is to use the industry-specific cost changes calculated via (1) and (2) as exogenous shocks in a short-run ORANI simulation. Given the ORANI production functions, no opportunity exists in the model for industries to substitute labour for other inputs in the short run.[1] Hence, all that is important in determining industries' output and aggregate-employment responses are the changes in their aggregate costs. This method of simulating the effects on industries of the teenage-wage subsidy does involve two second-order errors. Firstly, it ignores the extent to which industries can enhance the cost impact of the subsidy by substituting in favour of the relatively cheapened teenage employees. In a Johansen solution of ORANI, which involves linear approximations, this effect would not be captured even if teenage wage costs in particular, rather than costs in general, had been shocked in the simulations.[2] Secondly, the simulations implicitly assume that occupational wage relativities do not change. Such an assumption is in tension with the observation that the shares of teenagers in occupational employment differ across occupations. We do not in any case draw upon the model's projections of changes in occupational employment levels.

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1. In general, labour can be substituted for other primary factors (capital and agricultural land) but in short-run simulations the quantities of these available for use are fixed. No substitution is allowed between primary factors as a whole and other inputs (see DPSV, 1982, section 12).

2. A method has been developed for obtaining solutions to ORANI which are free of linearization errors. The evidence is that these errors are usually quite small. See DPSV (1982, chapter 5 and section 47).

From the ORANI simulations described in the previous paragraph, we extract projections of percentage changes in a total employment index for each industry. The third stage of our method is to calculate the implied changes in the aggregate demand for teenage and adult employment. For each industry, we calculate the percentage change in the employment of teenagers ($\ell_j^T$) and of adults ($\ell_j^A$) as:

$$\ell_j^k = \ell_j - \alpha^k \sigma_{TAj}(1 - \psi_j^k)(w^T - w^A) \quad , \quad j=1,\ldots,h \ , \quad k=T \text{ or } A \ , \qquad (3)$$

where $\ell_j$ is the percentage change in total employment in industry $j$ (taken from the ORANI projections), $\alpha^k$ is +1 for k=T and -1 for k=A, $\sigma_{TAj}$ is the elasticity of substitution between teenage and adult workers in industry $j$, $\psi_j^k$ is the share of teenage wages (k=T, see equation (1)) or adult wages (k=A) in the total wage bill of industry $j$, and $w^k$ is the percentage change in the real teenage (k=T) or adult (k=A) wage rate.[1] In our simulations the percentage change in the real teenage wage rate to employers is the negative of the subsidy rate and the real adult wage rate remains constant.[2] That is:

$$w^T = -s \qquad (4)$$

and

$$w^A = 0 \ . \qquad (5)$$

1. The labour demand equation (3) is consistent with the labour demand equations in the standard ORANI theory. See DPSV (1982, section 12).

2. Note that in the ORANI simulations money wage rates are fully indexed to the CPI. Thus the real teenage wage rate to employers is effectively held constant at a level eight per cent lower than before the imposition of the subsidy.



19500 effective adult labour units.[1] The higher the value of the substitution elasticity, however, the greater is the share of the aggregate employment increase accounted for by teenagers.[2] Since each teenager counts as only 0.567 of an effective adult labour unit, the increase in raw numbers employed is greater the greater is the substitution elasticity.

To summarize, our results indicate that, if individual employers are assumed not to change the ratio of teenagers to adults in their workforces, an 8 per cent teenage-wage subsidy would lead to only a small increase in the employment of teenagers but to a larger increase in adult employment. Under this assumption the increase in employment is due solely to the expansion in industries' activity levels in response to reductions in their total labour costs (the industry-composition effect.) Since teenagers account for only 5.82 per cent of the aggregate wage bill, the cost reductions generated by the subsidy are quite small (0.18 per cent on average). About 70 per cent of teenagers are employed in non-traded industries which are projected not to increase their activity levels much in response to cost reductions. Greater increases in teenage employment would be generated by the teenage-wage subsidy if individual employers are

1. That is for $\sigma_{TA} = 0.5$ the increase is:
   $25146(0.567) + 5242 = 19500,$
   for $\sigma_{TA} = 1.0$:
   $48386(0.567) - 7934 = 19500,$
   and for $\sigma_{TA} = 2.0$:
   $94864(0.567) - 34285 = 19500.$

2. For values of $\sigma_{TA}$ in excess of 0.7 the share of teenagers in the increase exceeds one, i.e., teenage employment increases but adult employment falls.

