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THE EFFECT OF INTERRUPTIONS AND PART-TIME WORK ON WOMEN'S WAGE RATE: A TEST OF THE VARIABLE-INTENSITY MODEL

BY

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1 INTRODUCTION

Cross-sectional analyses usually show men's wage rates to be higher than women's. Different explanations have been put forward to explain this phenomenon. First, the gross wage rate differential can be ascribed to differentials in 'work-related skills.' However, these differentials can explain only part of the overall wage rate differential. A second explanation relates to labour market discrimination. A third explanation, which is discussed at length in this article, points to differences in the life-time labour supply of men and women. After leaving school, with the exception of time spent on military service, loss of working time due to health problems or additional training, men are usually continuously present in the labour market. Women on the contrary often take direct responsibility for household duties and the care of children. Therefore their labour supply profile is characterized by one or more interruptions in their labour market career. Besides, if they participate in the labour market, they often work only part-time. Related to these differences are differences regarding investments in 'on-the-job training' between men and women.

The effect of the deviant labour supply profile on women's wage rate is twofold. First, as a woman does not work during certain periods, less working experience is accumulated. Second, during periods of non-participation, the human capital stock suffers from additional depreciation due to a lack of maintenance. This effect is known as atrophy. Atrophy (literally: languishing) means the loss of market-oriented knowledge as a consequence of 'non-use.' For reasons of convenience, the loss because of changing circumstances, for instance technological development, is also labeled atrophy. This additional depreciation cumulates with the depreciation of the human capital stock due to ageing and wastage.

In this article two theoretical models are presented which both fit into the

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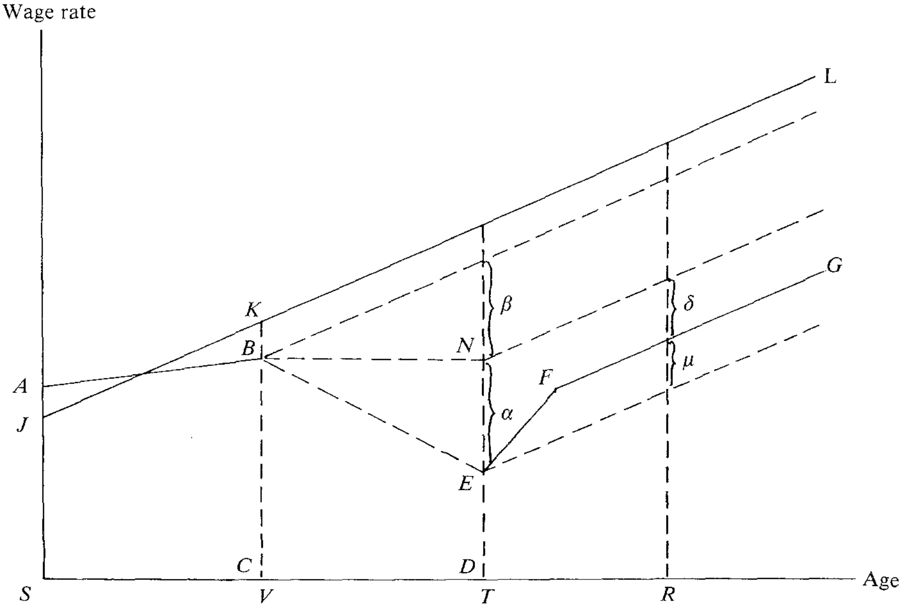
frame of human capital theory. From these theoretical models empirical estimation models are deduced in the form of wage rate equations that couple the wage rate as the variable to be explained with a number of explanatory variables, including education and experience. The first model only regards the difference between participation and nonparticipation and its consequences for women's wage rates. The second model (the variable-intensity model) explicitly takes into account the intensity of participation and its consequences for the accumulation, maintaince and depreciation of human capital stock.

The structure of the article is as follows. Section 2 discusses some theoretical issues concerning accumulation, maintenance and depreciation of human capital stock. Section 3 provides a confrontation of the two models and the deduction of the wage rate equations to be estimated. In section 4 the data and the estimation procedure are described. This section also includes the outcomes of the analysis. The last section summarizes the main conclusions.

2 FORMATION, MAINTAINANCE AND DEPRECIATION OF HUMAN CAPITAL AND DISCONTINUOUS PARTICIPATION: A THEORETICAL FRAMEWORK

Women's labour supply profile is often characterized by a discontinuous path. Besides the distinction between participation and nonparticipation it is possible to distinguish between part-time and full-time participation.

Fig. 1 shows the effects of interruptions in career in comparison with the



Source: Corcoran, Duncan and Ponza (1983, p. 508) (adjusted).

