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Determinants of Labor Force Participation of Older Married Men in Taiwan

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Abstract

As the proportion of older population increases in Taiwan, issues related to older individuals' labor market behavior attract public attention. During 1988 to 2008, labor force participation rate of older married men declined about 10 percentage points. This paper tries to identify the determinants of older married men's labor force participation in Taiwan. We use data from Manpower Survey and Manpower Utilization Survey from 1988 to 2008. The sample comprises 51,730 observations of married men aged 55-64. Decompositions with methodologies of Oaxaca (1973) and DiNardo et al. (1996) are conducted for explaining the decline in labor participation rate of older married men. The results indicate that the increase in wives' labor force participation increases husband's likelihood of participation and has prevented aggregate husbands' participation rate from declining to the extent of about 1 percentage point. However, regional unemployment rate negatively affects husbands' likelihood of participation and explains at least 3.5 percentage points of the total decline in husbands' participation rate.

1. Introduction

Today in Taiwan, more middle aged men decide to leave the labor force than was the case 30 years ago. Between 1978 and 2008, labor force participation rate of men aged 55-64 years in Taiwan decreased from 88.6% to 60.3%. This large decline has motivated this paper as we investigate labor force participation rate of older men in Taiwan, and try to answer the questions "why fewer older men are participating in the labor force in recent years?" and "what factors might be responsible for this decline?" Based on previous literature and data characteristics, we then focus on two possible answers: (1) increase in their wives' labor force participation; and (2) local labor market shocks.

One possible conjecture is that labor participation decisions of husbands might have been affected by the increase in the rate of married women's labor participation. Since the 1980s, the increase in female labor force participation rate has been one of the most significant demographic changes in almost every developed and developing country. Review of economic theories and extant empirical literature suggests that married women's labor force participation might affect their husbands' behavior through either income effect or shared leisure effect. To capture this effect, we consider a family context model and try to examine how a wife's labor participation decision determines that of the husband. Also, what proportion of change can it account for?

The local labor market conditions could be another factor affecting older men's labor force participation decisions. Local labor market shocks can influence those already in the labor market as well as potential participants. During an economic downturn, older men might experience some shocks such as job loss or wage cut which may change their attitude towards participating in the labor force. Also, not every county level unemployment rate follows the aggregate trend, and indeed unemployment rates vary among different counties in Taiwan. So we can identify different local labor market conditions by exploiting differences in regional unemployment, at the county level. Here we use county level unemployment rates in each year as a proxy for local labor market conditions. And we try to answer whether a higher unemployment rate discourages older people from participating in labor markets. Also, how large is the change in older men's labor force participation rate after an increase in local unemployment rate?

To sum up, this paper specifies and estimates a labor force participation decision model to explain the decline in older men's labor force participation rates. Pooled cross-sectional data from the Manpower Survey and Manpower Utilization Survey in Taiwan for the period from 1988 to 2008 is used. 51,730 married men aged 55-64 were selected as analysis sample. We construct a probit and a bivariate probit model to describe older men's labor market participation decisions. For examining wives' effect in the model, we follow Schirle (2008) to exploit older women's cohort effects to identify effects of wives' participation on their husbands in the model. Furthermore, for examining the effects of local labor market shocks, unemployment rates of different counties in each year are input as an independent variable in the models. Besides estimating the marginal effects of determinants in individual decision models, we decompose the overall older men's participation rate in our sample.

The next section presents the background for this paper including the related empirical literature. Section III outlines the theoretical model of older men's participation decisions. Section IV describes the data. Section V provides details of empirical specifications and methodology of bivariate probit and decomposition. Section VI presents empirical results, and decomposition results. The last section concludes the paper.

2. Background and Literature

Family labor force participation often refers to a family joint utility model or a

bargaining model. A joint utility model assumes that family members maximize their joint utility over total consumption and individual leisure subject to budget constraints. So, older men make their retirement decisions based not only on their own preferences, benefits and opportunity costs, but also take family income and household consumption into account (Blundell and MaCurdy, 1999; Ehrenberg and Smith, 2009). Another alternative way to look at family labor participation is to use a bargaining model. The bargaining model treats married couples' decisions as the consequences of bargaining. The bargaining power of each spouse is determined by his or her threat point. McElory and Horney (1981) noted that the existence of a threat point can relax some limitations of the joint utility model.

