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The Effect of Relative Wage on Hours Worked

Mark Giannis
Illinois Wesleyan University, mgiannis@iwu.edu

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Mark Giannis
Illinois Wesleyan University
Honors Research, Economics Department
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Project Advisor:
Professor Michael Seeborg, Economics Department.

Research Honors Committee:
Professor Robert Leekley, Economics Department
Professor Ilaria Ossella-Durbal, Economics Department
Professor Elisabeta Pana, Business Administration Department
Professor Michael Seeborg, Economics Department

ABSTRACT: Traditional economic research on the number of hours that one chooses to work depends largely on wage rates and total family income. However, more recent research in behavioral economics suggests that one's relative position in the community's income distribution could also affect hours worked. This paper investigates the effect of an individual's relative wage will have on their actual hours worked. Relative wage is defined as how one's wage compares to others within the same geographical region. Cross-sectional data from 2004 to 2013 is used from the Current Population Survey to estimate the traditional labor supply function with the addition of the relative wage variable. This paper uses OLS regression analysis to determine how ones hours of work changes from changes in relative income. As expected, one's position in the wage distribution has a negative relationship on hours worked.

I. Introduction

Many factors go into a person's decision to work. These factors include variables such as desired standard of living, family structure, or potential income. Economic theory suggests that as income increases, utility increases as well. This relationship exists because increased income allows more consumption. However, the empirical relationship between income and utility is not entirely clear. Easterlin (1974) found that despite rising incomes of countries from 1946 to 1970, reported utility levels did not have a corresponding increase. Despite the fact that people would be able to consume more, they did not have an increase in utility. The implication of this is that one's utility is not solely based off of absolute income. Instead, relative income has an effect on utility as well. In other words, the amount that someone is able to consume relative to others is important for a person's utility.

If a person's utility is influenced by his or her relative position in the income distribution, it would not be surprising to find that the optimal hours worked will also depend on one's position in the income distribution. People who have a decline in relative income may attempt to increase their income relative to others by working more hours in order to increase their utility. Indeed, there have been a growing number of studies examining the relationship between relative income and hours worked. The magnitude of this relationship is growing increasingly important as inequality in the United States rises. The U.S. Congressional Budget Office (2011) reports that the GINI index (a common variable that portrays income inequality with an index closer to 1 indicating more inequality within a country) has risen from .464 to .562 from 1979 to 2007. This figure is important due to the findings of Bowles and Park (2005) who find that greater inequality has led to longer working hours. Thus, increased inequality might indicate an increased motivation for people to act depending on their relative wage. So as inequality increases, one's relative wage may become increasingly important in their work/leisure decision.

This issue may become even more prescient due to a recent order by President Barack Obama. In March, 2014, he signed a presidential memorandum that will allow the Labor Department to examine how overtime eligible employees can be expanded. Specifically, more salaried workers will be able to receive overtime (Jackson 2014). By allowing more people to be eligible to receive overtime, hours worked will have more of a direct impact on income. Thus, people will be able to influence their position within the wage distribution more. As a result, the effect of relative wage will have a larger effect.

As such, this paper explores the hours worked decisions of people by examining how hours of work choices are affected by one's position in the wage distribution as compared to people in the same geographical region. This paper expands on prior literature because it uses a different data set and examines the data through different reference groups (the group in which a person compares themselves to). Furthermore, I present theory that serves to provide reasoning for results that prior literature has obtained and to provide support for my hypothesis. The results of this study are important because they may be beneficial for the government to understand people's hours worked choices when making policies that deal with labor supply. Furthermore, it would be helpful to understand more how people respond to their environment differently in determining how many hours to work. Lastly, my paper expands on the literature that looks at how the characteristics of one's peers effects and individual's choices.

