The Montana Discount: Who Earns Less in Montana, How Much, Why, and What Can Be Done About It

Richard Barrett
Department of Economics
University of Montana
Missoula, MT 59812

September 1998

A Working Paper Prepared For

The Liz Claiborne and Art Ortenberg Foundation

The Montana Discount: Who Earns Less in Montana, How Much, Why, and What Can Be Done About It

1. Introduction

In its September 1998 *Profile of the Montana Worker*, the Montana Department of Labor and Industry reported that average personal income in Montana in 1997 was $20,046, or 78 percent of the national average. Only four states had lower average incomes, and all of Montana's neighbors – Idaho, Wyoming, North Dakota and South Dakota - had higher ones.

These findings were far from unexpected. Numerous analyses reaching similar conclusions have been available for many years and the fact that incomes in Montana are low has been a source of great concern to the public, policy makers and the press (see, for example, Montana Department of Labor and Industry, Research and Analysis Bureau, 1998; Center on Budget and Policy Priorities, 1998; The Missoulian, September 6 and 7; 1998). Low incomes in Montana are frequently interpreted as evidence that the economy is performing badly, that the standard of living of Montanans does not match that of the rest of the nation, and that public policy measures to improve employment opportunities and raise wages are imperative.

Despite extensive evidence that the state's residents earn lower incomes than other Americans, there has been relatively little analysis of why that might be the case. Public discussions often center on the paucity of good jobs or on business climate conditions that ostensibly depress the demand for labor, but almost no formal evidence exists to verify the importance of those factors. As a result, policy makers know the dimensions of the problem they face and appear determined to do something about it, but do not necessarily know what, if anything, will work.

The purpose of this report is to examine the issue of low Montana incomes in some detail. It focuses on hourly wage differentials between Montana workers and their counterparts in the rest of the nation and addresses several aspects of those differentials.[1] These include

- What is the magnitude of the "Montana discount", i.e. the reduction in hourly wages that Montana workers experience simply as a result of living and working in the state?
- How does the Montana discount vary among workers? Is it uniform, or does it vary in some systematic way with workers' demographic characteristics, occupation, industry or education?
- Does the pattern of the Montana discount exacerbate or reduce the degree of inequality in the state?
- Does the pattern of the Montana discount reveal anything about *why* workers in Montana earn less?
- Is there anything that can be done to close the gap between wages in Montana and the rest of the country? If so, is it something that Montana should do?

Section 2 of the report is a brief description of the methods and data used, section 3 describes the pattern of wage differentials, section 4 is an analysis of the role of wage differentials in income inequality and section 5 explores the causes and policy implications of the findings. Section 6 consists of a brief summary.

[1] Differences in hourly wages are an important but not exclusive source of differences in personal income. In Montana in 1996, labor earnings constituted 59 percent of total personal income and differences in earnings arose from differences in the number of hours worked as well as hourly wages. Barrett (1990) found for 1988 that 37 percent of the variance in the natural log of annual earnings was attributable to the variance in hourly wage rates.

2. Data and Methods

What Montana workers earn per hour compared to their counterparts elsewhere depends on two factors. The first of these is simply the wage determining characteristics, such as gender, marital status, race, education, occupation, and industry, which Montana workers possess. The second is the way in which such characteristics are rewarded in Montana, relative to other states. For the purpose of measuring the wages losses associated with living and working in Montana – the "Montana discount" – only the latter effect is relevant.

If all of the difference in what they earn could be attributed to their having less desirable characteristics than their national counterparts, workers in Montana would earn as much in the state as elsewhere. Low average wages in Montana might still be a source of concern, but they would be a by-product of low labor force quality rather than residence in the state.[2] On the other hand, if workers with a given set of characteristics earned less in Montana than they could elsewhere, there would be a wage loss associated solely with living and working in the state. To measure this Montana discount, it is essential to estimate the difference in wages between Montana and elsewhere, of workers with *identical characteristics*. In this report, such measures are developed with the use of earnings functions.

An earnings function is an algebraic statement which expresses hourly earnings as a function of a series of known characteristics of workers which are presumed to determine their wages. Given the characteristics of a particular worker, the earnings function can be used to predict that worker's wages. Similarly, given the average characteristics of a group of workers, the earnings function can be used to predict the wages of a worker who possesses those average characteristics. The approach taken here is therefore (1) to identify a group of workers of interest, say, for example, college graduates; (2) to determine what the mean characteristics of that group are and (3) to predict, using separate earnings functions for Montana and the nation as a whole, what an individual with those mean characteristics would earn in the two labor markets.[3] The difference in hourly earnings between Montana and the country then provides an estimate of the Montana discount for that group.

