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AN APPLICATION OF THE LAZEAR AND MOORE MODEL**

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DEPARTMENT OF ECONOMICS

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ABSTRACT

Lazear and Moore (1984) suggested that incentive effects are minor for the self-employed and that their age-earnings profiles should therefore reflect mainly on-the-job training effects. In contrast, for wage and salary workers, upward sloping age-earnings profiles can also generate effort incentives and raise the present value of lifetime earnings. Therefore, the present value of lifetime earnings should rise more rapidly with the slope of the age-earnings profile for wage/salary earners than for the self-employed. In this paper data from the 1991 Australian Census of Population and Housing are used to test whether the incentive effects identified by Lazear and Moore are prevalent in the Australian labour market.

INCENTIVE EFFECTS IN THE AUSTRALIAN LABOUR MARKET: AN APPLICATION OF THE LAZEAR AND MOORE MODEL

I. Introduction

Economists' interest in analysing wage schemes that discourage shirking and promote higher productivity has intensified in recent years. The class of models referred to as efficiency wage theories represents one area where the links between wages and productivity/effort have been explored. Efficiency wage theories suggest that, within limit, the greater the wage paid the greater the effort expended by the worker. As such they offer an attractive menu to the manager. Moreover, efficiency wage theories have a number of implications that have led to their widespread appeal among economists, including wage stickiness and involuntary unemployment [see, for example, Solow (1979)]. However, effort is unobserved in many workplaces and certainly it is not recorded in the data sets that are available for analysis in Australia. Consequently, the practical relevance of the notion of an efficiency wage has been difficult to establish. Most research in this area has been based on indirect tests, with the most popular approach in this regard being the study of inter-industry wage differentials advanced by Krueger and Summers (1987, 1988). They suggest that empirical regularities in the inter-industry wage structure across various occupations and skill groups can provide insight into the nature and extent of efficiency wage setting. The basis of this approach is that these wage differentials may reflect differences in technological conditions such as monitoring or screening costs that entail the payment of wage premia. Application of this approach to Australian data by Borland and Suen (1990) led them to conclude that there was little evidence that efficiency wages were an important feature of the Australian labour market.

Another area where incentive effects are important is the seniority wage

models of Lazear (1979, 1981) and Lazear and Moore (1984). In these models, the emphasis is on the ways that the lifetime compensation package may be designed to generate incentives that promote higher levels of productivity. In particular, Lazear and Moore argue that variations in the steepness of the age-earnings profile may be used to generate incentive effects, and illustrate this by contrasting the compensation schemes of wage and salary workers and the self-employed. They suggest that incentive schemes are unnecessary for the self-employed owing to the absence of agency problems, and hence their profiles should reflect mainly on-the-job training effects. In contrast, in addition to reflecting on-the-job training effects, upward sloping profiles for wage/salary workers can be used to reduce the incentive to shirk, thereby raising productivity and increasing the present value of lifetime earnings. While the present value of lifetime earnings may be increased, it need not exceed its market clearing level. Consequently, the incentives normally associated with efficiency wages may be secured without the involuntary unemployment that characterises efficiency wage models.

The purpose of this paper is to examine whether incentive effects are prevalent in the Australian labour market using the model of Lazear and Moore. The basis for this test is Lazear and Moore's (1984) prediction that the present value of lifetime earnings should increase with the slope of the age-earnings profiles more for wage and salary earners than for the self employed. The plan of the paper is as follows. In Section II a brief outline of Lazear and Moore's approach is provided. Following this the data are described in Section III. Regression results are presented in Section IV while Section V applies the results of the regression analysis using the methodology outlined in Section II. Section VI compares the major findings of our study for Australia with those reported for the US by Lazear and

Moore (1984). It is shown that the age-earnings profiles for wage-salaried workers in Australia are steeper than those for the self-employed, and that the present value of lifetime earnings rises more with the slope of the experience-earnings profile for wage and salary workers than for the self employed. These findings are consistent with the model of Lazear and Moore (1984), although it is to be noted that the incentive effects associated with this phenomenon appear to be less important in Australia than in the U.S.. Finally, this paper is concluded in Section VII by an explanation for the smaller incentive effects identified in the Australian labour market.

II. The Lazear and Moore Model

The starting point for the Lazear and Moore model is the empirical wage-experience profile. The general form of the relationship to be estimated is:

$$\ln \text{WAGE} = \alpha_0 + \alpha_1(\text{SCHOOL}) + \alpha_2(\text{XP}) + \epsilon, \quad (1)$$

where WAGE is the hourly wage rate which is used in natural log form, SCHOOL is the highest grade of schooling completed, XP denotes experience which is defined as AGE - SCHOOL - 5, $\alpha_0, \alpha_1, \alpha_2$ are coefficients to be estimated and ϵ is a random error term. The estimated coefficients are denoted by $\hat{\alpha}_i, i = 0 \text{ to } 2$.