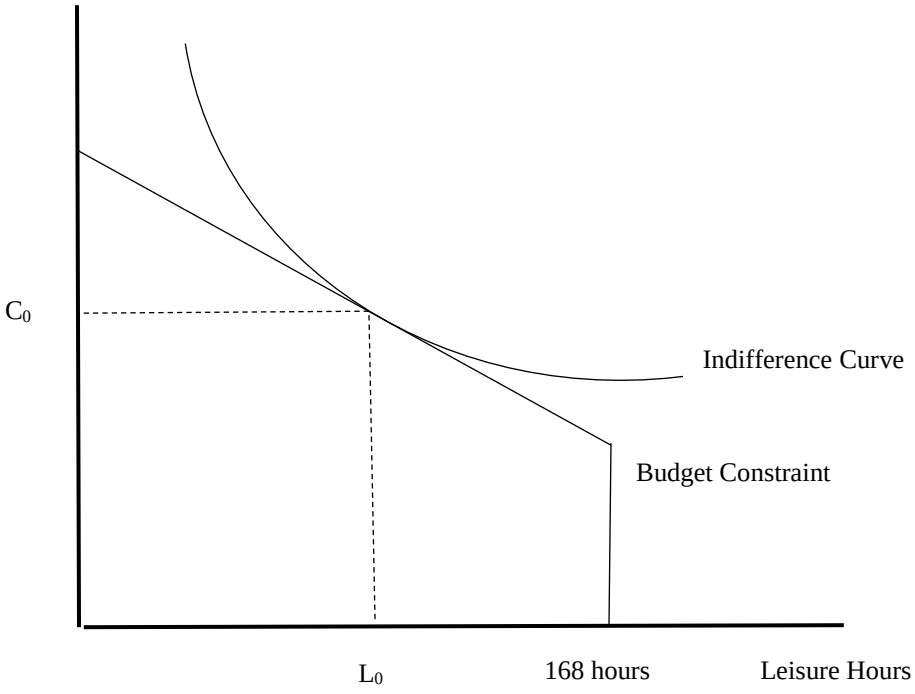
The rest of the paper is organized as follows: Section II outlines the traditional labor supply theory that determines an individual's hours of work. Section III provides an empirical basis for the paper by reviewing prior literature. Section IV describes the data across the complete sample. Section V runs the regression models and discusses the findings. Finally, Section VI presents the conclusions.

II. Theory

This paper adds an important variable to the traditional hours of work model (Borjas 2005). The addition of a measure of one's position in their metropolitan area's wage distribution as an independent variable is the most important contribution of my paper to the traditional labor supply model. This section introduces the new "relative wage" variable as one of the variables that is a part of determining the shape of one's labor/leisure indifference curves. Relative wage is defined as how one's wage compares to the average wages of his or her reference group. In general, one's reference group is defined as the peer group that an individual compares oneself to. There are many ways one could measure a reference group, but I will measure it through geographical area. Overall, relative wage specifies how one's wage compares to others that he or she may compare it with.

I will show how this relative wage variable can be included as part of the traditional labor supply. The traditional labor supply theory that exhibits the choice between hours of leisure and consumption is shown in Figure 1. In this model, there are a total of 168 hours per week to be allocated between work and leisure. Since the horizontal axis measures hours of leisure, hours

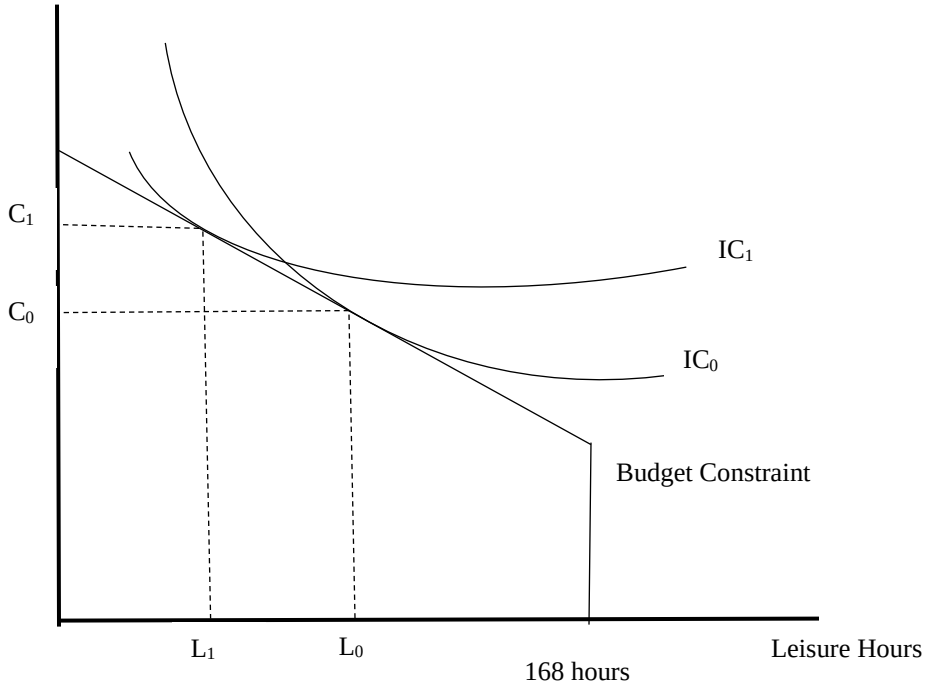
Figure 1: Traditional Labor Supply Model