The earnings functions used in this analysis were estimated using regression analysis of data for a large number of workers; each function is a quantitative statement of the relationship between hourly earnings and various worker characteristics and reflects the average experience of the body of workers studied. Predictions of hourly wages made using earnings functions are obviously subject to some error, both because no individual conforms precisely to group means and because earnings functions typically cannot include all the characteristics relevant to the determination of hourly wages. Appropriately specified, however, earnings functions can provide predictions which are unbiased, i.e. do not err consistently in one direction or another.[4]

The data used in this study were extracted from the March Current Population Survey (CPS) for 1991-1994, 1996 and 1997 (1995 was unavailable).[5] In the March CPS, data is collected on the economic and demographic status during the preceding year of every individual in each surveyed household. Only data for those individuals who were working during the previous year

---

[2] The case is entirely hypothetical. In fact labor force quality, at least as it is measured by education, is somewhat greater in Montana than in the rest of the nation.

[3] An individual with the mean characteristics of the group is an abstraction; no actual person could fit the description. The group, for example, distributes its efforts across industries and occupations in a way which a single person could not. It should also be noted that given the distribution of wage rates and the form of the earnings function, the predicted earnings of an individual with the mean characteristics of the group does not equal the mean earnings of the group.

[4] The specification of the earnings functions used in this study and their statistical estimation is described in the Technical Appendix.

[5] The Current Population Survey is conducted monthly by the Bureau of the Census. It is widely used in labor market research and as the basis of a wide variety of regularly issued Bureau of Census reports.

and whose earnings came from a single employer were usable in this analysis[6]. Using these criteria and pooling the six surveys, samples of 3,504 and 346,256, for Montana and the nation respectively, were extracted.

3. The Montana Wage Discount: The Effect of Demographics, Industry, Occupation and Education

During the period 1990 to 1996, the predicted hourly wage for a typical Montana worker living and working in the state was $8.41[7]. The same individual, moving out of the state and into the national labor market, would be predicted to have earned $9.53. Thus by staying in the state, a worker sacrificed 11.8 percent of his or her potential hourly earnings; this is the Montana discount. But such discounts were far from uniform across demographic, industrial, occupational or educational groups. The diversity of discounts is examined in this section.

Gender, Marital Status, and Age

Table 1 lists predicted hourly wages in Montana and in the national labor market and the Montana discount for a variety of demographic categories. Predicted wages in this table are those of individuals who are identical and representative of the typical Montana worker in every respect except the one indicated. Thus, for example, the Montana wages listed in the table for married women ($7.68) and married men ($10.18) are those that would be predicted for two individuals of the same age, race and educational attainment and the identical distribution of work across industries and occupations. Since they also share the same marital status, the difference between these wages reflects the effect of gender alone, controlling for all other wage determining characteristics.

The figures in the top panel in Table 1 imply that in Montana, *other things equal*, women earn substantially less than men and that single men and women earn somewhat less than their married counterparts. This pattern of wage earning, when compared to the national pattern, means that single female wage earners pay a particularly high price for working in Montana, followed closely by married men. Single men and married women, on the other hand, face a below average Montana discount.

The bottom panel in Table 1shows the Montana discount for workers who are identical in all respects except age. The wage structure by age in the state is almost identical to that in the rest of the nation, with the result that the Montana discount for all age groups varies very little from the average of 11.8 percent. This is somewhat surprising, given the widespread perception that younger workers are particularly adversely affected by labor market conditions in the state.

Occupation

Table 2 shows predicted hourly wages in the Montana and national labor markets and the Montana discount by occupation, for workers who are otherwise identical and typical of the entire Montana labor force. Although the results cannot be readily characterized, it is notable that with the exception household services[8], the occupation with the highest Montana discount is the relatively well paid group of executives, administrators and managers. At the opposite extreme,

---

[6] The structure of the survey is such that it is impossible to uniquely associate hourly wages with industry of employment and occupation in the case of workers with earnings from more than one source. Thus such individuals were not eligible for inclusion in the sample.

[7] A typical Montana worker is an individual who possesses the average characteristics of all Montana workers, rather than a real, representative person. See fn. 3.

[8] Only 1.4 percent of the workers in the Montana sample listed household service as their occupation.

farming, forestry and fishing occupations, with the exception of household services the worst paid occupations in the state, face the lowest wage losses due to working in Montana.[9]

Table 1

Predicted Hourly Wages in Montana and the US Labor Market and Montana Discount; By Selected Demographic Groups; 1990-1996

Group	Predicted Hourly Wage		Montana Discount
	Montana	US	
Gender and Marital Status			
Married males	10.18	11.61	12.3%
Single males	8.21	9.24	11.2%
Married females	7.68	8.62	10.8%
Single females	7.13	8.20	13.1%
Age			
All 25 year olds	7.51	8.51	11.8%
All 35 year olds	8.10	9.18	11.8%
All 45 year olds	8.73	9.90	11.9%
All 55 year olds	9.41	10.69	12.0%