Subtracting the industry-composition effects[1] from the total percentage projections in Table IV.3 yields the substitution effects (cf. equation (8)). These are reported in the last row of Table IV.3.

For teenagers the substitution effect is much more powerful than the industry-composition effect. The projections in Table IV.3 indicate that if the substitution elasticity between teenagers and adults is much above zero, strong growth in the demand for teenage labour would be stimulated by the wage subsidy. If the substitution elasticity is 0.5 the projected increase in teenage employment is 4.03 per cent. If the elasticity is as large as 2 the projected increase in employment exceeds 15 per cent. On the other hand, the substitution effect reduces the demand for adult labour. When the substitution elasticity is only 0.5, the industry-composition effect dominates and a small net increase (0.09 per cent) in adult employment is projected. For the higher values of the elasticity net falls in adult employment (0.15 per cent when $\sigma_{TA} = 1.0$ and 0.65 per cent when $\sigma_{TA} = 2.0$) are projected. The value for the substitution elasticity for which the projected adult-employment effect of the teenage-wage subsidy is neutral is about 0.7.

The value of the substitution elasticity makes no difference to the stimulus to total employment given by the wage subsidy when this is measured as the increase in effective adult labour units. For all three of the pairs of columns in Table IV.3 this increase is

1. Note that the industry-composition effect is invariant with respect to the value of the substitution elasticity (cf. equation (8)).



Finally we calculate the percentage change in the aggregate employment of teenagers ($\ell^T$) and adults ($\ell^A$) as:

$$\ell^k = \sum_{j=1}^{h} \phi_j^k \ell_j^k \quad , \qquad k=T \text{ or } A \quad , \tag{6}$$

where $\phi_j^k$ is the share of total teenage employment (k=T) or adult employment (k=A) accounted for by employment in industry j.

In computing the changes in employment via (3) - (6), the values of the substitution elasticities ($\sigma_{TAj}$) are clearly important. We have experimented with various values, each time ignoring possible variation across industries. When we set

$$\sigma_{TAj} = 0 \qquad \forall\, j=1,\ldots,h, \tag{7}$$

our calculations give the industry-composition effects on employment. More generally, combining (3) - (6) and ignoring possible variation across industries in the value of the substitution elasticity (i.e., assuming $\sigma_{TAj} = \sigma_{TA}$ for all j ), then

$$\ell^k = \sum_{j=1}^{h} \phi_j^k \ell_j + \alpha^k \sigma_{TA} s \sum_{j=1}^{h} \phi_j^k (1 - \psi_j^k) \quad , \tag{8}$$

$$k=T \text{ or } A \quad .$$

The first term on the RHS of (8) is the industry-composition effect and the second term is the substitution effect.

## III. DATA

To implement equations (1) through (8) we require earnings and employment data. In the case of equation (1) we need to be able to compute the teenage shares of industry wage bills. This involves the identification of appropriate wage rates for teenagers and adults and employment levels cross-classified at least by industry and age. Our approach is to use occupational wage rates for junior and adult employees. This allows us to take some account of:

(i) the differing occupational structures across industries, and

(ii) differences in the teenage and adult shares of occupations.

Data from the 1981 Census of Population and Housing (ABS, microfiche Table 22) give employment by age, and sex in 12 major industry groups[1] with 73 minor occupational categories. These occupations are set out in Table III.I. In this study, we do not exploit the sex dimension of the employment cross-classification. For employment we combine the male and female data and for wage rates we use earnings data for males.[2] Published data are available for Average Weekly Ordinary Time Earnings at May 1981 (Table 22, ABS, 6306.0) for 43 of the census occupational classifications for male employees aged 21 years and over, and for 10 of these occupations for males aged less than 21 years. In the latter case

1. Persons included in the data but not classified to any industry were distributed proportionately to the other 12 industries.

2. Since sex shares do vary across occupations this involves some bias. However data were not available to allow us to make the necessary corrections.