Figure 1 – Wage and rate profiles

wage rate profile of a worker who participates continuously. This last profile is indicated by the line JL.

The line ABCDEFG belongs to the wage rate profile of someone who interrupts his career during the period VT. Regarding this discontinuous participation profile four periods can be distinguished:
- the pre-interruption period (line AB),
- the interruption period (CD),
- the restoration period (EF),
- the post-restoration period (FG).

Between V and T a worker does not participate, so no wage rate can be recorded. Concerning the pre-interruption period we only note the effect of anticipated interruptions. When an interruption is anticipated it is likely that during the pre-interruption period less investments take place than when no interruptions are anticipated.[1] This effect is shown in Fig. 1 by drawing AB less steep than JK.

As market-oriented activities are suspended for a longer period, a larger part of human capital stock will be lost due to non-use or lack of maintainance. The path of BE suggests a rather even depreciation of human capital stock. However, the realism of this hypothesis can be questioned. According to some authors especially firm-specific knowledge loses its value, as soon as a worker leaves the company. As a consequence a worker's potential wage rate would fall drastically immediately after his resignation.[2] According to Mincer and Ofek the loss of firm-specific human capital is a 'once and for all phenomenon due to separation from the job.'[3] Afterwards the depreciation mainly concerns general human capital. The line BN shows the path of the potential wage rate if there is no depreciation of the human capital stock during the interruption.

After returning to the labour market a worker will usually have to settle for a lower wage rate than before quitting. Two explanations are possible, both consistent with the profile drawn. The first explanation emphasizes the depreciation of human capital stock during the interruption that has a reducing effect on the wage rate. The second explanation concentrates on imperfect information: a worker's new employer does not exactly know the worker's productivity. Besides, the worker has to search the labour market looking for the job that fits best to his or her capabilities.[4]

1 See for a further analysis Schippers (1987, Ch. 3).

2 It should be remarked that several potential wage rates can be distinguished: (a) within the own company (this is the highest potential wage rate that can be calculated for a worker), (b) within another company in the worker's 'own' branch, (c) within another company in another branch (this is the lowest of all possible potential wage rates). The hypothesis concerning the possible reduction regards the potential wage rate as meant at (b) and (c).

3 Mincer and Ofek (1980, p. 19).

4 See for example Hartog (1981).

The same types of explanation can be given for the so-called 'rebound effect,'[5] which is the phenomenon by which the wage rate shows a fast rise immediately after re-entrance of the labour market (line EF). This rise indicates a rapid restoration and reparation of human capital stock. The first line of explanation holds that during an interruption the market productivity of human capital is affected more strongly than the productivity of human capital in the process of its own reproduction. In other words, knowledge and skills that have been unlearned are rapidly recovered. The second explanation holds that after re-entrance productivity rises rapidly from a low level to a higher one as both employer and employee get more information about which job is most suitable for the employee and offers highest productivity. The 'rebound effect' can for the greater part compensate the short-term depreciation effect, but it can never make up for the 'foregone experience effect.' After some time the 'rebound effect' runs out, after which the post-recovery period starts.

Because of the 'rebound effect' it is necessary to distinguish between the short-term and the long-term depreciation effect. The short-term depreciation effect, which manifests itself at a worker's re-entry in the labour market, will be larger than the long-term depreciation effect, which is the overall effect of an interruption in a worker's career. By way of the 'rebound effect' part of the wage rate loss is compensated. Observations concerning wage rates at point of time T or shortly afterwards, show – unless no depreciation took place at all – a different effect from an interruption than observations around or at point of time R.

The different Greek symbols from Fig. 1 should be interpreted as follows:

β = long-term effect of experience;
α = short-term effect of an interruption or short-term depreciation effect;
δ = long-term effect of an interruption or long-term depreciation effect;
μ = 'rebound effect' or short-term recovery effect.

The meaning of δ might need some explanation. If during a career interruption no depreciation of human capital stock takes place, there is no reason why the wage rate at the moment of re-entry should be lower than the wage rate at the moment of resignation. In that case 'rebound' and short and long-term depreciation effects fail to come up. At point of time R the difference between the situations with and without depreciation is equal to the distance δ.

3 THE CLASSICAL EARNINGS FUNCTION AND THE VARIABLE-INTENSITY MODEL

3.1 *Introduction*

This section discusses two specific models that will be used to analyze the effects of career interruptions as distinguished in the last section. In both cases the discussion is about a human capital wage rate equation. A human capital

5 See Corcoran, Duncan and Ponza (1983, pp. 503–510) and Mincer and Ofek (1980, p. 2).

wage rate equation expresses a relation between a worker's human capital stock and the wage rate or the labour income he earns. The variable-intensity model concentrates on the effect of part-time work on worker's wage rates.