Table 2

Predicted Hourly Wages in Montana and the US Labor Market and Montana Discount; By Occupation; 1990-1996

Occupation	Predicted Hourly Wage		Montana Discount
	Montana	US	
Executive, administrative and managerial	10.24	12.27	16.5%
Professional specialty	11.03	11.96	7.8%
Technicians and related support	11.16	11.79	5.4%
Sales	8.58	9.72	11.7%
Administrative support, including clerical	7.74	9.34	17.1%
Private household	4.57	5.82	21.5%
Protective services	8.68	9.40	7.6%
Other services	6.80	7.80	12.8%
Farming, forestry and fishing	6.83	6.99	2.3%
Precision production, craft and repair	9.42	10.08	6.6%
Machine operators, assemblers and inspectors	7.13	8.17	12.7%
Transportation and material moving	7.37	8.69	15.2%
Handlers, equipment cleaners, helpers and laborers	6.87	7.73	11.1%
Armed forces, currently civilian	7.31	7.18	-1.8%

[9] This occupational category does not include most workers in the lumber products industry.

The results in Table 2 also suggest that with the exception of professional and technical occupations, many "white collar" jobs – managers, administrators, executives, administrative support and other service occupations – involve greater than average Montana discounts while another important white collar occupation, sales, faces a discount about equal to the average for all workers. On the other hand, most "blue collar" jobs – precision production, craft and repair; farming, forestry and fishing; protective services, and handlers, equipment cleaners, helpers and laborers – entail below average Montana discounts; machine operators, assemblers and inspectors and transportation and material moving occupations are exceptions, with discounts above the average for all workers.

Industry

Table 3 shows predicted hourly wages in the Montana and national labor markets and the Montana discount by industry, for workers who are otherwise identical and typical of the entire Montana labor force. To the extent that wage rates define job quality, the figures in Table 3 can be used to identify those industries which provide "good" or "bad" jobs, i.e. jobs that, given workers' other characteristics – education, occupation and so forth – pay a relatively high or low wage premium[10]. Not surprisingly, mining; construction; manufacturing; transport, communications, and public utilities; wholesale trade; finance, insurance and real estate and public adminstration are all industries with above average wages. Agriculture, forestry and fisheries; retail sales and all categories of service industries pay below average wages. Although the structure of wage premia by industry in Montana is quite similar to that of the rest of the nation[11], the size of the Montana discount associated with each industry varies substantially. There are some obvious exceptions, but in general industries which pay wages which are low compared to other industries in Montana also tend to pay wages which are low compared to their national counterparts[12], i.e. have high Montana discounts.

Education

The upper panel in Table 4 shows predicted hourly wages in the Montana and national labor markets and the Montana discount by level of educational attainment, for workers who are otherwise identical and typical of the entire Montana labor force. The lower panel shows similar figures, except that in this case workers at each level of educational attainment also differ in occupational and industrial distributions, reflecting the differences by education level in these distributions actually observed in the Montana labor force sample; workers at each level of educational attainment in the lower panel are otherwise demographically identical and typical of the Montana labor force. Thus while the upper panel depicts the effects of educational attainment alone, the lower panel adds the effects of the occupational and industrial employment decisions taken by workers with different levels of educational attainment.

Regardless of the measure selected, Table 4 indicates that the Montana discount rises substantially with the level of educational attainment. In fact, for workers with less than a high school education employed in the industries and occupations characteristic of such individuals in

[10] The fact that some industries pay higher wages that others for workers with the same characteristics has been the object of extensive study and analysis. It is a critical finding because it not only permits the characterization of industries by wage level, it also implies the absence of wage equalizing competition across industries and therefore the possibility of raising the average earnings of a particular group of workers by changing the industrial structure of employment, i.e. by a policy which attracts "good jobs".

[11] The rank order correlation for wages by industry between Montana and the US is .91.

[12] The correlation between the Montana hourly wages and the Montana discount, by industry, is -.72.

Montana, the wage loss disappears entirely, while for workers with professional degrees it reaches 20 percent.

Table 3

Predicted Hourly Wages in Montana and the US Labor Market and Montana Discount; By Industry; 1990-1996

Industry	Predicted Hourly Wage		Montana Discount
	Montana	US	
Agriculture, forestry and fisheries	7.08	8.32	14.8%
Mining	12.16	12.84	5.3%
Construction	9.64	10.55	8.6%
Durable goods	10.50	11.66	9.9%
Nondurable goods	10.13	10.79	6.1%
Transport, communications and other public utilites	12.89	12.23	-5.4%
Wholesale trade	9.38	10.63	11.8%
Retail trade	7.50	8.07	7.1%
Finance, insurance and real estate	9.70	10.90	11.0%
Business and repair services	8.19	9.11	10.1%
Personal services, including private households	7.37	8.34	11.6%
Entertainment and recreation services	7.07	8.24	14.2%
Professional and related services	7.63	9.23	17.3%
Public administration	8.69	11.04	21.3%