Given estimates of the relationship specified in equation (1), lifetime wealth (P) in an occupation i may be computed. This is defined as the present value of the average annual wage earnings for a typical individual who enters the occupation at age 20 and works continuously in the same occupation until 65 years of age. 2000 hours are used in the computations to scale up the wage figures to more familiar annual income data. Hence,

$$P_i = 2000 \sum_{t=0}^{45} \{ \exp[\hat{\alpha}_0 + \hat{\alpha}_1 \overline{\text{SCHOOL}}_i + \hat{\alpha}_2 t] / (1+\gamma)^t \}. \quad (2)$$

where γ is the discount rate imposed.

The natural log of the slope of the wage profile may be derived from (1): $\ln S \equiv \ln (\text{WAGE}_t / \text{WAGE}_{t-1}) = \alpha_2$. For each occupation the experience coefficient $\hat{\alpha}_{2i}$ in the wage regression may therefore be used to represent a transformed measure of the slope.

Lazear and Moore plotted the present value (P_i) against the slope coefficients computed in this manner for 13 occupation groups formed from a sample drawn from the March 1978 US Current Population Survey.¹ They found that the figures resemble the shapes conjectured in Section I. They also summarised this information by fitting separate regression lines through the present value-slope combinations for the self-employed and wage/salaried workers. It was reported that the coefficient on the slope variable was significantly different from zero for wage/salary workers, while it was statistically insignificant for self-employed workers. This contrast in coefficients also confirms that the present value of lifetime earnings rises more with the slope of the age-earnings² profile for wage/salary workers than for the self-employed.

These results are consistent with Lazear and Moore's hypothesis concerning the links between incentives and the slope of the earning profiles for

wage/salary workers. This suggests that employers may be able to induce their employees to work harder by increasing the slope of the age-earnings profile. Steeper profiles also imply a larger increment to lifetime wealth for wage/salary workers than for the self-employed. This increment can be estimated by comparing the outcomes for the self-employed and wage/salary workers, and Lazear and Moore report that most of the slope in the age-earnings profile reflects incentive-based wealth rather than human capital accumulation through on-the-job training.

III. The Data

This study uses data from the 1991 Australian Census Household Sample File. This is a one percent sample of households in occupied private dwellings, with all associated persons being counted within each selected dwelling, and a one percent sample of persons in nonprivate dwellings.

The sample selected for analysis is restricted to 20-64 years old males who were employed in the private-sector and who worked for at least 35 hours per week. Only individuals who reported valid information for their years of schooling, qualifications, occupations and incomes are included in the study. The study also excludes those who were still in school or at educational institutes at the time of the Census. A total of 18,551 individuals are included in the sample. A general description of the variables employed in the empirical work is given in Appendix A.

For the total sample of 18,551 observations, the average annual income is \$31,183 and the average hourly income is \$13.40. When the total sample is split into two major groups according to employment status (*i.e.*, wage/salary and the self-employed), it is found that the wage/salary group (71.6 per cent of the total sample) tend to earn higher average annual

¹ Included in the sample were 20-65 years old, male non-government workers who reported positive income and worked for at least 35 hours per week for at least 30 weeks during 1977.

² We use age and experience interchangeably in this discussion. Given the specification of the basic model and the definitions of variables, the same results will be derived regardless of whether age or experience is used.

income (\$31.651) than their self-employed counterparts (\$30,005). They also have higher hourly earnings (\$13.95 compared to \$12.01), with the widening of the pay differential between the two groups as we move from annual to hourly incomes reflecting the greater number of hours worked among the self-employed. The average schooling, experience and marital status of the wage/salary group tend to be less than those of the self-employed, though the difference in schooling levels of the two groups is minimal. Tables 1 and 2 set out some basic descriptive statistics for the total samples of wage/salary earners and the self-employed, and for each of these employment groups within each of the eight occupations under consideration.

From Table 1 the average hourly incomes of each of the first four occupations (managers, administrators and all professionals) are higher, and that of each of the final four occupations lower, than the average of all wage/salary earners. The pay differential between the occupational groups at the top and bottom of the occupational hierarchy is quite large. For example, business professionals (group 2) tend to have an average hourly income of just over \$20 which is 44 percent higher than the average of all wage/salary earners. By comparison, transport workers/drivers (group 7) tend to have an average hourly income of just \$11.55 which is 17 percent lower than the average of all wage/salary earners and 43 per cent lower than that of business professionals.

Table 1: Descriptive Statistics for Wage/Salaried Earners

	Hourly Income	Mean log Income	Average Schooling	Average XP	MST Ratio	Sample Size
Total Sample	13.95	2.528	11.623	20.281	.622	13276
1 Managers/Administrators	18.79	2.785	12.570	22.074	.752	1988
2 Business Professionals	20.10	2.917	14.717	15.233	.618	490
3 Other Professionals	18.54	2.808	15.364	16.993	.680	744
4 Para-professionals	15.73	2.672	12.171	20.310	.689	588
5 Clerks	13.73	2.556	11.604	20.656	.599	806
6 Sales/Personal Service	13.32	2.498	11.650	19.964	.619	1469
7 Transport Workers	11.55	2.378	10.480	22.522	.634	789
8 All Other Occupations	11.74	2.395	10.744	20.239	.570	6402

The average years of education categorised by occupation reveal a pattern similar to that described for the mean hourly income. Thus, the first four occupations have more, and the final two occupations tend to have fewer, years of education: than the average for all wage/salary earners (groups 5 and 6 are near the average of 11.6 years). The highest educated group is the other professionals (group 3) who have over 15 years of education while the group with the least education is transport workers/drivers (group 7) who have just under 10.5 years of education.