Most family retirement literature use longitudinal data and construct a dynamic model, and most of them have found that social security incentives and retirement dates of wives have strong influence on older men's participation in labor force (see Blau (1998), Blau and Riphahn (1999)). However, Gustman and Steinmeier (2000) investigated causes of joint retirement decisions, and their results revealed that a wife's retirement decision was not strongly influenced by the husband's, but the husband's retirement decision was indeed strongly influenced by the wife's. Gustman and Steinmeier (2004) exploited a measure of how much the couples enjoy their time with each other, on retirement, to simulate retirement behaviors. They found that interdependence of a husband's and wife's retirement decision exists. Moreover, husbands are more likely influenced by their wives' retirement status than their wives. Coile (2003) used Health and Retirement Survey (HRS) in the U.S., and found that men were very sensitive to their spouses' retirement incentives like social security and private pension but women were not.

Some studies rely on cross-sectional pooled data which have larger sample sizes and alternative viewpoints. For example, Zweimuller et al. (1996) used a bivariate probit to study the probability of interdependence between retirement decisions of spouses from Austrian data. They found the magnitude of husbands' reactions to changes in wives' minimum retirement age to be large. Their results revealed an asymmetry that husbands respond to changes in wives' retirement age but wives' do not respond to change in husbands' retirement age. Schirle (2008) used data from the United States, Canada and the United Kingdom to study labor force participation rate of older men. Schirle (2008) found that at least 25 percentage points increase in older married men's participation rate since mid-1990s can be explained by the increase in their wives' labor force participation.

Economic conditions, especially labor market conditions, might also play an important role in older men's participation decisions. Previous studies reveal that bad labor market conditions reduce older men's labor participation probability. That is, probability of labor participation increases when the local unemployment rate falls. Coile and Levine (2007) examined how labor market condition, i.e. the regional unemployment rate, affects individuals' retirement decisions. They found a 3 percentage points increase in unemployment rate raises the retirement probability by about 5 to 10 percentage points. Hallberg (2008) studied old workers' retirement decisions in Sweden emphasizing demand side factors. The study indicated that a downturn in aggregate industry employment increases early retirement probability, particularly in the public sector. Sung and Ahn (2006) examined determinants of decisions of older persons to work in Korea, and they found that the local unemployment rate had a strong negative effect on employment probability of individuals aged 45 and older.

Many empirical studies employ a joint family utility model and focus on studying female labor supply in Taiwan. Huang (2007) studied retirement age from a family point of view by using the Manpower Survey of 1997. The main finding of Huang (2007) showed that retirement age would depend on spouse's expected retirement age and family income. San (1988) and Chuang and Lin (2006) both found the effect of wife's wage elasticity on

husband's labor supply it was larger than the effect of husband's wage elasticity on wife's labor supply. That is, wife's wage strongly influenced husband's labor supply but husband's wage only had a smaller effect on wife's labor supply.

The main contribution of this paper is that we extend the literature on older men's labor force participation in Taiwan in three aspects. First, we use a family labor supply model and a bivariate probit specification to estimate determinants of husbands' labor force participation decisions. Second, we focus on the contribution of regional labor market shocks on labor force participation rate, a really important issue that has not been addressed before. Finally, the methodologies in Oaxaca (1973) and DiNardo et al. (1996) are employed to determine what proportion of the trend can be explained by these two factors, i.e. wife's participation effect and regional labor market conditions, besides other personal characteristics.