worked can be determined by subtracting hours of leisure from total hours available per week. For example, if an individual chooses 158 hours of leisure for the week, the hours of work chosen must be 10 hours. The model demonstrates the interaction between consumption and leisure as shown through the budget constraint and the indifference curve. The budget constraint is affected by those variables that affect one's income (e.g., hourly wage, other family income, and non-wage income). The slope of the budget constraint is determined by the wage rate of the individual. The vertical line at 168 weekly hours of leisure shows other income that comes from other family members or non-work related income such as gifts, government transfers, and investment income. These two lines form the budget constraint. The indifference curve shows the combination of leisure and consumption that yields a constant level of utility. The shape of this curve is generally assumed to be influenced by various demographic factors such as marital status, age, education, and number of children. The optimal utility maximizing leisure/consumption choice by the individual is where the budget constraint is tangent to the indifference curve where leisure hours equals L_0 and hours of work equals $168 - L_0$.

I add to this traditional labor supply by adding a variable that I hypothesize already implicitly effects the shape of the indifference curve. Figure 2 demonstrates how the addition of the relative wage variable affects the model. To illustrate, assume an individual experiences a decrease in their position in the wage distribution. I hypothesize that they will then want to work more to improve their wage position (as working harder through more work hours increases the probability of receiving a raise or bonus) because their position in the wage distribution has an

Figure 2: The effect of a Change in Relative Wage



effect on their preferences. Since the individual's utility decreases with a decrease in relative wage, the individual will value marginal consumption more than marginal leisure. In terms of the model shown in Figure 2, this means that the person will be willing to trade-off more leisure for a unit of consumption which makes the person's indifference curve flatter. This will result in the individual working more hours. The two indifference curves that are illustrated cross because they are for two different preference structures due to outside environmental impacts- a decrease in relative wage- and thus the individual's preferences change. Figure 2 demonstrates how a

change in relative wage might change one's preferences. By including relative wage in this model, this paper hopes to better explain the hours work decisions.

III. Literature Review

Cole, Mailath, and Postlewaite (1995) show that in response to a negative individual wage shock, the individual will give more effort in order to reach the relative position previously occupied. Depending on other agents' responses to an aggregate shock, the original individual's response can take on multiple forms. If the other agents of a negative aggregate wage shock give more effort in order to reestablish themselves at the wage previously held, then the individual will give more effort as well. If none of the agents respond, there is no change in effort by the individual. In other words, changes in wage are not as important as the relative wage. My paper will use this reasoning to hypothesize that people with lower relative wages will give more effort towards work (as shown through work hours) because a person will try to respond to a lower wage by working more in order to change their relative position.

My paper will use this theoretical background as well as various empirical papers that examine the topic. Numerous papers deal with the effects of relative wage on economic outcomes. Many of these deal with the relationship that it has with utility. Although examining the relationship between relative wage and utility is different than my paper in the sense that I study how relative wage effects hours worked, the other papers are still similar because they demonstrates how one's preferences are changed. These papers have generally gotten consistent results with each other and also the hypothesis of my paper. McBride (2001) uses the General Social Survey and finds that a higher relative wage has a positive effect on utility. Similarly, Pérez-Asenjo (2010) finds that there is an inverse relationship between labor supply and relative income using the same data set. Neumark and Postlewaite (1998) use the National Longitudinal Survey of Youth to examine the labor force participation decisions of women using relative income variables. They find that women are more likely to enter the labor force if their sister-in-laws are in the labor force and if their husbands earn less than their sister's husbands. Clark, Kristensen, and Westergard-Nielsen (2009) use the European Community Household Panel to find a positive correlation between worker happiness and co-workers wages because an increase in a co-workers wage provides a signal for future increased earnings. Bowles, Samuel, and Park (2005) find that greater inequality predicts longer work hours. Bell and Freeman (2001) also find

support for this relationship. This agrees with my paper's hypothesis because it indicates the claim that workers respond to disparity in wages.