3.2 *The Standard Human Capital Model Adjusted for Women*

According to standard human capital theory a worker's wage rate can be explained from the stock of human capital he disposes of. Usually two major components of human capital are distinguished: schooling and experience. Often this distinction is translated into the application of a two-period model, with a first period dedicated exclusively to schooling. During the second period human capital is acquired in the form of experience.

Taking into account the deviant investment pattern for women the two-period model needs modification. Mincer and Polachek[6] have presented such a modified model.[7] From their analysis one can deduce the following earnings function:

$$ln\ Y_t = ln\ Y_0 + r \cdot S + r(a_1 - d_1)E_1 + r(a_2 - d_2)E_2 + r(a_3 - d_3)E_3 \qquad (1)$$

with:

Y_t = income in period t
S = number of years of schooling
E = periods of (non-)participation in years
r = rate of return

The terms between the brackets represent the fractions of the different periods spend on human capital investments. The net investment effect is the balance of two separate effects: gross investments (a_i) and depreciation (d_i). So, another year of experience increases human capital stock with a_i. However, during this year part of human capital stock is lost due to depreciation, which results in a net growth of human capital stock of $(a_i - d_i)$.

Usually, instead of labour income the wage rate is taken as the dependent variable, because labour income not only depends on wage rate, but also on working hours. So, the equation that is used for estimation can be written as:

$$ln\ W_t = a + b_0 \cdot S + b_1 \cdot E_1 + b_2 \cdot E_2 + b_3 \cdot E_3 \qquad (2)$$

with:

W_t = gross hourly wage rate

As E_2 is used to indicate a period of non-participation this period will be marked H ('home time') throughout the remainder of this article.

6 Mincer and Polachek (1974, p. S80).
7 See for a description Schippers (1987, Ch. III).

Investigation of the effects of interruptions[8] requires either longitudinal or retrospective data. From equations (1) and (2) it is obvious that one needs at least information concerning a worker's schooling, his current wage rate and his working history.

3.3 *The Variable-Intensity Model*

The model discussed in the last section does not take account of the fact that many women work part-time. As can be seen from equation (2) the model only distinguishes between on the one hand experience acquired before and after an interruption (E_i) and on the other hand the length of the interruption itself. This approach presents two difficulties. First, an arbitrary criteria has to be set to decide whether the number of hours worked is sufficient or not to count a year as a working year (belonging to E_i), or that it has to be considered a year belonging to an interruption (H). Second, and this is the central issue of earlier studies by Levine and Moock[9] and by Jones and Long,[10] this approach does not leave any room to do justice to the effects of part-time work on human capital investments and through this on wage rates.

The effects of part-time work on human capital investments are three-fold. First, from an employer's point of view it is less profitable to offer (on-the-job) training facilities to part-time workers. For when one counts the working hours, the period during which these investments will pay off is shorter for part-time workers than for full-time workers. Second, now from a worker's point of view, for the same reason the pay-off period for investments in general forms of human capital for which the worker himself has to pay completely is shorter. Finally, due to non-use (atrophy) the depreciation rate will be higher for part-time than for full-time workers, though probably not as high as during interruptions.[11]

These arguments lead to the conclusion that the gross investment ratios a_i from equation (1) will be smaller for part-time than for full-time workers, while depreciation ratios d_i will show to be higher for part-time workers. From the combination of these effects we expect the coefficients b_1, b_2 and b_3 from equation (2) to be lower for part-time than for full-time workers.

The variable-intensity model as developed by Levine and Moock, offers a clear hold to incorporate the effects of part-time work directly into the model presented in the last section. The model distinguishes between three activities for which the productive abilities, and thereby potential income (Z_i), can be

8 Total costs (in terms of the wage rate) of a one-year interruption are equal to $b_1 - b_2$ if $b_2 < 0$; the (net) effects of 'foregone experience' and depreciation should be added together.

9 Levine and Moock (1984).

10 Jones and Long (1979).

11 'If part-week work provides for the exercise and maintainance of market skills, then the depreciation of earning power associated with work in the home by women may be reduced.' Jones and Long (1979, p. 564).

used: the generation of money income (Y_i), investments in human capital (C_i) and non-market activities (N_i). If for the time being N_i is set equal to zero and k_i is defined as the ratio between human capital investments and the value of market-oriented activities, one can write:

$$Z_i = C_i + Y_i + N_i \tag{3A}$$

$$k_i = C_i/(C_i + Y_i) = C_i/Z_i \tag{3B}$$

$$Y_i = Z_i - C_i = Z_i(1 - k_i) \tag{4}$$

$$Z_{i+1} = Z_i + r \cdot C_i = Z_i(1 + r \cdot k_i) \tag{5}$$

Levine and Moock introduce the hypothesis that the investment ratio k decreases monotonically from k_o (the value of k at the moment of leaving school) according to [12] :

$$k_i = k_o - k_o \cdot i/T \tag{6}$$

with T = length of the post-school (investment) period.