3. Empirical Model

We consider a classical static labor supply model in a family context which is similar to Schirle (2008).

$$L_{it}^{H*} = L_{it}^{W}\gamma^{H} + X_{it}^{H}\beta^{H} + X_{it}^{W}\beta^{HW} + X_{it}^{family}\beta^{HF} + un_{it}\beta^{HU} + \varepsilon_{it}^{H}$$

$$L_{it}^{H} = 1 \text{ if } L_{it}^{H*} > 0, \text{ and } L_{it}^{H} = 0 \text{ if } L_{it}^{H*} \leq 0, \text{ and}$$

$$L_{it}^{W*} = X_{it}^{H}\beta^{WH} + X_{it}^{W}\beta^{W} + X_{it}^{family}\beta^{WF} + un_{it}\beta^{WU} + Z_{it}^{W}\beta^{WZ} + \varepsilon_{it}^{W},$$

$$L_{it}^{W} = 1 \text{ if } L_{it}^{W*} > 0, \text{ and } L_{it}^{W} = 0 \text{ if } L_{it}^{W*} \leq 0 \tag{1}$$

where L_{it}^{H} and L_{it}^{W} are husband's and wife's labor force participation status, respectively; X_{it}^{H} and X_{it}^{W} are husband's and wife's personal characteristics vector, respectively; X_{it}^{family} is family common characteristics vector, and un_{t} is local labor market conditions vector, Z_{it}^{W} is cohort effects for wife only, and ε_{it}^{H} and ε_{it}^{W} are random disturbances.

Under a family joint decision making setting, it is very likely that a husband takes his wife's labor force participation decision into account when making his own labor participation decision. A husband's decision might also be affected by his wife's individual characteristics like age, educational attainment, etc. Thus, wife's choice of labor force participation L_{it}^{W} and her individual characteristics X_{it}^{W} are both included in the husband's labor force participation equation.

Notice that in Equation (1) factors affecting wife's labor force participation are very similar to the husband's except the husband's labor force participation status L_{it}^{H} is not in wife's labor force participation equation, and a cohort effects variable, Z_{it}^{W}, is added.

Several reasons explain the absence of husband's labor force participation status in the wife's utility function. First, from the empirical studies we discussed earlier, like Gustman and Steinmeier (2000), Gustman and Steinmeier (2004), Coile(2003), and Zweimuller et al. (1996), wife's retirement decision is not strongly influenced by the husband's. Second, if a husband's labor force participation decision enters into his wife's decision function, the empirical specification will be logically inconsistent when both husband and wife's decisions are jointly modeled. This is the so-called logically inconsistent problem (see Maddala, 1983). The main problem is that the sum of the likelihoods is not equal to one unless wife's participation status variable, L_{it}^{W}, is not included in the husband's decision equation.

Here we add one more variable (cohort effects Z_{it}^{W} based on Schirle, 2008) in wife's

decision function but not in the husband's. The wife's cohort effects are used as an exclusion restriction. This exclusion is like an instrumental variable in linear models which can identify the husband's decision function. Wives' labor force participation rates of different cohorts at age 35 (Z^W) is the exclusion restriction which requires no correlation with the error term applied in the husbands' decision function. In fact, going by theory, young husbands would consider retirement decisions taking into account their own and their wives' labor market productivity, and wealth, but not the cohort's participation rate of their wives. Therefore we assume that the cohort effects do not directly influence husbands' decisions. Cohort effect Z^W represents working arrangement of a wife's cohort but needs to have enough variation across different cohorts.

The Equation (1) can be taken as an application as in Wooldridge (2002) section 15.7.3, a case where the probit model contains a binary explanatory variable that is endogenous. We assume Z_{it}^W is uncorrelated to ε_{it}^H, and $(\varepsilon_{it}^H, \varepsilon_{it}^W)$ is distributed as bivariate normal with mean zero, each has unit variance, and $\rho = Corr(\varepsilon_{it}^H, \varepsilon_{it}^W)$. If $\rho = 0$, these two equations can be regarded as two independent probit models and estimated separately. If $\rho \neq 0$, then ε_{it}^H and ε_{it}^W are correlated, which means estimates of γ^H and β^H in the single probit model for Equation (1) are inconsistent. Thus the bivariate probit method provided by Maddala (1983) and Wooldridge (2002) will be used.