Various empirical papers have used different ways to define a reference group. The distinction between how reference groups are determined is important because it illustrates how data in my paper could be organized. Clark *et al* (2009) show that co-workers are not the best reference group as there are other influences. Neumark *et al* (1998) conclude that friends and family could be used as reference groups. Pérez-Asenjo (2010) uses reference groups of age, gender, race, and religion. Furthermore, relative wage does not affect each group uniformly. Relative wages' effect is more concentrated on those with higher incomes and white males (McBride 2001), (Pérez-Asenjo 2010). Luttmer (2005) uses geographical area to find a relationship between utility and relative income. Like Luttmer (2005), my paper will also focus on geographic area in order to define the reference group by defining one's position in the wage structure within broadly defined metropolitan areas. However, I expand on the work of Luttmer (2005) by examining hours worked rather than utility. By going one step further, I further demonstrate the effect of relative wage on hours worked.

There are many ways that the relative wage can be defined. Luttmer (2005) divides the person's income by the average income for his respective reference group. Pérez-Asenjo (2010) also uses this method as well as using the percentile rank of the individual within the reference group. Park (2010) uses three different ratios. These are personal income divided by the highest income of the 90^{th} percentile, median, and 10^{th} percentile. He finds that people with a relatively lower income have an incentive to work more when they see people with higher incomes as compared to those at the top of the income bracket. I will use the ratio definition used by Luttmer (2005) and Pérez-Asenjo (2010).

There is some evidence that work hours are affected by the actions of peers. For example, Frijters and Leigh (2008) examine the effect interstate mobility has on work hours through the Current Population Survey. They find that states that have higher mobility (defined by if the individual has moved to a different state in the past year) have higher average work hours. Including this variable is important because full time workers are probably more willing to change location. Also, the finding by Frijters and Leigh (2008) further demonstrates how actions of peers may have an effect on workers labor supply choices. As such, a variable that specifies whether a person has moved within the past year will be included in this paper.

In terms of data structure, there are paper will use a cross-sectional data set. This is consistent with McBride (2001), Pérez-Asenjo (2010), and Aronsson *et al* (1999) who also use cross sectional data in their research. Park (2010) uses a similar data structure and applies a tobit regression model because hours of work is censored with top and bottom codes. In addition, similar to my paper, Park (2010) uses the Current Population Survey (CPS) data from 1969 to 1979.

Past research has shown that endogeneity is a problem with much labor supply research. For example, both income and hours worked have an effect on one another. There are some issues that can arise when one deals with reference groups (how relative wage will be determined in this paper) as explanatory variables. Manski (1993) explains that creating a variable measuring individuals relative position in the income distribution makes an incorrect assumption by assuming that the reference group's action is exogenous. Various papers have presented fixes for this such as Glaeser and Scheinkman (2001) who present a methodological method for controlling for these potential problems. However, due to data and time constraints, this paper will not attempt to resolve the possible endogeneity issue. Instead it will assume that one's wage rate affects hours worked, not the other way around. Bell and Freeman (2001) argue that individuals will work more in order to achieve future promotions. This is significant for my paper because it implies that salaried workers still have a motivation to work more hours in response to relative wage.

Much of the prior literature serves as a model for this paper by suggesting variables that approximate the individual's budget constraint (e.g., wage rate, non-wage income, and income from other family members). The literature also suggests a number of control variables that could influence preferences as shown through changes in the indifference curve regarding hours of work and consumption. Among the many variables that determine preferences is the person's position in the wage distribution. My study adds to previous labor supply research that considers the effect of position in the wage distribution by employing a large data set and a unique definition of one's relative wage position within metropolitan areas.

IV. Data/Methods

The Census data used in this study is from the Current Population Survey and was downloaded from the Integrated Public Use Microdata Series (IPUMS) (King *et al.* 2010). The

data is a person-level data set and was collected from the years 2004 to 2013. These years were chosen because they go across a business cycle. An ordinary least squares regression is used. Initially, a tobit regression was to be used because the data for Usual Hours Worked is top-coded at 99 hours and people cannot work less than zero hours. Additionally, prior research such as Park (2010) used a tobit model. However, my study only includes people who are currently working at the time of the survey. The reasoning for this choice is that this paper is separating itself from prior literature by focusing on choices once people have joined the labor force, rather than if they join the labor force or not. This paper accepts that there may be some self-selection bias as a result of this. Heckman (1993) shows that one has to account for missing wages of people not working. However, when people with zero hours worked were included in the regression, the results were not substantially different than when people with zero hours worked were excluded. Also, the number observations that have the top-code is only 1,701 out of over a million per model so less than .002 percent of the cases were effected by upper or lower codes. Therefore, the effect of the tobit model as opposed to OLS is negligible and the estimated tobit coefficients were nearly identical to estimated OLS coefficients. Therefore, this paper uses Ordinary Least Squares.