Table 4

Predicted Hourly Wages in Montana and the US Labor Market and Montana Discount; By Educational Attainment and by Educational Attainment, Industry and Occupation Grouping; 1990-1996

Educational attainment	Predicted Hourly Wage		Montana Discount
	Montana	US	
Educational attainment alone			
Less than high school	7.04	7.08	.5%
High school	8.06	8.86	9.1%
Some college	8.08	9.69	16.7%
College graduate	10.10	11.75	14.1%
Post graduate	11.25	13.74	18.1%
Educational attainment, occupation and industry			
Less than high school	5.81	5.78	-0.4%
High school	7.98	8.66	7.9%
Some college	8.05	9.68	16.8%
College graduate	11.34	13.45	15.7%
Post graduate	13.32	16.69	20.2%

4. The Montana Discount and Income Inequality

It has been widely noted that between the late 1970s and the mid 1990s, the distribution of income among American families became notably more unequal. There are many ways in which the degree of inequality can be expressed, but one of the simplest is the ratio of average family incomes for families in the top and bottom fifths of the income distribution. Table 5 shows, for both Montana and the US, the values of these average family incomes and their ratios at the beginning and end of the period. These figures illustrate some important contrasts between Montana and the nation as a whole in the behavior of family income. At the beginning of the period, Montana and the US displayed roughly equal levels of inequality, although Montana incomes at both the top and the bottom of the distribution fell well below those of their national counterparts. In both Montana and the US, inequality grew over the period. But in Montana, the growth in inequality was much smaller. This was because while the incomes of the poorest fifth of Montana families declined more slowly than those of families in the rest of the country, the income of the richest fifth rose much more slowly as well. In 1978-80, the mean income of families in Montana's lowest quintile was 87 percent of that of the lowest quintile in the nation as a whole; by 1994-96, this figure had risen to 98 percent. At the other end of the spectrum, however, in the highest quintile, Montanan's mean family income fell from 91 to 77 percent of that of their national counterparts. Thus it would appear that the widely noted tendency for Montana incomes to fall behind the rest of the nation's was concentrated at the upper end of the income scale.[13] This behavior of income distribution mirrors, in part, the pattern of the Montana discount in hourly wages.

Table 6 shows predicted hourly wages in the Montana and national labor markets and the Montana discount by hourly wage quintile. For each quintile, hourly wages are predicted for an individual all of whose characteristics equal the means for that quintile in the Montana worker sample. Echoing the income distribution data in Table 5, workers in the lowest fifth of hourly wages pay the lowest Montana discount, 9.4 percent, and the discount rises through the middle quintile and then falls somewhat, to 11.4 at the top.

5. Interpreting the Pattern of Discounts

There are two broad interpretations of the fact that Montana wages lag so far behind those of the rest of the nation. These interpretations rest on different implicit theories of how the state labor market operates.

One view of the labor market implicitly treats it as if it were substantially or entirely closed, i.e. not subject to in- and out-migration of workers. In such a case, wages in Montana can fall below wages elsewhere due to lack of demand; high costs of transportation, business property taxes, shortages of capital, or other constraints on business activity cause the level of economic activity and the demand for labor to stagnate. As a consequence, wages are low. Because the labor market is closed, workers are to some degree trapped in Montana and must accept the wages they are paid. There is no significant tendency for workers to leave the state, which would make labor scarcer and require employers to compete for workers at nationally competitive wages.

A variant of this view emphasizes the concept of good and bad jobs. In this case, the wages that a worker earns are only in small part a reflection of market value of his or her abilities and training; they depend, as well, on the mix of jobs available. Workers earning low wages would be in a position to occupy jobs paying much higher wages, if only they were available. It follows that low wages in Montana are symptomatic of the loss of such jobs, due, particularly, to the decline of natural resource based industries. Workers are trapped in the state and as good job opportunities collapse around them, so necessarily do their wages.

[13] None of these comments are meant to imply that the decline in real income of the lowest quintile, or the rise of inequality, are not matters of serious social concern. The dimensions of the problem, however, are different and somewhat less severe in Montana than in the nation as a whole.