We apply decomposition methods from Oaxaca (1973) and DiNardo et al. (1996) to decompose the effects from wife's labor force participation status, personal characteristics and other variables. Basically, a counterfactual probability is first constructed for each year in the sample period by using the estimated coefficients of 1988. For example, the counterfactual probability in 1989 is $\overline{LF}_{89}^{88} = \overline{X}_{89}\hat{\beta}_{88}$, where $\overline{X}_{89}$ is the vector of sample means for independent variables in 1989, and $\hat{\beta}_{88}$ is the coefficient of X in 1988. Then, the differences in counterfactual and real probabilities reveal the percent change that can be attributed to the unexplained part of variable X.

The Oaxaca decomposition emphasizes first moment differences and coefficient differences between two groups. However in nonlinear functions like bivariate probit model, Oaxaca decomposition is problematic since it is parametric. So we apply a semi-parametric DiNardo-Fortin-Lemieux Decomposition which follows a similar spirit and can be easily applied in nonlinear models.

4. Data

The data for this paper come from the Manpower Survey and the Manpower Utilization Survey. In January 1978, the survey began to interview civilian population over 15 years old in randomly selected households of all 23 counties and cities in Taiwan. The questionnaire includes information such as individual characteristics, labor force status, working conditions, reasons of nonparticipation, reasons of unemployment, etc. Also, once a year, in May, a supplementary survey, the Manpower Utilization Survey, is conducted with the same sample. It has more information about reasons of leaving the labor market. So we use the available yearly datasets of these two surveys for this study.

We matched heads of households and spouses of heads to identify couples, and selected males who were married and were aged 55 to 64 in the period 1988 to 2008. The Labor Standards Act in Taiwan says "A worker may apply for voluntary retirement if he attains the age of fifty-five and has worked for fifteen years," though most social security benefits and pensions for the elderly start at age 65. Therefore, for simplifying the analysis, age group between 55 and 64 was chosen. Until 1988 the survey did not include the information of

number of children in households. Therefore, only data from 1988 onwards were used.

The key dependant variable is labor force participation status. We also include several independent variables in the data set. First, we divide educational attainment into seven categories. Number of children is provided in the data set. We also construct a variable which measures cohort-specific participation rates at age 35. Women born in 1920-69 are classified into five ten-year cohorts. County-level unemployment rate is also included. The unemployed population is divided by the population in the labor force for each county in each year to get the county-level unemployment rates.

The descriptive statistics are reported in Table 1. In our sample, we had 51,730 observations for the period 1988-2008. As we can see, labor force participation rate of married men declined 8 percentage points from 1998 to 2008 in the full sample (i.e. 0.71 to 0.63). It decreased by 11 percentage points (i.e. 0.64 to 0.53) for those whose spouses were not in the labor force. As noted earlier, we focus on the increase of female labor force participation for explaining the trend in male labor force participation. Here we can find that labor force participation rate of spouse rose 7 percentage points (0.32 to 0.39) between 1988 and 2008.

5.   Empirical Results

Older men's labor force participation is taken as a dependant variable. Wife's participation decision, own education level, own age, number of children, wife's education level, interviewed year, and county are treated as dummy covariates, while local unemployment rate and spouse's age are treated as numerical covariates.

Results of probit and bivariate probit estimates are shown in Table 2. The marginal effects in second and fourth column are calculated at mean for numerical variables, effects for dummy variables are evaluated at zero to one by using the methodology of Anderson and Newell (2003) and Greene (2008). The estimate results first suggest that if the wife is in the labor force, the probability of husband's participation would significantly increase; about 18 percentage points in probit model, and 6 percentage points in bivariate probit model. This result indicates shared leisure effects are larger than income effects, that is, wife's participation might negatively affect husband's likelihood of participation.

However, there is a 12 percentage points difference between the marginal effect of probit and bivariate probit model. The single probit model could overestimate marginal effect of the wife's participation because it ignores the correlation between ε_{it}^{H} and ε_{it}^{W}, in the single probit model, ε_{it}^{W} is in the husband's decision function, and estimates of the coefficient of wife's effect include both the real coefficient and correlation ρ between ε_{it}^{H} and ε_{it}^{W}. Hence, estimates from the bivariate probit model which takes this correlation into account is more reliable and give us more consistent estimations.