The model will use variables defined in Table 1, which lists all of the independent variables, definitions, and their expected values. The dependent variable is Usual Hours Worked. This variable describes the number of hours a person usually works per week. Table 1 splits up the independent variables into two categories. The first category includes the variables that affect the budget constraint of the labor supply model that predicts hours worked. The second category includes the variables that influence the indifference curve preferences of the individual. This category includes Relative Wage Rate (which is further explained below) as well as various demographic variables. Other non-demographic variables are included such as Moving. This variable indicates if the respondent has moved within the past year of taking the survey. This variable is included due to the work done by Frijters and Leigh (2008) who find that people in more mobile states work more on average. Another independent variable to note is Female*Number of Children. This is an interaction term that assumes the value of N if the respondent is a female with N children and 0 if the respondent is either male and/or has no children. This is important to include in predicting hours worked because females with children

Table 1: Variable Definitions

Variable	**Definition**	Expected Value
Dependent Variable		
Usual Hours Worked	Hours worked per week	
Budget Constraint		
Ln Other Income	Natural log of Income from other sources	-
Wage Rate	Income from wages/hours worked	+
Indifference Curve		
Relative Wage Rate	Wage Rate/average wage rate of reference group	-
Number of Children	Number of children in household	+
Female	Gender	-
Female*Number of Children	Interaction term indicating if observation is female and has children	-
Moving	Person has moved to a different county or state within the past year	+
Race	Dummy variables for Black and Asian are included	?
Married	Marriage status	+
Education	Dummy variables for various levels of educational attainment	+
Age	Respondents age	+
Age2	Square of respondents age	-
Unemployment Rate	The unemployment rate of the given MSA	-

are often the primary childcare provider and these women tend to work fewer hours because of child care responsibilities.

The construction of the variable that identifies a person's position in the wage distribution is especially important, specifically deciding how one's comparison is made. The reference group used here differs from prior studies because it involves a geographically defined reference group. This is measured through the reported Metropolitan Statistical Area (MSA) for each respondent. An MSA is an area with a large center population with surrounding communities that rely economically on it. Ideally, the geographical region would be smaller (such as a neighborhood or school district) but data availability necessitates that the wider MSA be used. The person's relative position in the wage distribution is referred to as "Relative Wage Rate." Relative Wage Rate is calculated by dividing the respondents wage rate by the average wage rate for all respondents in the MSA. Thus, someone who has the same wage rate as the

average wage rate in their MSA would have a Relative Wage Rate of 1. If their relative wage rate is below the average, the Relative Wage Rate would be between 0 and 1.

These variables are consistent with the theory laid out above. When all of this comes together, the final regression equation comes out to:

$$Usual\ Hours\ Worked = \beta_0 + \beta_1\ Relative\ Wage\ Rate + \beta_2\ Female + \beta_3\ Other\ Income\ Variables + \beta_4\ Demographic\ Variables + e$$

This equation will be analyzed using OLS regression from the STATA econometrics package. Expected values of all the variables are listed in Table 1. Consistent with the literature, Relative Wage Rate is expected to have a negative relationship with Usual Hours Worked. This is consistent with prior literature- Pérez-Asenjo (2011), McBride (2011), and Neumark *et al* (1998). The main reason for this is that people will give more effort towards work if their relative earnings are less than their reference group.

V. Results

Next, transformations of the data are conducted. All dollar amounts are converted into values with 1999 as the base year using the Consumer Price Index. Dummy variables are created for gender (with 1 indicating female), highest education finished (ged, associate's degree, bachelors' degree, or advanced degree), marital status, and race (Black and Asian). Wage rate is calculated by dividing income from wages and salaries by total hours worked in a year. Next, Relative Wage Rate is constructed. Consistent with McBride (2001) and Luttmer (2005), Relative Wage Rate is calculated by dividing the individual's wage rate by the average for the reference group which is determined by year and MSA. Thus, someone who earns the same wage rate as the average for their reference group would have a Relative Wage Rate of 1. Someone who earns more than the average would have a Relative Wage Rate of greater than 1. Cases in which reported hours are zero are omitted since the goal of the paper is to predict hours worked of employed individuals.