Table 5

Average Income of Families in the Top and Bottom Quintiles; 1978-80 and 1994-96; US and Montana; 1997 Constant Dollars

Income Measure	Montana	US
Average Family Income – 1978-80		
Top 20 percent	$82,742	$90,728
Bottom 20 percent	$10,281	$11,758
Ratio – top/bottom	8.0	7.7
Average Family Income – 1994-96		
Top 20 percent	$89,902	$117,499
Bottom 20 percent	$9,051	$9,254
Ratio – top/bottom	9.9	12.7
Percent change in ratio – 1978-80 to 1994-96	23.4	64.6

Source: Center on Budget and Policy Priorities, *Pulling Apart: A State by State Analysis of Income Trends*, December 1997

Table 6

Predicted Hourly Wages in Montana and the US Labor Market and Montana Discount; By Hourly Wage Quintile; 1990-1996

Quintile	Predicted Hourly Wage		Montana Discount
	Montana	US	
First (lowest)	5.79	6.39	9.4%
Second	7.02	7.96	11.9%
Third (middle)	8.38	9.70	13.6%
Fourth	10.40	11.91	12.7%
Fifth (highest)	12.12	13.67	11.4%

The alternative view of the labor market is that, rather than closed, it is open. Workers migrate into and out of the state readily, in response to differential economic opportunities. In this view, wages are lower in the state because workers value the quality of the state's natural and social environment. Observable wage shortfalls are not sufficient to trigger out-migration because the higher wages available outside the state cannot compensate for the loss of amenities out-migration would entail. Indeed, on this view, the Montana discount measures the differential value of the quality of life in the state, and the combined value of the wages earned in the state and its differential attractiveness provide a level of wellbeing which is closely tied, through migration, to that available in the national economy.[14]

These two views of the labor market lead to profoundly different interpretations of the significance of the Montana discount and the appropriate public policies to address it. In the closed labor market case, lower wages mean real losses in economic wellbeing. These losses can be remedied by policies which stimulate economic growth and the demand for labor, and encourage, in particular, the growth of industries which provide good, high wage jobs.[15]

[14] In the national economy, wellbeing is provided by higher wages and lower amenities than in Montana. Power (1980) advances this argument in detail.

[15] Whether such policies exist and are effective is an open question that is beyond the scope of this report.

Table 7

Percentage of US Workers Changing State of Residence in Prior Year; By Educational Attainment and Hourly Wage Quintile; 1990-96

Educational attainment	Percent changing state of residence
Less than high school	2.56
High school	2.48
Some college	2.76
College graduate	3.71
Post graduate	3.58
Hourly Wage Quintile	
First (lowest)	3.78
Second	2.94
Third (middle)	2.47
Fourth	2.45
Fifth (highest)	2.56

On the other hand, if the labor market is open, wages in Montana are closely tied to those in the rest of the nation, albeit at a discount that represents the differential amenity value of living in the state. Policies which stimulate the demand for labor will result in an inflow of workers willing to work at Montana wages and eager to take advantage of employment opportunities in Big Sky country. Ironically, such policies may indeed raise wages: as workers crowd into the state and the natural and social environment is transformed, the amenity value of living in Montana will fall and employers will find that in order to attract or retain workers they will have to pay higher wages.[16] In this circumstance, however, the growth of wages would not signal an improvement in the wellbeing of Montana workers, since any wage growth would be offset by amenity losses.

Similarly, strategies to encourage the growth of high wage jobs will work to raise average wages, not because poorly paid workers will move into such jobs, but because high wage workers will move into the state in pursuit of the new opportunities. Although not primarily the result of public policies, the rapid growth of the specialized medical services industry in Missoula is illustrative of this point. This growth has brought many good jobs to the community, and the addition of those jobs has no doubt raised average wages. But it is doubtful that low wage workers have generally been able to occupy such jobs; rather, they have arrived in Missoula accompanied by their occupants.

The evidence presented in this report is that workers with high levels of educational attainment and high wages and incomes are also those who either face the highest Montana discount and/or have fallen most rapidly behind their national counterparts. If low Montana wages are the result of workers being trapped in a stagnant labor market, then those workers with the lowest mobility should be most trapped and face the highest discounts; those with the highest mobility should face the smallest discounts. Both wages and education influence mobility, with higher wages associated with lower mobility and higher educational attainment associated with higher mobility. This is illustrated in Table 7, which shows, by level of educational attainment and hourly wage quintile, the percentage of respondents in the national sample who reported having changed state of residence in the year before they were interviewed. Thus there is no clear relationship between mobility and the size of the Montana wage discount, and no evidence that the discount is a product of immobility.[17] Given the critical implications of this issue for public

[16] It should be noted that low in-state wages constitute a distinct locational advantage for Montana producers.

[17] If mobility is in fact high across all levels of educational attainment and wage quintiles, then the higher discounts associated with high attainment and wages must result from workers with those characteristics placing a higher value on the amenities of state residency. Power (1980) argues

policy outlined above, further and more conclusive evidence on the relationship between mobility and the size of the Montana discount is an important subject for additional research.