Another important effect for older married men is regional unemployment rates. A one percentage point increase in regional unemployment rate decreases older men's likelihood of participating by 1.5 and 1.7 percentage points for probit and bivariate probit models, respectively. This effect of labor market condition is significant. It implies that higher regional unemployment rate discourages older men from either entering or staying in the labor market.

Decomposition of the probit model is presented Table 3. Participation rate of married men declines 8.4 percentage points which can be attributed to changes in wives' participation (-19.05 percent), to changes in unemployment rate (66.51 percent), and finally to unexplained part (54.48 percent). The negative percentage points in wife's participation effect means if the participation rate of wives did not rise (remained unchanged in 1988), labor force participation rate of their husbands would have decreased .016 (19.05 percent of total change). The results show that changes in couples' characteristics and family status can explain only a

little.

The methodology of DiNardo-Fortin-Lemieux (DFL) decomposition from DiNardo et al. (1996) is more proper for a nonlinear model because it is semi-parametric and provides more nonlinear properties. Applying the primary order from changes in unemployment rate, men's characteristics, and wives' participation, the results are shown in Table 4. The first column of Table 4 is the decomposition result of probit model and the second column is decomposition result of bivariate probit model. We found that the DFL decomposition has results similar to Oaxaca decomposition ones.

The labor force participation trends, real and counterfactual, from the probit model between 1988 and 2008 are plotted in Figure 1. It shows that if in 1999-2004, wives' participation rate and characteristics were the same as 1988, the hypothetical labor force participation rate would increase and vice versa. Also it is noteworthy that after holding the regional unemployment rate constant at 1988 level, the hypothetical labor force participation rate would increase significantly. Changes in regional unemployment rate can explain changes in labor force participation rate since 1996. It means without the labor market shocks so far, the labor force participation rate would be even higher.

6. Conclusion

As the proportion of the older population increases in Taiwan, issues of older individuals' behavior attract public attention. During 1988 to 2008, labor force participation rate of older married men declined over 10 percent. In this paper, we try to identify the determinants of older married men's labor force participation in Taiwan, and to explain the 10 percentage points decline. Data from Manpower Survey and Manpower Utilization Survey from 1988 to 2008 were used, and only married men aged 55-64 are selected. The sample size was 51,730.

Probit and bivariate models were used for labor participation decisions of older married men, and decompositions used are from methodologies of DiNardo et al. (1996) and Oaxaca (1973). The results indicate that wife's participation decision increases husband's likelihood of participation, and regional unemployment rate negatively affects husband's likelihood of participation. In addition, the increase in wives' labor force participation rate has prevented husband's labor force participation rate from declining to the extent of about 1 percentage point (-8 percentage points of total decline). The results also show that at least 3.5 percent or 40 percent of the total reduction in labor force participation rate of older married men during 1988 to 2008 can be explained by changes in regional unemployment rates.

These results provide another perspective for policy makers. That is, instead of worrying about the decline in older men's labor force participation, the one of the key factor is to reduce regional unemployment rates. In fact, many older men might be willing to work but encounter a job loss during economic downturns, especially blue collar or people with lower educational backgrounds. In this situation, they might decide to exit the labor market. Therefore, future policy analysis can or at least should focus on addressing regional labor market conditions, or on helping discouraged workers reenter the labor market.

References

Anderson, Soren and Richard G. Newell (2003) "Simplified Marginal Effects in Discrete Choice Models" *Economics letters* 81,321-326.

Blau, David M. (1998) "Labor Force Dynamics of Older Married Couples" *Journal of Labor Economics* 16, 595-629.

Blau, David M. and Regina T. Riphahn (1999) "Labor Force Transitions of Older Married Couples in Germany" *Labour Economics* 6, 229-252.

Blundell, Richard and Thomas MaCurdy (1999) "Labor Supply: A Review of Alternative Approaches" *Handbooks in Economics* 5, 1559-1696.