As specified in the previous section, four models are run with an increasing number of independent variables. The model is run using OLS with robust standard errors (since Breusch-Pagan test failed to reject the h_0 of heteroscedasticity). Initially, a tobit model was to be run, but due to the small number of observations that had Usual Hours Worked of over 99 hours, it was

determined that it would not make a significant difference, and the tobit results were nearly identical to the OLS results. Model 1 tries to explain Usual Hours Worked with just the variable of Relative Wage Rate. This results in Model 1:

$$Usual\ Hours\ Worked = \beta_{0+}\ \beta_1\ Relative\ Wage\ Rate + e \quad (1)$$

The results of estimating Model 1 are reported in Table 2.This regression does not achieve significant results as the coefficient for Relative Wage Rate is insignificant. This result is not surprising because at an individual level, people might consider their reference groups to be from other sources than place of residence. These could include gender, education, ethnicity, age, etc. Thus, when we control for these variables in Models 2, 3, and 4, we expect more significant results. This is supported by Model 2:

$$Usual\ Hours\ Worked = \beta_{0+}\ \beta_1\ Relative\ Wage\ Rate + \beta_2\ Female + e \quad (2)$$

This regression returns significant results for both variables. Female is significant at the one percent level with a coefficient of -5.57. This result makes sense because females generally work much less than males. Relative Wage Rate has a coefficient of -.04 and is significant at the one percent level. This result where Relative Wage Rate becomes significant when Female is included in the regression is not that surprising of a result. Gender is a significant variable to include because males and females often have different patterns and societal norms for entering the labor force. This is supported by the fact that other papers have focused on women when examining relative wage (Neumark and Postlewaite 1998).

Next, this paper furthers the analysis in Model 3 where other income variables and the metropolitan area unemployment rate are included:

$$Usual\ Hours\ Worked = \beta_{0+}\ \beta_1\ Relative\ Wage\ Rate + \beta_2\ Female + \beta_3\ Wage\ Rate + \beta_4\ Unemployment\ Rate + \beta_5\ Ln\ Other\ Income + e \quad (3)$$

Relative Wage Rate has a coefficient of -.0439 and is significant at the one percent level. This magnitude is consistent with Model 2. Unemployment Rate is calculated at the MSA level for each year. Unemployment Rate decreased Usual Hours Worked by .1026 and was significant at the one percent level. This value makes sense because it indicates that the MSA might be in a

Table 2: Regression Results

Dependent Variable: Usual Hours Worked

	Model 1	**Model 2**	**Model 3**	**Model 4**
Relative Wage Rate	-0.00599	-0.04392***	-0.0427***	-0.1972***
	(-.62)	(-7.57)	(-5.62)	(-7.24)
Ln Other Income			-0.4096***	-0.2941***
			(-123.4)	(-86.59)
Wage Rate			0.0000	0.0007***
			(-0.06)	(6.09)
Unemployment Rate			-0.1026***	-0.0979***
			(-24.83)	(-25.33)
Moving				1.5555***
				(44.36)
Female		-5.5703***	-5.3577***	-3.8785***
		(-237.25)	(-228.51)	(-133.08)
Black				0.0788**
				(2.37)
Asian				-0.2243***
				(-4.66)
Married				0.8469***
				(31.13)
GED				1.5766***
				(56.52)
Associates				1.7084***
				(43.55)
Bachelor				2.5927***
				(76.59)
Advanced Degree				4.0266***
				(85.5)
Number of Children				0.1897***
				(40.38)
Female N Children				-1.6172***
				(-83.56)
Age				1.4434***
				(252.92)
Age2				-0.0159***
				(-236.32)
R-Squared	0.0000	0.0509	0.0615	0.1923
F statistic	0.3	28,183.1	14,590.3	13,154.51
Sample Size	1,053,170	1,053,170	1,050,288	1,050,288

Values in parentheses are t-statistics.
Indicates significance at the 1%(***), 5%(**), and 10%(*) levels.