TABLE IV.3 : PROJECTIONS (VIA EQUATION (3)) OF THE PERCENTAGE EFFECTS OF AN 8 PER CENT TEENAGE-WAGE SUBSIDY ON TEENAGE EMPLOYMENT ($\ell_j^A$) AND ADULT EMPLOYMENT ($\ell_j^T$) FOR DIFFERENT VALUES OF THE ELASTICITY OF SUBSTITUTION ($\sigma_{TA}$) BETWEEN TEENAGERS AND ADULTS

| Industry | Projections | | | | | |
|---|---|---|---|---|---|---|
| | $\sigma_{TA} = 0.5$ | | $\sigma = 1.0$ | | $\sigma = 2.0$ | |
| | $\ell_j^T$ (1) | $\ell_j^A$ (2) | $\ell_j^T$ (3) | $\ell_j^A$ (4) | $\ell_j^T$ (5) | $\ell_j^A$ (6) |
| 1. Agriculture | 5.07 | 1.07 | 8.90 | 0.90 | 16.58 | 0.58 |
| 2. Mining | 5.06 | 1.06 | 8.92 | 0.92 | 16.64 | 0.64 |
| 3. Manufacturing | 4.35 | 0.35 | 8.09 | 0.09 | 15.58 | -0.42 |
| 4. Electricity, gas, water | 4.19 | 0.19 | 8.02 | 0.02 | 15.68 | -0.32 |
| 5. Construction | 3.75 | -0.25 | 7.54 | -0.46 | 15.11 | -0.89 |
| 6. Wholesale & retail | 3.73 | -0.27 | 7.32 | -0.68 | 14.51 | -1.49 |
| 7. Transport & storage | 4.25 | 0.25 | 8.13 | 0.13 | 15.88 | -0.12 |
| 8. Communication | 4.19 | 0.19 | 8.07 | 0.07 | 15.84 | -0.16 |
| 9. Finance | 4.09 | 0.09 | 7.84 | -0.16 | 15.33 | -0.67 |
| 10. Public admin. & defence | 3.84 | -0.17 | 7.65 | -0.35 | 15.29 | -0.71 |
| 11. Community services | 3.93 | -0.07 | 7.82 | -0.18 | 15.60 | -0.40 |
| 12. Recreation | 3.83 | -0.17 | 7.52 | -0.48 | 14.89 | -1.11 |
| Total (per cent) (a) | 4.03 | 0.09 | 7.75 | -0.15 | 15.18 | -0.65 |
| Total (persons) (b) | 25146 | 5242 | 48386 | -7934 | 94864 | -34285 |
| Substitution effect (per cent) (c) | 3.72 | -0.24 | 7.44 | -0.48 | 14.87 | -0.98 |

(a) Calculated according to equation (8).

(b) 1981 Census data as base.

(c) Calculated by subtracting the industry-composition effects (0.31 per cent for teenagers and 0.33 per cent for adults) from the total percentage effect.

and on adult employment (cf. equation (8)). The industry-composition effect increases teenage employment by 0.31 per cent and adult employment by 0.33 per cent. That is, because the main employers of teenagers are in the non-traded sectors which do not benefit much from cost reductions, the industry-composition effect of the teenage-wage subsidy is more favourable to adult employment than to teenage employment. Taking 1981 Census data as a base, the increase in aggregate employment generated by the industry-composition effect of the wage subsidy is 20325 persons of which 1907 are teenagers and 18418 are adults. According to our data the average wage rate of teenagers is about 56.7 per cent of the average adult wage rate. Thus in the neoclassical equilibrium assumed by the model, the marginal product of an average hour of teenage labour is 56.7 per cent of the marginal product of an average adult hour. In terms of effective adult labour units, the increase in employment stimulated via the industry-composition effect of the subsidy is 19500 persons.[1]

Table IV.3 gives projections of the percentage changes in the employment of teenagers and adults following the 8 per cent teenage-wage subsidy under three alternative assumptions about the elasticity of substitution between teenagers and adults (viz., $\sigma_{TA} = 0.5$, $\sigma_{TA} = 1.0$ and $\sigma_{TA} = 2.0$). The industry-specific projections are calculated via equation (3) and the aggregate percentage changes via equation (8). Again we have taken 1981 census data as a base to calculate the changes in persons employed.