Chuang, Hwei-Lin and Eric S. Lin (2006) "The Evolution of the Empirical Study of Taiwan's Female Labor Supply" *Taiwan Economic Review* 34, 119-172.

Coile, C. (2003) "Retirement Incentives and Couples' Retirement Decisions" *NBER Working Papers*.

Coile, Courtney C. and Phillip B. Levine (2007) "Labor Market Shocks and Retirement: Do Government Programs Matter?" *Journal of Public Economics* 91, 1902-1919.

Council for Economic Planning and Development, Executive Yuan (2008) *Population Projections for Taiwan Areas: 2008-2056*.

Council for Economic Planning and Development, Executive Yuan (2009) *Taiwan Statistical Data Book*.

DiNardo, John, Nicole M. Fortin and Thomas Lemieux (1996) "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach" *Econometrica* 64, 1001-1044.

Ehrenberg, Ronald G. and Robert S. Smith (2009) *Modern Labor Economics: Theory and Public Policy*: Addison-Wesley.

Greene, William H (2008) *Econometric analysis*: Prentice Hall Upper Saddle River, NJ.

Gustman, Alan L. and Thomas L. Steinmeier (2000) "Retirement in Dual-career Families: a Structural Model" *Journal of Labor Economics* 18, 503-545.

Gustman, Alan L. and Thomas L. Steinmeier (2004) "Social Security, Pensions and Retirement Behavior within the Family" *Journal of Applied Econometrics* 19, 723-737.

Hallberg, Daniel (2008) "Economic Fluctuations and Retirement of Older Employees" *IFAU Working Papers*.

Huang, Li-Jing (2007) "Household Factors on Personal Expectancy of Retirement Age" Graduate Institute of Industrial Economics, National Central University.

Maddala, G. S. (1983) *Limited-dependent and qualitative variables in econometrics*: Cambridge University Press. Cambridge, GB.

Oaxaca, Ronald (1973) "Male-female Wage Differentials in Urban Labor Markets" *International Economic Review* 14, 693-709.

San, Gee (1988) "Family Labor Supply with Income Taxes in Taiwan" *Taiwan Economic Review* 16, 251-267.

Schirle, Tammy (2008) "Why Have the Labor Force Participation Rates of Older Men Increased since the Mid 1990s?" *Journal of Labor Economics* 26, 549-594.

Sung, Jai-Mie and Jo-yup Ahn (2006) "Determining Factors of Older Workers' Employment. *Labor Policy Research* 6, 39-74.

The Directorate General of Budget, Accounting and Statistics (DGBAS), 1978-2008, Manpower Surveys, Survey Research Data Archive, Academia Sinica.

The Directorate General of Budget, Accounting and Statistics (DGBAS), 1978-2008, Manpower Utilization Survey, Survey Research Data Archive, Academia Sinica.

Wooldridge, Jeffrey M. (2002) *Econometric analysis of cross section and panel data*: The MIT press.