From (3A) up to and including (6) and taking logs Levine and Moock generate[13]:

$$ln\ W_t = (ln\ Z_{-s} - k_o - ln\ 1875) + r_s \cdot s + (r \cdot k_o + k_o/T)t - (r \cdot k_o/2T)t^2 \tag{7}$$

with: Z_{-s} = potential income at the start of the schooling period
r_s = the rate of return of human capital acquired at school
r = the rate of return of human capital acquired by way of 'on-the-job training'
1875 = number of working hours of a full-time job
t = potential experience (this is the number of years one could have worked after leaving school)

12 Monotonically decreasing investments can be deduced from an optimization model with continuous full-time participation. The main reason for investments to decrease as one gets older is the shortening of the revenue period. See Ben-Porath (1967) and Mincer and Polachek (1974, p. S79). In case of discontinuous participation investments do not need to decrease monotonically; see Mincer and Polachek (1974, p. S81) and Corcoran (1979, p. 219). During the working period before the birth of children investments will be low (to prevent depreciation) and investments will be postponed till the moment of return in the labour market. However, Sandell and Shapiro (1980), Corcoran and Duncan (1979) and Corcoran (1979) do not find this effect in their empirical analyses.

13 Levine and Moock (1984, Appendix).

This equation, where $ln\ Y_t$ has been resolved in $ln\ W_t$ and $ln\ 1875$, can be estimated by way of regression of $ln\ W_t$ on the number of schooling years, potential experience and potential experience squared (and a constant term). As it contains four regression coefficients with five unknown parameters (Z_{-s}, k_0, r_s, r and T) Levine and Moock introduce the hypothesis that $r_s = r$.

In the wage rate equation from (7) the magnitude of the investments for each year i is overestimated with k_iN_i for people who work part-time (which implies $N_i > 0$). Besides, possible variations in the depreciation rate due to variations in the intensity of use of the human capital stock for paid labour are not taken into account. To come to meet these objections Levine and Moock[14] define a second measure - next to k_i - for the magnitude of human capital investments. This measure, q_i, is defined as the ratio between the value of market-oriented activities and potential income, so that:

$$q_i = (Y_i + C_i)/Z_i \tag{8}$$

$$C_i = k_i q_i \cdot Z_i \tag{9}$$

Just as in the case of section 3.2, we have to consider atrophy, that is the depreciation of human capital stock due to non-use. This depreciation is indicated by the symbol d. Total depreciation related to part-time work is equal to the product $\mathrm{d}N_i$, with:

$$\mathrm{d}N_i = d(1 - q_i)Z_i \tag{10}$$

From this we get:

$$Z_{i+1} = Z_i + r \cdot k_{i+1} \cdot q_{i+1} \cdot Z_i - d(1 - q_i)Z_i \tag{11}$$

Taking into account equation (11) we can rewrite (7) as:

$$ln\ W_t = (lnZ_{-s} - k_0 - ln\ 1875) + rs + (r \cdot k_0 + d)\ldots$$

$$\ldots \textstyle\sum_{i=0}^{i=t-1} q_i - (r \cdot k_0/2T) \cdot \sum_{i=0}^{i=t-1} (2i+1)q_i + ((k_0/T) - d)t \tag{12}$$

In equation (12) q_i is operationalized as the ratio of the actual number of hours worked and the number of hours corresponding to a full-time job (1875 hours per year).

3.4 *Estimation Problems*

Before presenting the empirical analyses of the effects of schooling, experience and interruptions (in a given case part-time instead of full-time work) on the

14 Levine and Moock (1984, p. 185).

wage rate, we pay attention to the discussion concerning the most suitable specification of the wage equation.[15] At least three specifications seem possible:

$$ln\ W = a_1 + b_1S + b_2PEX + b_3H \tag{13}$$

$$ln\ W = a_2 + b_4S + b_5P \tag{14}$$

$$ln\ W = a_3 + b_6S + b_7H + b_8EXP \tag{15}$$

with:

W = wage rate
S = number of years of schooling
PEX = potential experience
H = length of the interruption period
P = percentage of the potential experience period devoted to non-paid labour
EXP = actual experience