1. That is 1907(0.567) + 18418 = 19500.



TABLE III.1 : AVERAGE WEEKLY ORDINARY TIME EARNINGS OF JUNIOR AND ADULT MALES, IN MINOR OCCUPATION GROUPS, MAY 1981

| | Occupation group [a] | Earnings ($)[b] | |
|---|---|---|---|
| | | Aged 21 years and over[c] | Aged under 21[d] |
| 1. | Architects, engineers, surveyors | 367.1 | *173.9* |
| 2. | *Chemists, physicists* | *330.9* | *173.9* |
| 3. | *Biologists, vets* | *330.9* | *173.9* |
| 4. | *Medical practitioners, dentists* | *330.9* | *173.9* |
| 5. | Nurses, incl. probationers, trainees | 268.3[e] | 184.5[e] |
| 6. | *Professional medical workers* | *330.9* | *173.9* |
| 7. | Teachers | 357.5 | *173.9* |
| 8. | *Clergy, religious orders* | *330.9* | *173.9* |
| 9. | *Law professionals* | *330.9* | *173.9* |
| 10. | Artists, entertainers, writers | 337.3 | *173.9* |
| 11. | Draftsmen and technicians | 306.3 | *173.9* |
| 12. | Other professional, technical, etc. | 322.0 | *173.9* |
| 13. | Administrative & executive government | 313.4 | *182.0* |
| 14. | *Employers, managers, n.e.c.* | *313.6* | *182.2* |
| 15. | Book-keepers, cashiers | 273.2 | *157.6* |
| 16. | Stenographers, typists | 224.7[e] | *157.6* |
| 17. | Other clerical | 277.9 | 156.6 |
| 18. | Insurance, real estate, etc. | 331.6 | *141.5* |
| 19. | Commercial travellers, etc. | 279.7 | *141.5* |
| 20. | Retail and wholesale salesmen, etc. | 248.4 | 138.5 |
| 21. | *Farmers, farm managers* | *219.8* | *127.7* |
| 22. | Farm workers incl. foremen | 214.8 | *124.8* |
| 23. | *Wool classers* | *219.8* | *127.7* |
| 24. | *Hunters, trappers* | *219.8* | *127.7* |
| 25. | *Fishermen, related workers* | *219.8* | *127.7* |
| 26. | *Timbergetters* | *219.8* | *127.7* |
| 27. | Miners, mineral prospectors | 398.2 | *231.3* |
| 28. | *Well drillers, oil, water* | *380.4* | *220.9* |
| 29. | *Mineral treaters* | *380.4* | *220.9* |
| 30. | *Deck, engineer officers* | *259.5* | *183.2* |
| 31. | *Deck, engine hands* | *259.5* | *183.2* |
| 32. | *Air pilots, navigators* | *259.5* | *183.2* |
| 33. | Drivers & firemen rail transport | 292.9 | *183.2* |
| 34. | Drivers, road transport | 238.6 | *183.2* |
| 35. | *Guard, conductors - rail* | *259.5* | *183.2* |
| 36. | Inspectors, supervisors, traffic con. | 288.9 | *183.2* |
| 37. | *Telephone operators* | *259.5* | *183.2* |
| 38. | Postmasters, postmen, messengers | 255.6 | *183.2* |
| 39. | *Other transport & commercial, n.e.c.* | *259.5* | *183.2* |
| 40. | Spinners, weavers, etc. | 229.0 | *158.0* |

contd ...