Zweimuller, Josef, Rudolf Winter-Ebmer and Josef Falkinger (1996) "Retirement of Spouses and Social Security Reform" *European Economic Review* 40, 449-472.
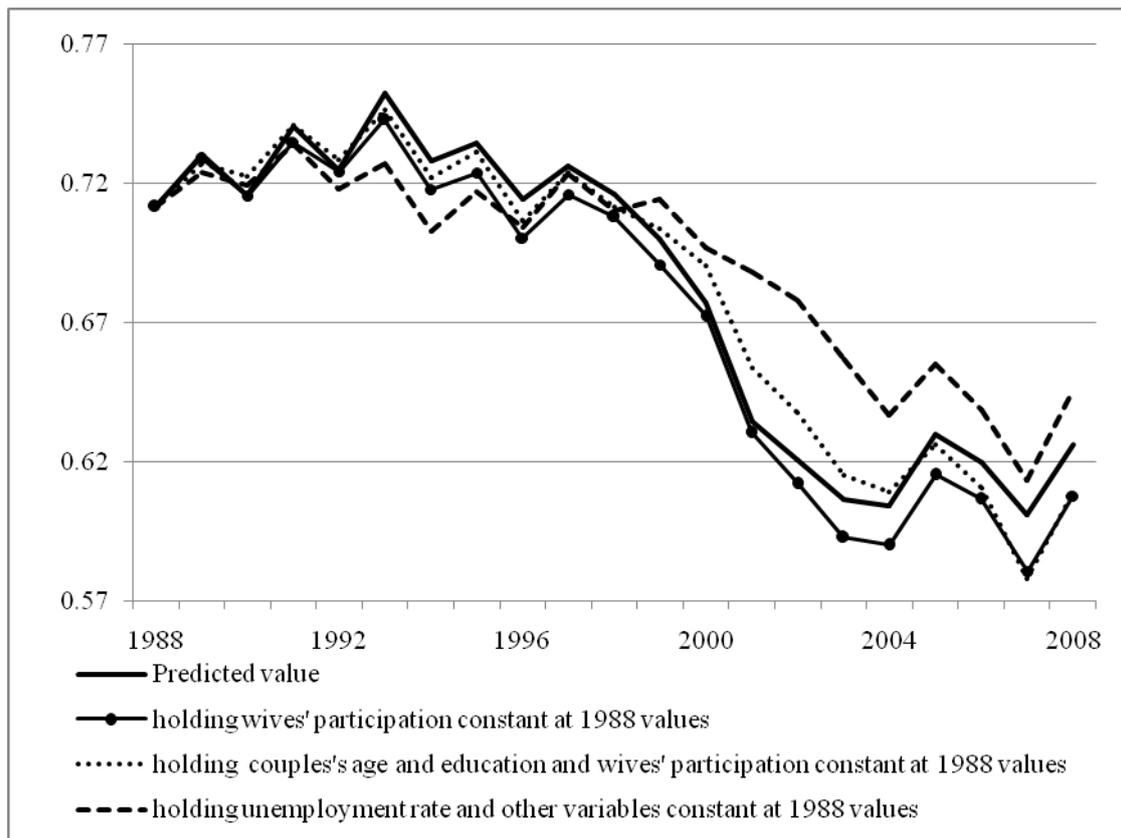
Figure 1: Participation Rate and DFL Decomposition, Probit

Table 1 Mean Characteristics of Married Men Aged 55-64, Taiwan

Age 55 to 64	All Married Men			Wife in Labor Force		Wife Not in Labor Force	
	All	1988	2008	1988	2008	1988	2008
Participation rate	0.68	0.71	0.63	0.86	0.77	0.64	0.53
Age	59.29	59.06	58.90	58.53	58.38	59.32	59.24
Education:							
No school	0.10	0.15	0.01	0.17	0.01	0.14	0.01
Elementary School	0.53	0.53	0.42	0.54	0.39	0.53	0.43
Junior high school	0.12	0.12	0.15	0.11	0.14	0.12	0.16
High school	0.14	0.11	0.21	0.09	0.24	0.12	0.19
College	0.05	0.04	0.08	0.05	0.09	0.04	0.08
University degree	0.06	0.04	0.11	0.04	0.11	0.04	0.11
Graduate/professional degree	0.009	0.002	0.027	0.001	0.022	0.003	0.029
Spouse:							
In the labor force	0.36	0.32	0.39	1	1	0	0
Age	55.55	55.01	55.29	54.27	54.43	55.35	55.84
Age difference	4.00	4.31	3.82	4.48	4.10	4.23	3.63
No school	0.27	0.43	0.03	0.46	0.03	0.41	0.04
Elementary School	0.51	0.45	0.50	0.40	0.45	0.48	0.54
Junior high school	0.09	0.06	0.14	0.05	0.14	0.07	0.14
High school	0.11	0.08	0.17	0.07	0.20	0.09	0.16
College	0.02	0.01	0.05	0.03	0.06	0.003	0.05
University degree	0.02	0.00	0.07	0.01	0.07	0.002	0.07
Graduate/ professional degree	0.002	0.0004	0.006	0.001	0.008	0	0.006
Number of children	3.53	4.06	2.78	3.95	2.69	4.11	2.83
Number of observations.	51,730	2,199	2,639	701	1,039	1,498	1,600

Source: Constructed using the Manpower Survey and Manpower Utilization Survey1988-2008.