In contrast to the clear ranking of occupations in terms of income and education, there does not appear to be any distinct patterns in the ranking by experience (XP) and marital status (MSP). The transport workers/drivers group (occupational group 7) has, on average, more than 22.5 years of experience followed by just over 22 years of experience among managers/administrators (group 1). Business professionals (group 2) have the lowest mean level of experience with just over 15 years, while the group of other professionals (group 3) has a similar ranking in this regard with just under 17 years of experience. Managers/administrators (group 1) have the highest ratio of marital status while tradespersons/labourers (group 8) have the lowest ratio of marital status (over two-thirds and just 57 per cent respectively).

Turning now to the information for the self-employed presented in Table 2, it is found that the business and other professionals (groups 2 and 3) tend to have relatively high average hourly income (\$22-\$23 compared to the mean for all self-employed of \$12). They also have a relatively high mean educational attainment (15 years of education compared to the sample average of 11.7 years). By comparison, tradespersons/labourers (group 8) tend to have relatively low average hourly income (\$10) and average years of

education (10.75). The mean income for managers is quite low, and this most likely derives from the inclusion in the sample of farmers.

Table 2: Descriptive Statistics for the Self-Employed

	Hourly Income	Mean log Income	Average Schooling	Average XP	MST Ratio	Sample Size
Total Sample	12.01	2.148	11.655	25.335	.792	5275
1 Managers/Administrators	10.06	1.888	11.344	27.056	.830	1922
2 Business Professionals	22.39	2.848	14.907	21.297	.785	172
3 Other Professionals	23.16	2.871	15.760	22.360	.857	467
4 Para-professionals	13.96	2.414	11.613	24.796	.731	93
5 Clerks	12.10	2.239	11.634	25.470	.806	67
6 Sales/Personal Service	10.86	2.088	11.479	26.735	.775	573
7 Transport Workers	12.37	2.309	10.798	24.748	.735	302
8 All Other Occupations	10.31	2.145	10.752	24.258	.751	1679

As was the case with the sample of wage and salary earners, the mean levels of experience and marital status exhibit considerable variation and do not appear to be characterised by any obvious pattern. Managers/administrators (group 1) and salespersons/personal services (group 6) have the highest mean level of experience (around 27 years), while business professionals (group 2) have the lowest level of experience (over 21 years). Other professionals (group 3) have the highest marital status ratio, over 85 per cent being married, followed by managers/administrators (group 1) where 83 per cent are married. Para-professionals (group 4) have the lowest marital status ratio, with just 73 per cent being married.

There are four features to be found from comparing Tables 1 and 2. First, the average hourly income of wage/salary earners is higher than that of their self-employed counterparts for occupations other than professionals (business and others) and transport workers/drivers (groups 2, 3 and 7). Second, a comparison of the average schooling figures reveals no obvious tendency except that self-employed business and other professionals may have slightly higher years of education than their wage/salary counterparts. Third, the self-employed tend to have more years of experience than their

wage/salary counterparts for all occupations. Fourth, the self-employed are far more likely to be married than wage/salary earners for all occupations.

IV. Empirical Results

Before proceeding to the detailed within-occupation analysis of wages that is the basis of the Lazear and Moore model, wage equations are estimated at an aggregate level. This provides a means of comparison with previous studies of wages in Australia (e.g., Chiswick and Miller (1985)). Thus the natural log of the hourly wage is regressed against two continuous, explanatory variables (years of schooling and experience) and two binary variables (marital status and employment status (SE)). A quadratic in experience is used here to enhance the comparison, although in the remainder of the paper we follow Lazear and Moore and use a linear experience variable. For the overall sample of 18,551 observations, the following estimated wage equation is derived (where the figures in parentheses are standard errors³):

$$\ln W = 1.199 + .079 \text{ SCHOOL} + .033 \text{ XP} - .00055 \text{ XPSQ} + .072 \text{ MST} - .447 \text{ SE} \quad (3)$$

(.0315) (.0021) (.0016) (.00003) (.0099) (.013)

$$R^2 = .173, \text{ SEE} = .593, \text{ sample size} = 18551$$

These results reveal that the hourly wage increases about 7.9 per cent with each extra year of schooling, and by about 1.7 per cent with each extra year of experience (evaluated at 15 years of experience).⁴ These results are

³ All standard errors in this paper have been computed using White's (1980) heteroscedasticity-consistent covariance matrix estimator.

⁴ Lazear and Moore note that their conclusions were not sensitive to the form of the wage equation. In the current study, omission of the marital status variable from the wage equation yields results similar to equation (3):

$$\ln W = 1.180 + .081 \text{ SCHOOL} + .036 \text{ XP} - .00060 \text{ XPSQ} - .442 \text{ SE}$$

(.0313) (.0021) (.0015) (.00003) (.013)

$$R^2 = .170, \text{ SEE} = .594, \text{ sample size} = 18551$$

quite similar to those reported by Chiswick and Miller (1985), based on an analysis of the Household Sample File from the 1981 Australian Census of Population and Housing.