Table III.1 (contd)

| Occupation group | Earnings ($) | |
|---|---|---|
| | Aged 21 years and over | Aged under 21 |
| 41. Tailors, cutters, furriers | 217.7 | *158.0* |
| 42. *Leather cutters* | *252.1* | *158.0* |
| 43. Furnacemen, rollers, etc. | 260.7 | *158.0* |
| 44. Watchmakers, jewellers, etc. | 272.2 | *158.0* |
| 45. Toolmakers, machinists, etc. | 257.9 | 153.0 |
| 46. Electricians, etc. | 280.4 | 166.1 |
| 47. Metal & electrical process workers | 231.4 | *158.0* |
| 48. Carpenters, woodworking machinists | 240.9 | 151.6 |
| 49. Painters and decorators | 247.0 | *158.0* |
| 50. Bricklayers, plasterers, etc. | 275.7 | *158.0* |
| 51. Compositors, engravers, etc. | 272.4 | *158.0* |
| 52. Potters, kilnmen, glass & clay, etc. | 261.0 | *158.0* |
| 53. Millers, bakers, butchers, brewers | 239.4 | 176.7 |
| 54. Chemical, sugar & paper workers | 283.0 | *158.0* |
| 55. *Tobacco preparers* | *252.1* | *158.0* |
| 56. Paper, rubber, plastic products | 233.8 | *158.0* |
| 57. Packers, wrappers, labellers | 222.9 | *158.0* |
| 58. Stationary engine, etc. operators | 262.9 | *158.0* |
| 59. Storemen & freight handlers | 232.9 | 154.5 |
| 60. Labourers, n.e.c. | 223.4 | 162.0 |
| 61. *Apprentices* | *268.5*(f) | *159.6*(f) |
| 62. Firemen, police, etc. | 334.1 | *190.2* |
| 63. Housekeepers, cooks, maids, etc. | 266.4 | *190.2* |
| 64. Waiters, bartenders | 221.8 | *190.2* |
| 65. Caretakers, cleaners buildings | 214.2 | *190.2* |
| 66. *Barbers, hairdressers* | *277.6* | *190.2* |
| 67. *Launderers, dressers* | *277.6* | *190.2* |
| 68. *Athletes, sportsmen* | *277.6* | *190.2* |
| 69. *Photographers* | *277.6* | *190.2* |
| 70. *Undertakers* | *277.6* | *190.2* |
| 71. Service, sport and recreation, n.e.c. | 234.9 | 190.2 |
| 72. *Members armed services* | *268.5*(f) | *159.6*(f) |
| 73. *Not stated or inadequately described* | *268.5*(f) | *159.6*(f) |

Source : Earnings and Hours of Employees Distribution and Composition, Australia, May 1981, ABS, No.6306.0.

(a) These are the minor groups of occupations according to the Classification and Classified List of Occupations, Revised June 1976.

contd ...



Hence, they gain somewhat from the expansion of the traded goods sectors. Industries 6, 10, 11 and 12 produce mainly for domestic final demand. Since aggregate real domestic absorption is held fixed in the simulation, these industries gain little from the cost reduction. The Construction industry is the only industry projected to experience a fall in employment as a consequence of the teenage-wage subsidy. It suffers from a projected reallocation of the economy's fixed investment budget in favour of sectors, especially Mining, whose capital structure is of less than average construction intensity.

Comparing column (1) of Table IV.2 with column (2) of Table IV.1, it is notable that there is little correlation between the size of the cost reductions experienced by industries and the extent to which they expand their employment. In fact the industry experiencing the largest cost reduction (6, Wholesale and retail) has the fourth smallest employment expansion, and the two main gainers in terms of employment (Agriculture and Mining) both have below average cost reductions.

Columns (2) and (3) of Table IV.2 contain, respectively, the shares of total teenage and adult employment accounted for by the 12 industries. The heaviest employer of teenagers (industry 6) shows a relatively small employment gain. The industries showing the strongest growth in employment (industries 1 and 2) account for higher shares of adult employment than of teenage employment. When we form averages of the percentage changes in industries' employment levels weighted by these two sets of shares, we get the industry-composition effects of the teenage-wage subsidy on teenage employment