England[16] prefers specification (15), because the effects of 'foregone experience' and depreciation are better distinguished in this equation. Polachek,[17] however, uses the specifications from (13) and (14). In equation (14) the coefficient (b_5) belonging to P measures a combination of 'foregone experience' and depreciation. A higher percentage on missed experience indicates both more depreciation as well as more 'foregone experience.' For b_3 from (13) an analogous reasoning is possible. When potential experience is kept at a certain level, more 'home-time' (H) implies not only more years of depreciation of human capital, but also that less experience has been acquired. The fact that b_3 reflects the balance of two partial effects can also be deduced from rewriting equation (15). Using the fact that potential experience is the sum of actual experience and the length of the interruption, equation (15) can be written as:

$$ln\ W = a_3 + b_6S + b_8PEX + (b_7 - b_8)H \tag{15'}$$

This implies that $b_2 = b_8$ and $b_3 = (b_7 - b_8)$. The expected signs of b_1 and b_2 ($= b_8$) are positive and the expected sign of b_3 is negative. The sign of b_7 is negative if the absolute value of b_2 is smaller than b_3, and *vice versa.* The coefficent b_3 can be interpreted as a compound effect of an interruption on the wage rate, consisting of (a) the depreciation effect, and (b) the effect of missing

15 See England (1982), Sandell and Shapiro (1980) and Mincer and Polachek (1978).

16 England (1982).

17 Polachek (1981).

experience. The coefficient b_7 reflects the effect of depreciation on the wage rate and b_8 reflects the effect of (missing) experience. Also equation (13) can be rewritten in terms of (15), from which we get:

$$ln\ W = a_1 + b_1S + b_2\ EXP + (b_2 + b_3)H \qquad (13')$$

Once again, $b_2 = b_8$ and $b_7 = (b_8 + b_3)$.

In the current analysis we have chosen to estimate equation (13), as the analysis focuses on the total effect of interruptions on the wage rate. Estimation of equation (13) implies estimation of the effect of interruptions, controlling for potential experience (which is very similar to controlling for age) and schooling, while estimation of (15) implies controlling for actual experience and schooling. Estimation of (15) is preferable if all experience- and 'home-time'-segments can be distinguished separately. However, the available data do not allow such an estimation.

No matter which equation is estimated, some problems arise. First, all variables used are based on retrospective data. This enlarges the chance of measurement errors. A second, serious, but inevitable problem regards selectivity bias, originating from the fact that wage rates are only known for those who participate in paid labour at the time of interview.[18] Besides, there is the possibility of 'simultaneous equation bias.'[19] This bias arises because not all explanatory variables from the model are really exogenous. For instance, total 'home-time' will in part depend on wage rates. The same holds for the experience terms.

4 EMPIRICAL ANALYSIS

4.1 *Introduction*

In this section we present the results of the estimation of the models discussed in the previous section. First, we give a description of the data and discuss the distinction between the subsets used (section 4.2). Section 4.3 contains the results of the empirical analyses.

4.2 *Data*

The empirical analysis is conducted on a Dutch data-set from 1982 by CBS/IVA.[20] We selected only those women who worked at the moment the questioning was carried out and for whom all relevant information was

18 Due to this selectivity bias the depreciation effect will be overestimated; see Corcoran (1979, p. 234). Closely related to this item is the discussion concerning the 'homogeneity hypothesis or dichotomy hypothesis'. Does an average labour force participation rate for women of 50% imply that all women participate about 50% of their lives (homogeneity) or that 50% of all women participate all of their lives, while others do not participate at all (dichotomy)?

19 See Sandell and Shapiro (1980).

20 For more information about the NPAO survey see Heinen and Maas (1984).

TABLE 1 - CHARACTERISTICS OF THE DIFFERENT SUBSETS

Variables	Subsets						
				Age		Education	
	All	Married women	Non-married women	Under 34 years	34 years and over	Less than twelve effective years of schooling	Twelve or more effective years of schooling
Logarithm of the gross wage rate	2.47	2.51	2.42	2.39	2.62	2.41	2.58
Education[a]	10.1	9.7	10.6	10.6	9.1	8.2	13.0
Home-time[b]	5.6	7.1	3.6	1.8	12.6	7.6	2.4
Pthome-time[c]	7.0	8.7	4.6	2.5	15.1	9.3	3.4
Potential experience[d]	13.6	15.7	10.8	6.8	25.9	17.0	8.3
Home-time/ potential experience	0.41	0.45	0.33	0.26	0.49	0.45	0.29
Phtome-time/ potential experience	0.51	0.55	0.43	0.37	0.58	0.55	0.41
Number of cases	211	122	89	136	75	129	82

a In effective years of schooling. To determine the number of effective years of schooling education up to and including the primary level has been set equal to six years of schooling, education at the first step of the secondary level to nine, the second step of the secondary level to twelve, the first step of the third level to fifteen, and the second step of the third level to seventeen. See for the educational classification CBS (1980).

b The number of years not spent on paid work.

c If someone works x hours for a year, than this year does not count for the variable 'home-time' and for $(40-x)/40$ in the variable 'phtome-time'.

d The number of years passed at the time of interview since the moment of leaving school.