According to the equation (3) results, married males receive about 7 per cent more income than the non-married,⁵ and the hourly incomes of the self-employed tend to be around 56 per cent lower than those of their wage/salary counterparts.⁶ Chiswick and Miller (1985) did not include a variable for self-employment status in their estimating equation, so a comparison with their study is not possible in this respect. However, the study by the Bureau of Labour Market Research (1986) contains an analysis of the relative pay of the self-employed and wage/salaried groups. In this study it was reported that the pay of the self-employed is 25 per cent lower than that of wage/salary earners. The different impacts reported by the Bureau of Labour Market Research (BLMR) and in the present study undoubtedly reflect the difference in specification of the dependent (earnings) variable. The hourly income used in this section is weekly income adjusted by working hours, whereas the BLMR used the weekly income of individuals working 35 or more hours. Since the working hours of the self-employed tend to be greater than those of wage/salary earners, the hourly income of the self-employed relative to wage/salary earners will be reduced proportionately more than the weekly income of the self-employed. A similar pattern is evident in the

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⁵ This effect of being married on income is considerably less than that reported for the 1981 Australian Census of Population and Housing by Chiswick and Miller (1985), but it is in line with more recent research by Miller (1994).

⁶ The coefficient of a dummy variable in a semi-logarithmic wage equation can be converted to a percentage effect using the formula:

impact = $[\exp(\hat{\alpha}) - 1] \times 100$, where $\hat{\alpha}$ is the estimated coefficient.

descriptive statistics cited in the introduction to this section where the mean annual incomes of wage/salary earners and the self-employed are similar, while the mean hourly earnings differ by around 15 per cent.

This preliminary analysis shows that study of the 1991 Census data yields results that are consistent with those reported in previous studies. The data therefore provide an adequate basis for application of the Lazear and Moore model.⁷

We turn now to the wage equations estimated separately for each of eight occupations for both wage/salary earners and the self-employed. Relevant results are presented in Table 3. It is found that years of schooling tend to be associated with significant, positive effects on earnings for almost all occupations for both wage/salary earners and the self-employed. The exceptional cases here are a zero coefficient for self-employed transport workers/drivers (group 7), and negative but insignificant coefficients for transport workers/drivers (group 7) employed on a wage/salary basis and self-employed tradespersons/labourers (group 8).

Years of labour market experience are associated with increments in earnings for all wage/salaried occupations, and the coefficients estimated are mostly significant (except occupation 7). However, the impacts of experience on earnings within each self-employed occupation are all statistically insignificant. In addition, the point estimates vary considerably. For example, the effect of experience is positive for the first four occupations but negative for the last four occupations. In other words, years of labour

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⁷ In applying this model we follow Lazear and Moore and focus on a specification of the earnings equation that has a linear experience term. Wage equations that included a quadratic in experience were also estimated separately for each of eight occupations for both wage/salary earners and the self-employed. The results are presented in Appendix B.

market experience do not really matter when it comes to determining relative earnings among the self-employed.⁸

Table 3: Coefficients in the Estimated Wage Equations

Groups	Size	Intercept	Schooling	XP	MST	SEE	R ²
All W/S S/E	13276	1.447 (.0254)	.073 (.0019)	.0072 (.0004)	.143 (.0080)	.423	.167
	5275	0.997 (.0781)	.094 (.0053)	.0017 (.0013)	.008 (.0313)	.892	.063
W/S Managers/Admin. S/E	1988	1.177 (.0698)	.098 (.0046)	.0120 (.0014)	.141 (.0272)	.505	.214
	1922	1.053 (.1710)	.068 (.0117)	.0036 (.0023)	-.037 (.065)	1.03	.016
W/S Business Profess. S/E	490	1.963 (.1493)	.050 (.0088)	.0107 (.0024)	.097 (.0352)	.387	.115
	172	1.592 (.6137)	.078 (.0308)	.0015 (.0103)	.086 (.2137)	.843	.058
W/S Other Profess. S/E	744	1.732 (.1342)	.058 (.0079)	.0049 (.0020)	.155 (.0376)	.469	.111
	467	0.370 (.2861)	.126 (.0143)	.0068 (.0039)	.431 (.1470)	.781	.178
W/S Para-Profess. S/E	588	1.889 (.1254)	.039 (.0084)	.0097 (.0018)	.167 (.0370)	.396	.114
	93	0.446 (.5189)	.143 (.0384)	.0098 (.0083)	.098 (.2229)	.745	.094
W/S Clerks S/E	806	1.664 (.1057)	.058 (.0082)	.0070 (.0010)	.126 (.0245)	.316	.152
	67	0.789 (.5045)	.131 (.0368)	-.0006 (.008)	-.07 (.1655)	.786	.192
W/S Sales/Per. Serv. S/E	1469	1.505 (.0995)	.063 (.0078)	.0092 (.0011)	.113 (.0240)	.404	.122
	573	1.647 (.2769)	.046 (.0190)	-.0011 (.004)	-.069 (.087)	.856	.017
W/S Transport S/E	789	2.485 (.1303)	-.016 (.011)	.0008 (.0012)	.061 (.0276)	.363	.015
	302	2.081 (.2853)	.008 (.0229)	-.0023 (.003)	.271 (.0854)	.640	.031
W/S All Other S/E	6402	2.118 (.0400)	.014 (.0033)	.0026 (.0005)	.126 (.0103)	.380	.041
	1679	2.439 (.1508)	-.02 (.0122)	-.0015 (.002)	-.055 (.041)	.691	.003

Note: Standard errors in parentheses; wage/salaried W/S; self-employed S/E.