Table 2 Results of Probit and Bivariate Probit
(Men's Labor Force Participation)

	Probit		Bivariate Probit	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Wife participation in the labor force	0.575**	0.188**	0.543**	0.062**
	(.014)	(.004)	(.021)	(.003)
Unemployment Rate, county level	-4.420**	-1.529**	-4.391**	-1.757**
	(1.005)	(.347)	(1.003)	(.120)
Education:				
Elementary school	0.068**	0.023**	0.067**	0.026**
	(.022)	(.008)	(.022)	(.003)
Junior high school	0.037	0.013	0.038	0.014
	(.027)	(.009)	(.027)	(.003)
High school	0.053	0.018	0.054	0.019
	(.033)	(.011)	(.032)	(.004)
College degree	0.007	0.002	0.009	0.000
	(.035)	(.012)	(.035)	(.004)
University degree	0.210**	0.069**	0.211**	0.069**
	(.037)	(.011)	(.037)	(.004)
Graduate/professional degree	0.649**	0.179**	0.646**	0.190**
	(.079)	(.016)	(.079)	(.009)
Wife's education:				
Elementary school	-0.005	-0.002	-0.005	-0.004
	(.014)	(.005)	(.014)	(.002)
Junior high school	0.014	0.005	0.014	0.003
	(.024)	(.008)	(.024)	(.003)
High school	0.072**	0.024**	0.071**	0.026**
	(.028)	(.009)	(.028)	(.003)
College degree	-0.171**	-0.062**	-0.170**	-0.046**
	(.044)	(.017)	(.044)	(.005)
University degree	-0.207**	-0.075**	-0.208**	-0.064**
	(.050)	(.019)	(.050)	(.006)
Graduate/professional degree	-0.076	-0.027	-0.067	0.001
	(.146)	(.052)	(.145)	(.017)
Age	-0.113**	-0.039**	-0.113**	-0.043**
	(.003)	(.001)	(.003)	(.000)
Wife's age	0.012**	0.004**	0.012**	0.003**
	(.002)	(.001)	(.002)	(.000)
Number of children	0.018**	0.006**	0.018**	0.006**
	(.005)	(.002)	(.005)	(.001)
Constant	5.947**		5.857**	
	(.142)		(.150)	
ρ			0.070**	
			(.340)	
Number of observations	51730		51730	

Note: The dependent variable is husband's participation in the labor force. Standard errors are in parentheses. Full sets of year dummies and county dummies are included in the models. ** is a 5% significant level.

Table 3 Results of Oaxaca Decomposition

	Probit
Participation rate, 2008	0.626
Participation rate, 1988	0.711
Total change	-0.084
Effect of :	
Change in men's characteristics	0.002
	-2.28%
Change in wives' characteristics	0.001
	-0.99%
Change in wives' participation	0.016
	-19.05%
Change in family status	-0.001
	1.33%
Change in unemployment rate	-0.056
	66.51%
Unexplained	-0.046
	54.48%

Note: The dependent variable is husband's participation in the labor force. Men's characteristics include husband's age and education dummies. Women's characteristics include wife's age and education dummies. Family status represents numbers of child.

Table 4 Results of DiNardo-Fortin-Lemieux Decomposition

	Probit	Bivariate Probit
Predicted Participation rate, 2008	0.626	0.584
Predicted Participation rate, 1988	0.712	0.681
Total change	-0.085	-0.097
Effect of :		
Change in unemployment rate	-0.035	-0.039
	41.14%	40.54%
Change in characteristics	0.000	-0.004
	0.52%	3.62%
Change in wives' participation	0.016	0.008
	-18.52%	-8.41%
Unexplained	-0.066	-0.062
	76.86%	64.25%

Note: The dependent variable is husband's participation in the labor force. Men's characteristics include husband's age and education dummies Women's characteristics include wife's age and education dummies.