Source: CBS/IVA-Arbeidsmarktonderzoek

available. This resulted in a data-set which contains information about 211 women. In the questionnaire all respondents were asked how many years (or months) they worked in the first, the second and other jobs. Moreover, they were asked how many hours a week they worked. If the respondents held only four or fewer different jobs since they left school then we have all the information we need to construct their working history, which starts at the age they left school and stops at the moment they responded to the questionnaire. From respondents who held five or more jobs in the past, we do not have information on the period between the end of the second job and the beginning of the previous job. However, this problem did not occur, as none of the respondents held more than four jobs. Along with information about work history we also have data with respect to education and age as well as information about net income, mortgages, subsidy allowance *etc.* With the help of software developed by the Economic Institute (Utrecht University), we were able to compute the hourly gross wage rate. In Table 1 we present means and percentages of the relevant variables for different subgroups. It shows that unmarried women and women younger than 34 received one to one-and-a-half more years of education than married and older women. The wage rate was the highest for older women and for women with twelve years education or more and the lowest for women younger than 34. In the third row we can read how many years, on average, the different subgroups did not participate in the labour market. The fourth row gives the same, with the exception that part-time work is taken into account: if somebody works one year x hours a week, then this year counts for $(40-x)/40$ in the variable with the name 'pthome-time.' The fifth row shows the potential experience, that is, the number of years elapsed since the respondents left school. The last row but one shows the percentage of potential experience which was lost when they did not participate in the labour market. In this respect unmarried women, women younger than 34 and highly educated women can be distinguished from the other women. It appears that the unmarried, highly educated and younger women do interrupt their labour market career for a considerably shorter time than the others.[21] Moreover, it shows that if we do not take the effect of part-time work into account (that is, when we only make a distinction between people who work irrespectively of how many hours a week, and people who do not work at all) we have underestimated the foregone experience by 10 percent. Although this average percentage is not high for the whole group, in individual cases the underestimation can be much higher. If, for instance, one out of three women had a part-time job, then for these women the underestimation is not 10, but some 30 percent. Finally, the difference of 20 percent between the two age groups points out that an interruption of the labour market career occurs mainly after the age of 34 or that we have to do with two different generations.

4.3 *Estimation Results*

The results of the estimation of equation (13) are summarized in Table 2 (the first column of each subcluster). One should keep in mind that the coefficients of a semi-logarithmic equation represent percentual effects. So, as can be seen from the third row of Table 2, unmarried women together with highly educated women have the highest rate of return from education (about 9 percent). Women with less than twelve years of education, on the other hand, have a very low rate of return (about 3 percent). For all women together, an increase in education with one year results in a permanent increase in the wage rate of 6.5 percent. Further, women younger than 34, the unmarried and the highly

21 Many women younger than 34 left school only recently. They have a comparatively low number of years home-time. In particular for this group the variable 'pthome-time/potential experience' is a better measure to evaluate their labor market participation.

TABLE 2 – RESULTS OF THE SEMI-LOGARITHMIC REGRESSION ANALYSIS TO EXPLAIN GROSS WAGE RATES

Explanatory variables	Regression coefficients[a] (*t*-values)							
	All		Married		Not married		Under 34 years	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Constant term	1.56**	1.57**	1.83**	1.83**	1.13**	1.08**	1.42**	1.42**
	(14.9)	(14.6)	(15.5)	(15.5)	(5.9)	(5.8)	(10.7)	(10.4)
Home-time	−0.02**	–	−0.02**	–	−0.01	–	−0.05**	–
	(−4.8)		(−3.9)		(−0.5)		(−3.7)	
Education	0.07**	0.07**	0.06**	0.06**	0.09**	0.10**	0.06**	0.06**
	(7.5)	(7.3)	(5.9)	(5.7)	(5.8)	(6.1)	(6.0)	(5.8)
Potential experience	0.03**	0.03**	0.02**	0.02**	0.03**	0.03**	0.06**	0.06**
	(8.6)	(6.8)	(4.5)	(4.0)	(6.5)	(4.7)	(7.8)	(6.7)
Pthome-time	–	−0.02**	–	−0.02**	–	0.01	–	−0.03**
		(−3.1)		(−3.3)		(1.0)		(−2.5)
$\bar{R}^2$	0.33	0.29	0.28	0.26	0.46	0.47	0.35	0.32
Number of cases	211	211	122	122	89	89	136	136

a ** = significant at the 1% level.