⁸ It is noted that the estimated equations for the self-employed group are poorly determined. Lazear and Moore report a similar result. The human capital/incentive approach to wage determination is less successful where luck and business acumen obviously play a far greater role than measurable human capital skills.

The effect of marital status is positive for all eight occupations in the wage/salary group, and all of these impacts other than that for transport workers/drivers (occupation 7) are significant. The coefficients of marital status for the self-employed vary considerably, with the impacts being insignificant in all but other professionals and transport workers/drivers (occupations 3 and 7) where it has a positive effect.

V. Application

Following the approach of Lazear and Moore, it is the relationship between the present value of lifetime earnings and the slope of the earnings profiles that needs to be quantified to provide information on the incentive effect. Hence, for each of the wage/salaried and self-employed occupational groups, the net present values of lifetime earnings are calculated from the estimated average annual earnings (estimated hourly wage $\times$ 2000 hours) for three discount rates (zero per cent, five per cent and ten per cent) and the slopes of earnings profiles are computed by a suitable transformation of the estimated experience coefficients in the wage-experience regressions, based on the method outlined in Section II. The results of these two calculations are shown in Table 4.

Table 4: Net Present Values of Lifetime Earnings (in Thousands of Dollars) and Slopes of Experience-Earnings Profiles for Each Group

Wage/salaried						Self- employed				
Slope	$\gamma = 0$	$\gamma =.05$	$\gamma =.1$	SEE	G	Slope	$\gamma = 0$	$\gamma =.05$	$\gamma =.1$	SEE
1.0121	1517.78	561.67	304.30	.5047	1	1.0036	598.17	237.11	134.61	1.032
1.0107	1856.81	694.93	379.47	.3875	2	1.0015	1590.61	641.64	368.46	.8434
1.0049	1570.49	616.15	347.41	.4689	3	1.0068	1632.87	630.83	352.02	.7808
1.0098	1370.72	517.04	283.86	.3959	4	1.0098	1014.43	382.53	209.98	.7448
1.0070	1206.24	465.39	259.47	.3161	5	0.9994	864.56	354.62	205.85	.7857
1.0093	1153.21	436.79	240.48	.4038	6	0.9989	746.23	307.28	178.81	.8561
1.0008	992.04	402.41	231.91	.3626	7	0.9977	931.36	387.18	226.68	.6399
1.0026	1015.01	405.88	231.75	.3798	8	0.9985	788.29	325.58	189.83	.6905

Note: Discount rate γ ; standard error of estimates SEE; occupational groups G.

An indication of the general nature of the relationship between the lifetime earnings and the slope of the profiles among wage/salary earners and the self-employed can be obtained by plotting the net present value against the slope of the experience-earnings profiles. The case for $\gamma = 5$ per cent is shown in Figure 1. From this information it is apparent that there is a slight, positive relationship between the lifetime earnings and the slope of experience-earnings profiles for wage/salary earners, but there seems no obvious relationship as such for the self-employed.

The above conjecture derived from visual inspection of the plots can be verified by using regression analysis to summarise the data. Here, lifetime earnings are regressed on the slope among salary earners and the self-employed separately. To account for the differing precision with which each within-occupation wage equation has been estimated in the first stage of the Lazear-Moore model, these second-stage regressions are weighted by the standard errors of the first-stage regressions. The results in Table 5 show that the coefficient of the slope for the wage/salary group is significantly different from zero, while that for the self-employed is insignificant. Even if we consider a one-side test appropriate (i.e., test of H_0 : slope = 0 against H_1 : slope > 0) given the priors provided by the theory, the result would still be a failure to reject the null hypothesis that there was no relationship between the present value and the slope of the age-earnings profiles for the self-employed. Thus, this summary analysis also confirms that lifetime earnings rise more with the slope of the experience-earnings profile for wage and salary workers than for the self-employed.

Figure 1: Regression Line for the Wage/salaried and the Self-employed

Table 5: Weighted Regressions,

Present Value (Thousands of Dollars) on Slope

Discount Rates		Intercept	Coefficient	R ²
$\gamma = 0$	W/S	-51709 (15560)	52653 (15490)	.485
	S/E	-32518 (23020)	33486 (23040)	.181
$\gamma = 5\%$	W/S	-16028 (5867)	16417 (5841)	.387
	S/E	-9684 (8960)	10077 (8968)	.113
$\gamma = 10\%$	W/S	-7455 (3224)	7682 (3209)	.312
	S/E	-4297 (5024)	4524 (5028)	.073

Note: Standard errors presented in parentheses;
wage/salaried W/S; self-employed S/E.