6. Conclusions

Several important conclusions arise from this analysis:

- Within Montana, there are significant hourly wage differentials associated with gender, marital status, industry and occupation of employment, and educational attainment.
- Almost everyone pays something, in lower wages, to live in Montana, but what workers pay varies substantially with their circumstances. Broadly speaking, the Montana discount is highest for single women and married men, for workers in low wage industries and white collar occupations and for individuals with high levels of educational attainment.
- The combined effect of these patterns is that the Montana discount tends to rise with the level of wages. Low wage workers are closest to their national counterparts in pay levels; high wage workers farthest away. This mirrors evidence that in the lowest quintile, Montana families receive almost the same income as families in the rest of the country. In the highest quintile, however, Montana families receive much less than their national counterparts and have lost ground to them significantly over the past 20 years.
- There is no evidence that the highest Montana wage discounts are associated with worker immobility. Thus such discounts do not appear to be the result of workers being trapped in a stagnant state labor market. If workers voluntarily accept lower wages in exchange for the amenity value of living in Montana, they are as well off as their counterparts in the rest of the nation, despite being paid less.
- Policies to stimulate business activity and attract good jobs to Montana can raise the demand for labor. But if workers are highly mobile, workers will come to the state to take advantage of the new employment opportunities; only if the quality of the state's natural and social environment deteriorates as a result will employers find they need to raise wages to attract and retain workers. New good jobs will be occupied by in-migrants prepared to occupy them, and not necessarily by Montana's current low wage workers.

References

Barrett, Richard, "Trends in Earnings Inequality in the Pacific Northwest*." Proceedings of the Twenty Fourth Annual Pacific Northwest Regional Economic Conference,* Northwest Policy Center, University of Washington, Olympia, 1980

Center on Budget and Policy Priorities, *Pulling Apart: A State-by-State Analysis of Income Trends*, Washington, 1997 (http://www.cbpp.org)

The Missoulian, "You can't eat the scenery but it's part of your paycheck," 2 part editorial, September 6 and 7, 1998

Montana Department of Labor and Industry, Research and Analysis Bureau*, Montana Informational Wage Rates by Wage and Occupation,* Helena, April 1998

_____, *Profile of the Montana Worker*, Helena, September 1998

Power, Thomas, *The Economic Value of the Quality of Life*, Westview Press, Boulder, CO., 1980

---

that net in-migration of workers alone consitutes evidence that the Montana discount is not the product of outward imobility.

Technical Appendix

Specification and Estimation of Earnings Functions

The earnings functions used in this report have the following specification:

$$\ln W = b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n + b_{n+1}D_1 + b_{n+2}D_{n+2} + \ldots + b_{n+m}D_m$$

where lnW is the natural log of hourly wages, the X_i are continuous variables measuring worker characteristics (e.g. age), the D_i are dummy variables measuring discrete worker characteristics (e.g. gender) and the b_l are coefficients which measure the response of the dependent variable (lnW) to changes in the independent explanatory variables.

Given the specification of the dependent variable as the natural log of hourly wages, the coefficient on a continuous explanatory variable measures, approximately, the percentage change in hourly wages per unit change in the explanatory variable. Dummy variables take on a value of 1 for cases in which the worker has the characteristic in question and 0 otherwise; the coefficient on a dummy variable therefore measures, approximately, the percentage change in hourly wages that results from having, as opposed to not having, a particular characteristic.

The data used in the estimation of the earnings functions was extracted from the March Currrent Population Surveys for 1991 to 1994, 1996 and 1997 and all the variables used, with two exceptions, are either those reported in the CPS or are simple transformations of the CPS variables.

Hourly wages are not reported directly in the CPS; for the purpose of this study they were imputed by dividing reported annual earnings by the product of reported weeks worked per year and normal hours worked per week.

In 1992, the CPS changed the form in which it reported educational attainment from *years* of education completed to *levels* completed or *degrees* received. Thus, educational attainment data for 1991 is not strictly comparable to that of the subsequent years. For the purposes of this study, this lack of comparability was resolved by assuming the relationships between years of schooling completed and degrees received displayed in the following table.

Years completed (1991 CPS)	Level or degree completed (1992-97 CPS)
Less than 4 years high school	Less than high school
4 years high school	High school
More than 4 years high school, less than 4 years college	Some college
4 years college	College
More than 4 years college	Post graduate

Table A1 shows the definition and mean values and standard deviations of the independent variables and Tables A2 and A3 show the SAS regression output for the estimation of the Montana and national earnings functions respectively. With the exception of age, all the variables listed in Table A1 are dummies; the mean value of a dummy variables gives the proportion of individuals in the sample having the characteristic indicated by the variable.