TABLE IV.2 : ORANI PROJECTIONS OF THE PERCENTAGE EFFECTS OF AN 8 PER CENT TEENAGE-WAGE SUBSIDY ON AGGREGATE EMPLOYMENT IN TWELVE INDUSTRY GROUPS

| | Industry | Projection ($\ell_j$) (1) | Shares in the total employment of | |
|---|---|---|---|---|
| | | | Teenagers ($\phi_j^T$) (2) | Adults ($\phi_j^A$) (3) |
| 1. | Agriculture | 1.23 | 0.046 | 0.067 |
| 2. | Mining | 1.94 | 0.010 | 0.016 |
| 3. | Manufacturing | 0.61 | 0.203 | 0.191 |
| 4. | Electricity, gas, water | 0.36 | 0.016 | 0.022 |
| 5. | Construction | -0.04 | 0.062 | 0.069 |
| 6. | Wholesale and retail | 0.14 | 0.328 | 0.173 |
| 7. | Transport and storage | 0.38 | 0.029 | 0.060 |
| 8. | Communication | 0.30 | 0.010 | 0.023 |
| 9. | Finance | 0.34 | 0.104 | 0.090 |
| 10. | Public admin. and defence | 0.02 | 0.048 | 0.062 |
| 11. | Community services | 0.05 | 0.078 | 0.171 |
| 12. | Recreation | 0.15 | 0.066 | 0.056 |
| | | | 1.0 | 1.0 |



Table III.1 Notes (contd)

(b) Ordinary time earnings are that part of weekly earnings which comprises payment by measured result, award or agreed base rate of pay and other earnings excluding overtime.

(c) These are the rates for full-time, non-managerial employees aged 21 years or more. Unless otherwise specified, the rates are for males.

(d) These are the rates for full-time, non-managerial employees aged under 21 years even if they are paid at adult rates. Unless otherwise specified the rates are for males.

(e) These are female rates.

(f) These are the average rates for all occupations as shown in ABS 6306.0.

the earnings data include some juniors who are paid at adult rates. The occupations where data were readily available are those shown in Table III.1 in ordinary type. Examples of these occupations where published data were used for both groups are 5, 17, 20, 45, 46, 48, 53, 59, 60 and 71.

A major difficulty in calculating industry wage bills is the missing data in 30 of the occupations for adults and 63 for junior employees. Generally, the missing data for juniors were in occupations where junior employment is a small proportion of the total, (e.g., Architects, Draftsmen). The assignment of occupational wage rates was done in a number of stages. To provide a wage rate for the missing elements of the 73 part classification, the first step was to assign to both adults and juniors the average rate for the major class of occupations to which the minor occupation belongs. For example, in the case of adult males, average earnings for the major group Professional, technical and related workers of $330.90 was assigned to minor occupations 2-4, 6, 8 and 9. In the case of juniors, this major group's junior rate of $173.90 was assigned to minor occupations 1-4 and 6-12. Other major classes were similarly assigned where a rate was available. These rates are easily picked out in the table where they appear as a string of similar amounts. The first procedure allowed an earnings figure for adults to be assigned to all occupations except the armed forces occupation (72). There, for both adults and juniors, the published average rate given for 'All occupations' was assigned. For the remaining eleven occupations for juniors (occupations 13, 14, and 21-29) the junior figure was derived by applying the 'All



The cost changes listed in column (2) of Table IV.1 were used as the exogenous shocks in a short-run ORANI simulation. IMPACT's standard set of neoclassical short-run assumptions were imposed in conducting the simulation (see DPSV, 1982, sections 23 and 44). The most important assumptions are that industries' capital stocks are held fixed, the level of real domestic absorption (consumption plus investment plus government spending) is insulated from the effects of the subsidy and money wage rates are fully indexed to the consumer price index. Thus, from the employer's point of view the shocks do not alter adult real wage rates, and the real wage rates of teenagers are held fixed at their post-shock levels, i.e., at levels 8 per cent lower than those ruling in the pre-shock situation.

Column (1) of Table IV.2 contains the model's projections of the effects of the cost shocks on the aggregate employment levels of the twelve industry groups. The main gainers are Agriculture (industry 1) and Mining (industry 2) which are both heavily export-oriented. In ORANI, export industries are assumed to face quite elastic foreign demand curves. Hence, the exporters are able to take advantage of reductions in their costs by expanding output without being faced with significant declines in their selling prices. The Manufacturing sector (industry 3) also benefits from the cost reductions because they are able to compete more effectively with imports. The remaining sectors are not so closely linked to international trade. Industries 4, 7, 8 and 9 produce goods and services of which large proportions are used as intermediate inputs.