VI. Comparison: Australia and the United States

The data descriptions for Australia are basically in line with those for the US reported in Lazear and Moore (1984), suggesting that a direct comparison of the empirical results is possible. The only major differences between the studies that arise are that: (i) a greater number of occupational categories is used in Lazear and Moore's study than in the study of the 1991 Australian Census, specifically, 8 groups in Australia and 13 groups in the US; (ii) the specification of the earnings function differs slightly in that a dummy variable for marital status is included in the estimating equation used in analysis of the data for Australia while no such variable was included in the wage regressions estimated in the study by Lazear-Moore. However, these matters are not expected to have a major influence on the findings.⁹

The major empirical finding from the study of the Australian labour market

⁹In the simple regressions in Table 5, $(n-2)^{0.5}$ enters into the numerator of the 't' statistic. The different sample sizes for Australia ($n=8$) and the US ($n=13$) will make the Australian results appear less significant. However, the difference in the 't' values for Australia and the US is greater than expected on the basis of only this sample size consideration.

is that there is evidence that the experience-present value of earnings profile for wage/salary earners is much steeper than that for the self-employed. In this regard the general pattern of results is the same as reported for the US labour market by Lazear and Moore.

However, closer examination reveals a number of differences between the findings from the two studies. First, less of the variation in the net present values is explained by the slope variable in Australia than in the US. For example, the R^2 for a zero discount rate is only 0.48 in Australia compared with 0.76 in the US.

Second, the coefficient on the slope variable is not as precisely determined in the analysis for Australia as it was in the analysis for the US. Thus, the 't' statistic on the slope variable in the regression for the zero discount rate is 3.4 in Australia compared with 5.94 in the US. Furthermore, when the net present values are calculated using a 25 per cent discount rate, the slope coefficient in the wage regressions for wage/salaried earners is statistically insignificant in the study for Australia whereas it is still significant ('t' = 3.55) in the study for the US.

Third, the incentive effect on lifetime earnings in Australia appears to be weaker than in the US. For example, the estimated lifetime earnings for a 5 per cent discount rate without human capital/incentive effects (i.e., $S=1$ in Section II), would be \$389,000.¹⁰ The mean estimated lifetime earnings given the self-employed's human capital effect across wage/salaried occupations

¹⁰ Appendix C provides relevant details on the calculations discussed here. A number of assumptions, viewed by Lazear and Moore (1984) as strong, are required before the human capital and incentive effects can be disentangled. These are: (i) opportunities to use seniority wages as an incentive mechanism are the same across occupations; (ii) the counterfactual present value-slope relationship for wage and salary earners is that observed for the self-employed.

would be \$450,000. This is an estimate of the present value of lifetime earnings in the presence of a human capital effect only. The expected lifetime earnings across wage/salaried occupations, which contains both human capital and incentive effects, is \$488,000. Therefore, the incentive effect to which the wage increase with experience may be attributed is only 38 per cent compared with 89 per cent in Lazear and Moore's study of the US labour market.

VII. Conclusion

The statistical analyses presented in this paper suggest that the experience-earnings profiles for wage/salaried workers are steeper than those for the self-employed and that the present value of lifetime earnings increase with the slope of the age-earnings profiles more for wage and salary earners than for the self-employed. In this regard it seems that the incentive effect identified by Lazear and Moore in the US labour market is also prevalent in the Australian labour market. But the incentive effect for Australia appears weaker than that reported for the US. This finding, however, is not totally surprising. The Australia labour market has a reasonably highly centralised system of wage determination. While enterprise bargaining is currently being applied, when the data were collected for the 1991 Australian Census the overwhelming majority of wage and salary earners would have had their wages determined by the centralised wage setting machinery. Incentive schemes at the plant level might still have a role to play under such a system of wage determination, to the extent that over-award pay is important. However, over-award pay for male workers in the private sector was only about 2.7 per cent of average weekly total ordinary time earnings¹¹ suggesting a minor influence from this avenue of wage flexibility. It would be expected, therefore, that the extent to which

incentive schemes influence wage outcomes will obviously be less important than in the US where wage determination is conducted under a much more competitively oriented system. In addition, the steepening of the wage profiles under the model of Lazear and Moore (1984) requires workers to be able to accept a low wage at the beginning of their careers. To the extent that minimum award rates of pay constitute effective constraints on this behaviour, there will be less scope for incentives to be generated in the manner envisaged by Lazear and Moore (1984). In this regard, it can be held that the centralised wage fixing machinery in Australia is inefficient, lessening incentives and lowering productivity and lifetime earnings. Greater flexibility in wage setting would help ameliorate this problem.

¹¹ May 1993 *Distribution and Composition of Employee Earnings and Hours-Australia*, Australian Bureau of Statistics, No. 6306.0, Table 11, p.38.

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Appendix A

The variables used in this study are listed below. The code of the Census variables used in the construction of each particular measure is given in parentheses prior to the description. Additional details on the primary data set can be found in Australian Bureau of Statistics (1994).

Age (AGEP): This study is restricted to individuals between 20-64 years of age. The original data are measured in single years for those aged 20-24 and in five-year intervals for those between 25-64. The information on age is used in the construction of the standard Mincer proxy for experience, namely Experience = Age - Years of Education - 5. In order to construct this variable a continuous measure of age must be derived. This is achieved by assuming the midpoint age for each group.