Table A1

Names, Definitions, Means and Standard Deviations
of Independent Variables; Montana and US Earnings Functions

Variable	Definition	Montana		U.S.	
		Mean	St. Dev.	Mean	St. Dev.
AGE	age in years	40.024	13.853	38.843	13.279
Marital status and gender					
MM	married male	0.331	0.471	0.331	0.471
SM	single male	0.162	0.369	0.188	0.391
MF	married female	0.330	0.470	0.277	0.448
Race					
WHITE	white	0.934	0.249	0.863	0.344
AFRAMER	African American	0.003	0.058	0.092	0.290
Educational attainment					
HSGRAD	high school graduate	0.324	0.468	0.340	0.474
SOMECOL	some college	0.298	0.457	0.266	0.442
COLGRAD	college graduate	0.165	0.371	0.150	0.357
POSGRAD	post graduate	0.072	0.258	0.080	0.271
Occupation					
MANAGE	exec., admin. and managerial	0.121	0.327	0.127	0.333
PROF	professional specialty	0.150	0.357	0.129	0.335
TECH	technician and related	0.025	0.155	0.034	0.181
ADMNSUP	admin. support, including clerical	0.154	0.361	0.160	0.367
PRVHSOC	private household service	0.013	0.115	0.008	0.091
PRTSVOC	for protective service	0.015	0.123	0.017	0.130
OTRSRVOC	other service	0.142	0.349	0.120	0.324
FARMOC	farming, forestry and fishing	0.058	0.234	0.022	0.147
PRSPRDOC	precision production, craft and repair	0.084	0.277	0.104	0.305
MACHOPS	machine operators, assemblers and inspectors	0.027	0.162	0.072	0.258
TRANSOCS	transportation and material moving	0.047	0.211	0.041	0.198
HANDLERS	handlers, cleaners, helpers and laborers	0.041	0.198	0.044	0.204
ARMDFRC	armed forces, currently civilian	0.010	0.101	0.008	0.088
Industry					
FARM	agriculture, forestry and fisheries	0.067	0.251	0.021	0.142
MINE	mining	0.009	0.094	0.007	0.084
CONST	construction	0.049	0.215	0.053	0.225
DURS	durable goods	0.047	0.211	0.103	0.303
NONDURS	non-durable goods	0.031	0.173	0.078	0.269
TCPU	transportation, communication and public utilities	0.075	0.263	0.070	0.255
WSLTRAD	wholesale trade	0.033	0.180	0.038	0.192
FIRE	finance, insurance and real estate	0.047	0.211	0.064	0.244
BUSERV	business and repair services	0.030	0.170	0.051	0.220
PERSERV	personal services	0.041	0.199	0.036	0.187

Table A1 (continued)

RECSERV	recreation and entertainment serivces	0.026	0.159	0.017	0.128
PROFSERV	professional services	0.270	0.444	0.232	0.422
PUBAD	public administration	0.081	0.273	0.058	0.233
Year in sample					
Y92	1992	0.167	0.373	0.176	0.381
Y93	1993	0.167	0.373	0.175	0.380
Y94	1994	0.174	0.379	0.168	0.374
Y96	1996	0.153	0.360	0.148	0.355
Y97	1997	0.166	0.372	0.155	0.362

Table A2
Montana Earnings Function
Regression Output

Dependent Variable: LNHRWAGE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	41	665.22250	16.22494	37.420	0.0001
Error	3462	1501.08521	0.43359		
C Total	3503	2166.30771			

Root MSE	0.65847	R-square	0.3071
Dep Mean	2.12954	Adj R-sq	0.2989
C.V.	30.92104		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.373485	0.07686215	17.869	0.0001
AGE	1	0.007525	0.00089529	8.405	0.0001
MM	1	0.356234	0.03874024	9.195	0.0001
SM	1	0.140949	0.04140793	3.404	0.0007
MF	1	0.075324	0.03456052	2.179	0.0294
WHITE	1	-0.045935	0.04710342	-0.975	0.3295
AFRAMER	1	0.045680	0.19730369	0.232	0.8169
HSGRAD	1	0.134821	0.03858072	3.495	0.0005
SOMECOL	1	0.136944	0.03895753	3.515	0.0004
COLGRAD	1	0.360382	0.04758719	7.573	0.0001
POSGRAD	1	0.468460	0.06155117	7.611	0.0001
MANAGE	1	0.177423	0.05154270	3.442	0.0006
PROF	1	0.251141	0.05753709	4.365	0.0001
TECH	1	0.263214	0.08399088	3.134	0.0017
ADMNSUP	1	-0.102729	0.05024197	-2.045	0.0410
PRVHSOC	1	-0.630413	0.12599295	-5.004	0.0001
PRTSVOC	1	0.012348	0.10370021	0.119	0.9052
OTRSRVOC	1	-0.232050	0.04927089	-4.710	0.0001
FARMOC	1	-0.228261	0.08241959	-2.769	0.0056
PRSPRDOC	1	0.093338	0.05853223	1.595	0.1109
MACHOPS	1	-0.184806	0.08583570	-2.153	0.0314
TRANSOCS	1	-0.151250	0.06849245	-2.208	0.0273
HANDLERS	1	-0.222253	0.06889206	-3.226	0.0013
ARMDFRC	1	-0.160195	0.12875320	-1.244	0.2135
FARM	1	-0.057120	0.07359508	-0.776	0.4377
MINE	1	0.483319	0.12500056	3.867	0.0001
CONST	1	0.250565	0.06308307	3.972	0.0001
DURS	1	0.336622	0.06583129	5.113	0.0001
NONDURS	1	0.301045	0.07223039	4.168	0.0001