Source: ipums.org

recession, so more people have to work part time. Ln Other Income had a coefficient of -.4096 and was significant at the one percent level. This value makes sense because it illustrates the income effect (as opposed to substitution effect). As one gains more money, he or she will choose more leisure and work fewer hours. Wage Rate was not significant. A reason for this could be collinearity with relative Wage Rate. A simple correlation test between these two variables indicated a value of .5924. There is some collinearity there. Another explanation is that labor theory suggests that a change in the wage rate will produce two effects, an income effect and a substitution effect. Since these two effects are offsetting (one positive and the other negative), the net effect of a wage change on hours worked could be insignificant. Finally, in model 4, all of the demographic variables that affect ones indifference curve are included. That ends up with an equation of:

$$Usual\ Hours\ Worked = \beta_0 + \beta_1\, Relative\ Wage\ Rate + \beta_2\, Female + \beta_3\, Wage\ Variables + \beta_4\, Demographic\ Variables + e \quad (4)$$

Throughout all four of these models (excluding Model 1), Relative Wage Rate remains significant and negative ranging from -.0421 to -.1667. The magnitude of these results are small but are similar to Perez Asenjo (2011). A reason for this small magnitude could be that the effect of Relative Wage Rate occurs at the margin of joining the labor force or not. A decrease in Relative Wage Rate might entice a family member to join the labor force more than enticing the individual to work more hours. Often, an individual's hours of work are much more fixed in the short-term compared to joining the labor force. Another reason could be an opposing effect illustrated through efficiency wage since some firms pay workers above market wage in order to motivate workers (Summers 1998). If payment of higher "efficiency" wages motivates some workers to work more hours, this would counter the relative wage argument that underlies my paper.

However, the consistency of the Relative Wage Rate sign verifies the robustness of the result. Furthermore, this agrees with prior research and the hypothesis of this paper. This paper predicted that as Relative Wage Rate decreases, people will work more because people are concerned about their status. Thus, they will attempt to work more hours when they fall below their reference group's wages. Although for salaried workers, hours of work has no immediate

bearing on income, it has the potential to have an effect on future promotions (Bell and Freeman 2001). Thus, this result is applicable to both salaried and non-salaried workers.

Other demographic variables that are included as control variables are also significant. Female has a negative coefficient because often males are the primary workers within a family. Thus often women work part time or less hours. Education has a positive and significant coefficient for each of the dummy variables because people with more education generally work more. N Children was positive because people with children have to work more because they need to support another person. Female N Children had a negative coefficient because women with children may work less hours in order to take care of their children. Moving also is significant and positive at 1.5555 which is consistent with what Frijters and Leigh (2008) found. In addition, my results show that individuals work more at a decreasing rate as they get older since Age was 1.4434 and Age2 was -0.0159.

VI. Conclusions

Data was collected from the Integrated Public Use Microdata Series. It came from the CPS collected from years 2004 to 2013. I expand on prior literature by adding another variable to explain labor supply. Traditional labor supply studies do not include variables that reflect a person's relative position in the income distribution. Recently, some studies have examined the relationship between labor supply and relative income. I advance on that by using a slightly different variable to represent this relative effect, Relative Wage Rate. As predicted, Relative Wage Rate has a negative relationship (and significant) with Usual Hours Worked in three of the four models. This finding is consistent with prior literature. One interesting note is that the Relative Wage Rate became significant when the female variable was included as a control variable in Model 2.

Pérez-Asejo (2011) finds a negative relationship between relative income and hours worked. Studies by Neumark and Postlewaite (1998) and McBride (2001) also find results that follow this trend. My results are very consistent with these except that I use a relative wage measure rather than relative income.

I also found significant variables with the expected signs for many of the control variables, for both the budget line and indifference curves. An interesting result of the study is that the relative wage variable is a significant predictor of hours worked regardless of

specification, except for the simple regression in model one. This suggests that it is important to control for demographic factors, especially gender, when determining the effect of one's relative position in the wage distribution on hours worked as it helps to further narrow down the reference group.

This study has a variety of policy applications. The government could take this into account when dealing with redistributive taxes. Redistributive taxes affect the relative income of a group. Thus, besides the redistribution of income, work effort might change which might be needed to be taken into account. Furthermore, this study could help firms decide competitive wages of individuals. An individual's labor supply schedule is not solely determined by the individual's needs but also by rank within a reference group. Thus, a firm needs to take wages outside the company into account in order to get the highest productivity out of workers.

This paper could be furthered in a number of ways. If an individual's reference group is determined by a smaller geographical region analysis of regions such as a neighborhood or school district would get more specific results. Another possible expansion on this topic could use a panel data structure and study how those people respond to changes of their peers.

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