Industry Sector (GNGP): The sample is restricted to those who were employed in the private sector.

Occupation (OCCP): The data on occupation in the 1991 Census were coded using the Australian Standard Classification of Occupations (ASCO). This is a skill-based classification that reflects the different educational and training requirements of jobs. When data are coded using ASCO the occupations will comprise a set of jobs involving similar tasks.

The full ASCO classification involves a six-digit coding system. Information on 60 occupations at the two-digit level was included in the 1991 Census Unit Record File. This information was aggregated into the following groups.

	Occupational Groups	Census Codes
1	Managers/Administrators	1 to 7
2	Business Professionals	15
3	Other Professionals	8 to 14,16,17
4	Para-professionals	18 to 24
5	Clerks	35 to 42
6	Salespersons/Personal Service	43 to 49
7	Transport Workers/Drivers	50 to 51
8	All Other occupations	all others

The disaggregation by occupation is motivated by the need to compute a number of present value-slope combinations in order to test the central proposition of the Lazear-Moore model. There is no need for the groups from which these combinations are computed to conform to any particular specification. Accordingly, the aim here is to determine a classification that would result in a reasonable number of groups for which statistically significant wage equations could be estimated for the self-employed.

Hours Worked (HRSP): Only individuals working 35 hours or more are included in the sample. The Census data on hours worked were collected in categorical form with the categories relevant to this study being 35-39 hours, 40 hours, 41-48 hours and 49 or more hours. These data are converted to a continuous measure using values of 37.5, 40, 45 and 56 respectively.

Individual Income (INCP): The Census income variable records the gross (including pensions and allowances) weekly income from all sources. These data were collected in 14 categories. The income of each category is assumed to be the midpoint value, except for the open-ended category of over \$70,000 where a value of \$105,000 is assumed.

Years of Schooling (ALSP, QLLP): This is calculated as "Age Left School (ALSP) - 5". Individuals who did not go to school are assigned a value of zero for this variable while those who left school between ages 18 and 19 are assumed to have completed 13 years of school. In order to take into account higher education the following adjustments are made. Individuals with undergraduate or associate diplomas are assumed to have completed the equivalent of 15 years of full-time schooling, those with a bachelor degree the equivalent of 16.5 years of full-time schooling, those with a post-graduate diploma the equivalent of 17 years of full-time schooling and those with a higher degree the equivalent of 19 years of full-time schooling.

Years of Experience: This is constructed according to the Mincer algorithm, "Age-Years of Education-5". Generally, the computed measure of experience is nonnegative, but is set to be 0 for negative values. The experience proxy is referred to as XP in the discussion.

Marital Status (MSTP): Marital Status is a dummy variable created from MSTP that is set equal to 1 for those married and to 0 for all others.

Appendix B: Coefficients in the Estimated Wage Equations

(with Experience Squared)

Groups	Size	Intercept	Schooling	XP	XPSQ	MST	SEE	R ²
All	W/S 13276	1.265 (.0281)	.073 (.0019)	.031 (.0014)	-.00050 (.00003)	.103 (.0083)	.418	.190
	S/E 5275	0.752 (.0942)	.093 (.0054)	.028 (.0054)	-.00049 (.00010)	-.025 (.0318)	.890	.068
Occ1	W/S 1988	0.910 (.0796)	.097 (.0046)	.047 (.0047)	-.00071 (.0001)	.083 (.0278)	.496	.240
	S/E 1922	0.662 (.1939)	.065 (.01175)	.044 (.0100)	-.00073 (.00017)	-.101 (.0661)	1.028	.024
Occ2	W/S 490	1.747 (.1454)	.052 (.00856)	.042 (.0065)	-.00078 (.00017)	.037 (.0365)	.376	.169
	S/E 172	1.154 (.6665)	.069 (.0275)	.062 (.0390)	-.00127 (.00078)	.037 (.2157)	.835	.081
Occ3	W/S 744	1.591 (.1338)	.057 (.0078)	.030 (.0054)	-.00061 (.00013)	.121 (.0366)	.464	.133
	S/E 467	0.2686 (.3091)	.124 (.0143)	.020 (.0157)	-.00028 (.00032)	.426 (.1469)	.781	.179
Occ4	W/S 588	1.677 (.1403)	.043 (.0085)	.031 (.0060)	-.00046 (.00012)	.125 (.0373)	.392	.133
	S/E 93	0.602 (.4996)	.143 (.0388)	-.0065 (.0303)	.00031 (.00057)	.117 (.2255)	.748	.097
Occ5	W/S 806	1.476 (.1108)	.058 (.0082)	.034 (.0034)	-.00056 (.000066)	.071 (.0246)	.305	.212
	S/E 67	0.653 (.6287)	.129 (.0357)	.016 (.0343)	-.00034 (.00063)	-.088 (.1604)	.791	.195
Occ6	W/S 1469	1.318 (.1047)	.065 (.0078)	.031 (.0038)	-.00046 (.000073)	.073 (.0246)	.398	.145
	S/E 573	1.470 (.3197)	.045 (.0190)	.016 (.0139)	-.00033 (.000256)	-.089 (.0881)	.856	.0196
Occ7	W/S 789	2.443 (.1420)	-.0157 (.0108)	.0055 (.0048)	-.000094 (.000088)	.058 (.0276)	.363	.016
	S/E 302	1.944 (.3523)	.0095 (.0240)	.0099 (.0162)	-.00023 (.000296)	.254 (.0912)	.640	.033
Occ8	W/S 6402	1.962 (.0424)	.013 (.0033)	.024 (.00178)	-.00044 (.000036)	.092 (.0108)	.375	.067
	S/E 1679	2.315 (.1619)	-.0206 (.0123)	.0117 (.0079)	-.000252 (.000144)	-.072 (.0420)	.690	.0054