Table A2 (continued)

TCPU	1	0.541764	0.05479723	9.887	0.0001
WSLTRAD	1	0.223516	0.06778666	3.297	0.0010
FIRE	1	0.257127	0.06069613	4.236	0.0001
BUSERV	1	0.087989	0.07193320	1.223	0.2213
PERSERV	1	-0.017299	0.07315632	-0.236	0.8131
RECSERV	1	-0.059179	0.07560389	-0.783	0.4338
PROFSERV	1	0.017715	0.04148923	0.427	0.6694
PUBAD	1	0.147705	0.05645239	2.616	0.0089
Y92	1	-0.022483	0.03833763	-0.586	0.5576
Y93	1	0.041276	0.03852605	1.071	0.2841
Y94	1	0.100273	0.03812969	2.630	0.0086
Y96	1	0.144598	0.03937983	3.672	0.0002
Y97	1	0.099989	0.03858111	2.592	0.0096

Table A3
US Earnings Function
Regression Output

Dependent Variable: LNHRWAGE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	41	67875.86270	1655.50885	4502.035	0.0001
Error	346214	127311.39150	0.36772		
C Total	346255	195187.25420			

Root MSE	0.60640	R-square	0.3477
Dep Mean	2.27176	Adj R-sq	0.3477
C.V.	26.69310		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	1.255400	0.00745084	168.491	0.0001
AGE	1	0.007605	0.00008427	90.241	0.0001
MM	1	0.347393	0.00328371	105.793	0.0001
SM	1	0.119382	0.00350614	34.049	0.0001
MF	1	0.049089	0.00308553	15.909	0.0001
WHITE	1	0.021620	0.00499952	4.324	0.0001
AFRAMER	1	-0.021890	0.00596927	-3.667	0.0002
HSGRAD	1	0.225117	0.00322652	69.771	0.0001
SOMECOL	1	0.314749	0.00348956	90.197	0.0001
COLGRAD	1	0.507544	0.00425723	119.219	0.0001
POSGRAD	1	0.663676	0.00533770	124.337	0.0001
MANAGE	1	0.233551	0.00464386	50.292	0.0001
PROF	1	0.208067	0.00518169	40.154	0.0001
TECH	1	0.193631	0.00683888	28.313	0.0001
ADMNSUP	1	-0.039719	0.00450143	-8.824	0.0001
PRVHSOC	1	-0.512606	0.01344413	-38.129	0.0001
PRTSVOC	1	-0.033324	0.00918645	-3.628	0.0003
OTRSRVOC	1	-0.219589	0.00465826	-47.140	0.0001
FARMOC	1	-0.329626	0.01158630	-28.450	0.0001
PRSPRDOC	1	0.036775	0.00516712	7.117	0.0001
MACHOPS	1	-0.173835	0.00585703	-29.680	0.0001
TRANSOCS	1	-0.111120	0.00649451	-17.110	0.0001
HANDLERS	1	-0.228714	0.00614755	-37.204	0.0001
ARMDFRC	1	-0.302234	0.01326405	-22.786	0.0001
FARM	1	0.029864	0.01164805	2.564	0.0104
MINE	1	0.464398	0.01266755	36.660	0.0001
CONST	1	0.267266	0.00570331	46.862	0.0001
DURS	1	0.367774	0.00474792	77.460	0.0001
NONDURS	1	0.290596	0.00503958	57.663	0.0001
TCPU	1	0.415617	0.00512034	81.170	0.0001
WSLTRAD	1	0.275144	0.00595743	46.185	0.0001
FIRE	1	0.300261	0.00507895	59.119	0.0001

Table A3 (continued)

BUSERV	1	0.121267	0.00547365	22.155	0.0001
PERSERV	1	0.032583	0.00682707	4.773	0.0001
RECSERV	1	0.019977	0.00850585	2.349	0.0188
PROFSERV	1	0.133903	0.00399962	33.479	0.0001
PUBAD	1	0.313267	0.00590545	53.047	0.0001
Y92	1	0.036725	0.00346602	10.596	0.0001
Y93	1	0.062649	0.00347472	18.030	0.0001
Y94	1	0.078821	0.00350848	22.466	0.0001
Y96	1	0.133871	0.00363203	36.859	0.0001
Y97	1	0.167517	0.00358881	46.678	0.0001