Source: CBS/IVA-Arbeidsmarktonderzoek

TABLE 2 - continued

Explanatory variables	Regression coefficients[a] (t-values)					
	34 years and older		Less than twelve effective years of schooling		Twelve or more effective years of schooling	
	(1)	(2)	(1)	(2)	(1)	(2)
Constant term	2.00**	2.01**	1.92**	2.03**	1.11**	1.09**
	(9.0)	(8.7)	(9.8)	(10.2)	(3.9)	(3.8)
Home-time	−0.02**	–	−0.02**	–	−0.01	–
	(−2.8)		(−4.2)		(−0.9)	
Education	0.07**	0.07**	0.03	0.02	0.09**	0.10**
	(5.4)	(5.3)	(1.5)	(0.9)	(4.2)	(4.3)
Potential experience	0.01	0.00	0.02**	0.02**	0.04**	0.03**
	(0.9)	(0.5)	(5.8)	(4.9)	(5.5)	(4.0)
Pthome-time	–	−0.01	–	−0.02**	–	0.00
		(−1.7)		(−3.2)		(0.2)
$\bar{R}^2$	0.39	0.35	0.19	0.15	0.51	0.50
Number of cases	75	75	129	129	82	82

a ** = significant at the 1% level.

Source: CBS/IVA-Arbeidsmarktonderzoek

educated women receive an increase in the wage rate of 3 to 5.5 percent for an increase of their potential experience by one year. For older women, on the other hand, the potential experience does not lead to a higher wage rate. The 'home-time coefficients' all have the expected sign, but they are not significant for the unmarried and the highly educated women. The question here is whether the effect of an interruption on the wage rate is really absent, or that the insignificance results from the short length of the interruption periods for these groups (see Table 1). If we compare the constants, the home-time coefficients and the coefficients of potential experience we see that they are almost the same for these groups. This is probably because both groups include, to a great degree, the same women. To a somewhat lesser extent this is true for married and elder women.

For the sample as a whole we can see from the first column of Table 2 that one more home-time year (that is, a year in which a woman did not work) results in a permanent reduction in the wage rate of 2 percent. This negative effect is highest for younger women and lowest for unmarried women. The coefficient which belongs to potential experience is a measure for the term (rk_i) and this term represents post-school investment.[22] So, postschool investments are highest for highly educated women and younger women.

In section 3.3 we focused our attention on the effect of part-time work on the wage rate. Table 2 (the second column for each subcluster) presents a first impression of these effects. Instead of home-time we use the variable pthome-time, which includes the home-time resulting from part-time work as an independent variable. It appears that the negative effect of pthome-time is half a percent less than the negative effect of home-time. This indicates that working only 20 hours a week for ten years results in lesser devaluation of skills and knowledge than working five years full-time and not at all during the next five years. A possible explanation is that part-time workers (because they do work, although part-time) not only have the opportunity, but are more or less forced to update their human capital. On the other hand, in section 3.3 we put forward the argument that part-time workers are excluded from jobs in which on-the-job training is an important feature. In the long run this would lead to a lower wage rate.

So far only the effect of part-time work was taken into account by measuring home-time inclusive of home-time resulting from part-time work. In section 3.3 we described the variable-intensity model. As the name indicates, this model takes explicitly into account the varying intensity of labour market participation. This intensity is measured by the proportion of actual hours of work and the hours of work for a full-time job (that is, 40 hours a week). The following equation was derived from the model:

$$\mathit{ln}\ Wt = (\mathit{ln} Z_{-s} - k_o - \mathit{ln}\ 1875) + rs + (r \cdot k_o + d) \ldots$$
$$\ldots \textstyle\sum_{i=0}^{i=t-1} q_i - (r \cdot k_o / 2T) \cdot \textstyle\sum_{i=0}^{i=t-1} (2i+1) q_i + ((k_o/T) - d)t$$

22 Mincer and Polachek (1974, p. S89).

In this equation five coefficients are estimated and from these, given the restriction of equality in rates of return ($r_s = r$), the five parameters d, T, r, k_0 and E_{-s} can be computed.