TABLE IV.1 : EFFECTS OF AN 8 PER CENT TEENAGE WAGE SUBSIDY ON THE COSTS OF 12 INDUSTRY GROUPS

| Industry | Percentage change in | | Shares of | |
|---|---|---|---|---|
| | Total wage cost ($w_j$) (1) | Total cost ($c_j$) (2) | Teenagers in total wage bill ($\psi_j^T$) (3) | Wages in total costs ($S_{Lj}$) (4) |
| 1. Agriculture | -0.329 | -0.124 | 0.041 | 0.3766 |
| 2. Mining | -0.277 | -0.060 | 0.035 | 0.2173 |
| 3. Manufacturing | -0.517 | -0.130 | 0.065 | 0.2512 |
| 4. Electricity, gas, water | -0.343 | -0.102 | 0.043 | 0.2981 |
| 5. Construction | -0.430 | -0.140 | 0.054 | 0.3257 |
| 6. Wholesale & retail | -0.816 | -0.321 | 0.102 | 0.3939 |
| 7. Transport & storage | -0.251 | -0.099 | 0.031 | 0.3948 |
| 8. Communication | -0.232 | -0.134 | 0.029 | 0.5773 |
| 9. Finance | -0.505 | -0.116 | 0.063 | 0.2297 |
| 10. Public admin. & defence | -0.362 | -0.255 | 0.045 | 0.7037 |
| 11. Community services | -0.221 | -0.171 | 0.028 | 0.7744 |
| 12. Recreation | -0.627 | -0.092 | 0.078 | 0.1461 |





occupations' junior to adult earnings ratio, to the adult rate. All of the estimated earnings data are shown in Table III.1 in italic type.

These procedures gave a vector of 73 occupational wage rates for juniors and adults. Although they are not ideal measures, the two sets of earnings data give a usable set of occupational wage relativities. From the point of view of this study, imprecision at this level is probably of a second-order of importance. In the first place, the missing junior rates from the published source apply to a minority of junior employees. Second, it will become clear in section IV that the extent of error in the estimate of junior to adult minor occupational wage relativities would have to be very substantial and industrially-specific to offset the macroeconomic effects on the changes in employment by industry and age. The industry wage bills in the base period were computed as the sum of the product (for each age group) of (i) the occupational wage rate and (ii) the level of employment in the occupation. The industry totals were found by summation over the 73 occupations. The subsidy s in equation (1) was the figure of 8 per cent suggested by the BLMR (1983) research.

The implementation of equation (1) gave percentage changes in labour costs for each industry due to the subsidy. To calculate the consequent change in total cost ($c_j$ in equation (2)) we require data on the importance of wage costs in industries' total costs. These data were taken from the 1974/5 ORANI data base for 113 industries and mapped to the 12 industries shown in the tables in

section IV.[1] Finally, the shares of teenagers in employment in our 12 industries ($\phi_j^k$ in equations (6) and (8)) were computed using the 1981 census employment data.

1. These data files are accessible on the CSIRONET system. Assistance in obtaining the files is available from the authors.



## IV. RESULTS

Table IV.1 describes the effects of an eight per cent teenage-wage subsidy on the costs of the twelve industry groups for which employment data were mobilized. Column (1) of the table contains the percentage changes in industries' wage costs (i.e., the $w_j$ from equation (1)). Differences in these depend just on differences in the shares of industries' wage bills which are accounted for by teenagers ($\psi_j^T$ in equation (1)). The shares are given in column (3) of the table. The wage-bill changes vary from -0.816 per cent for Wholesale and retail trade which has the highest share (0.102) of teenagers in its wage bill to -0.221 per cent for Community services where the teenage wage share is only 0.028. To convert the wage-cost changes into the total-cost changes (i.e., the $c_j$ from equation (2)) given in column (2) of Table IV.1, we multiply the former by the shares ($S_{Lj}$) of wages in the industries' total costs (see column (4) of the table).

The most notable feature of Table IV.1 is that the total cost shocks (column (2)) are all quite small. The largest, which is for Wholesale and retail trade, is only 0.321 of one per cent. Since teenagers account for only a small share of total wages, on average only 5.82 per cent, the effect on industries' costs of even a large teenage-wage subsidy is only small. It will follow therefore that the effects of the subsidy on industries' activity levels will also be small.