Note: Standard errors in parentheses; wage/salaried W/S; self-employed S/E; Occ 1 = Managers/Administrators; Occ 2 = Business Professionals; Occ 3 = Other Professionals; Occ 4 = Para-Professionals; Occ 5 = Clerks; Occ 6 = Sales/Personal Service; Occ 7 = Transport Workers; Occ 8 = All Other Occupations.

Appendix C

This Appendix provides the derivation of the estimated human capital and incentive effects for wage/salaried workers. It is based on the study by Lazear and Moore (1984).

The weighted regression of present value of lifetime earnings on the slope of the earnings profiles for wage/salaried earners under a five per cent discount rate results in the following regression equation:

$$\hat{P} = -16,028,000 + 16,417,000 S, \quad (C.1)$$

where $\hat{P}$ is the present value of earnings and S is the slope of earnings.

Based on the information provided in the text, it seems reasonable to assume that S will range in value from 1 (flat profile) to 1.0121 (the highest value in the sample). If S has a uniform distribution between these values, the estimated present value of lifetime earnings computed from equation (C.1) would have a uniform distribution between [\$389,000, \$587,000]. The mathematical expectation of the present value is therefore \$488,000 across all wage/salaried groups. When S is set equal to 1 in equation (C.1) an estimate of the present value of lifetime earnings in the absence of human capital/incentive effects of \$389,000 is computed. Comparison of this with the expected present value of \$488,000 indicates that the combined effects of human capital and incentives on the average present value of lifetime earnings for wage/salaried groups would be an increase of \$99,000.

The decomposition of the combined effects into components due to human capital and incentives is based on the assumption that the human capital/nonincentive effect is the same for both wage/salaried and self-employed groups. Thus, the increase in present value with the slope (i.e., the slope coefficient) for the self-employed is estimated to be 10,077,000 [see Table 5]. The increase in present value associated with the human capital/nonincentive effect for the wage/salaried groups is assumed to be the same, that is, $d\hat{P}/dS = 10,077,000$. This is equivalent to the first order differential equation given in (C.2)

$$\hat{P}(S) = \text{Constant} + 10,077,000 S, \quad (C.2)$$

with $\hat{P}(1) = 389,000$ as the initial condition.

The solution to the above differential equation turns out to be that:

$$\hat{P}(S) = 389,000 + 10,077,000 (S-1), \quad (C.3)$$

Given that S has a uniform distribution between [1, 1.0121], the estimated present value for wage/salaried earners in the presence of only the human capital effect would be described by a uniform distribution between [\$389,000, \$511,000]. The mathematical expectation of lifetime earnings with only the human capital effect across wage/salaried workers would then be \$450,000. Therefore, the pure human capital effect would be an increase of lifetime earnings from \$389,000 to \$450,000, which is \$61,000 and about 61 per cent of the total effect.

Given that \$450,000 is an estimate of lifetime earnings in the presence of only a human capital effect, the value of the incentive effect can be found

by comparing this with the adjusted mean net present value across all occupational groups of \$488,000. That is, the increase of lifetime earnings from \$450,000 to \$488,000 might be attributed to the incentive effect associated with the steeper earnings profiles of the wage/salaried workers. This is about 38 per cent of total increase in lifetime earnings across the wage/salaried groups.

In the study for the US by Lazear and Moore (1984), the slope S was assumed to have a uniform distribution between [1, 1.025], and hence the present value of lifetime earnings across the wage/salaried workers had a uniform distribution between [\$59,554, \$186,739]. From this, the present value of lifetime earnings without human capital and incentive effects was computed to be \$59,554 and the expected present value of lifetime earnings for the wage/salaried earners was \$123,146. Therefore, the total increase of present value from human capital and incentive effects was estimated to be \$63,592.¹²

The present value of lifetime earnings that the wage/salaried workers would earn if their human capital/nonincentive effects were similar to those for the self-employed was estimated to have a uniform distribution between [\$59,554, \$74,154], and the expected lifetime earnings with human capital/nonincentive effects for the wage/salaried groups would therefore be \$66,854. Hence, the increase of present value associated with human capital/nonincentive effects was only \$7,300, which is about 11 per cent of the total effect. The remaining 89 per cent could be attributed to the incentive effect associated with the steeper earnings profiles for wage/salaried workers in the study by Lazear and Moore.

¹² Lazear and Moore reported results only for a ten per cent discount rate.

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