Table 3 contains the results obtained by the estimation of equation (12). Besides education and (potential) experience the variables *SOMQ* and *SOMR* are included. These variables have a direct relation with equation (12) and reflect the intensity of participation. The variable *SOMQ* equals the term $\sum_{i=0}^{i=t-1} q_i$. If q_i equals one for all periods i then *SOMQ* represents the total labour market experience expressed in years. *SOMR* equals the term $\sum_{i=0}^{i=t-1} (2i+1)q_i$ of equation (12). If q_i equals 1 for all periods i then *SOMR* represents the square of the total labour market experience in years. As can be seen in the first column of Table 3 the coefficients are significant at a 1% level (that is, with a confidence interval of 99%). The rate of return on human capital of 6 percent is quite similar to the one found in Table 2. Again, this rate of return is higher for unmarried and for highly educated women. The bottom part of Table 3 shows the parameter values which can be derived by way of estimation of equation (12). Most attention should be given to the parameter values obtained from the regression which includes all women, because here all coefficients are significant.

The depreciation rate for all women together is about half a percent; for less educated women this rate is higher than for highly educated women.[23] An explanation could be that depreciation of firm-specific human capital (accumulated by on-the-job training) is higher than the depreciation of general human capital (accumulated by formal schooling). The higher the stock of firm-specific human capital, the higher the observed depreciation rate. This does not necessarily imply that depreciation measured in guilders instead of percentages is higher for the less educated. The outcome depends on the ratio of the stocks of human capital between these groups.

It was already noticed that the coefficient of potential experience is a measure for post-school investments. Just as in Table 2 these coefficients are found to be higher for highly educated and unmarried women than for other groups. The values of 32 years for the length of the investment period (T) and of 46 percent for the investment rate directly after leaving school (k_0) are relatively high compared to findings in some of the American studies mentioned earlier. However, the investment rate declines steadily (see equation 6). For instance, after 25 years the investment rate has declined to 10 percent. This implies that at the age of fifty 10 percent of working hours is still spent on on-the-job training (that is, on improving and enlarging one's knowledge and skills). The expectation expressed in section 3.3, that part-time work mitigates the depreciation of human capital, is confirmed. In Table 2 we found a deprecia-

23 This contrasts with findings in the American literature where higher depreciation rates are found for workers with higher stocks of human capital. See for instance Mincer and Polachek (1974) and Corcoran, Duncan and Ponza (1983).

TABLE 3 – RESULTS OF THE SEMI-LOGARITHMIC REGRESSION-ANALYSIS TO EXPLAIN GROSS WAGE RATES

Explanatory variables	Regression coefficients[a] (t-values)						
	All	Married	Not married	Under 34 years	34 years and older	Less than twelve effective years of schooling	Twelve or more effective years of schooling
Constant term	1.51**	1.78**	1.08**	1.42**	1.93**	1.90**	0.99**
	(14.3)	(13.4)	(5.9)	(10.4)	(8.1)	(9.5)	(3.4)
Education	0.07**	0.06**	0.09**	0.06**	0.08**	0.03	0.10**
	(7.6)	(5.8)	(6.1)	(5.9)	(5.3)	(1.4)	(4.4)
Potential experience	0.01**	0.00**	0.03**	0.03**	−0.00	0.01*	0.03**
	(4.0)	(4.5)	(5.9)	(2.7)	(−0.5)	(2.0)	(4.1)
SOMQ[b]	0.03**	0.03*	0.01	0.05*	0.02	0.03**	0.02
	(4.6)	(2.4)	(0.8)	(1.9)	(1.6)	(3.9)	(1.2)
SOMR (x 10^{-3})[c]	−0.48**	−0.32	−0.30*	−1.01	−0.21	−0.44**	−0.76
	(−4.3)	(−0.9)	(−2.0)	(−0.6)	(−1.5)	(−3.6)	(−1.2)
$\bar{R}^2$	0.33	0.26	0.51	0.32	0.33	0.18	0.51
Number of cases	211	122	89	136	75	129	82
d (in percentages)	0.3	0.9	−2.8	0.6	0.9	2.3	−1.7
T	31.8	29.8	61.5	19.7	14.6	10.7	22.7
r (in percentages)	6.7	5.7	9.2	6.3	7.5	3.0	9.8
k_o	0.46	0.33	0.40	0.63	0.08	0.31	0.39
E_{-S}	13.5	15.5	8.3	14.6	14.0	17.2	7.4

a ** = significant at the 1% level; * = significant at the 5% level.
b $SOMQ = \sum_{i=0}^{i=t-1} q_i$, with q_i as indicator of the intensity of participation.
c $SOMR = \sum_{i=0}^{i=t-1} (2i+1)q_i$, with q_i as indicator of the intensity of participation.

Source: CBS/IVA-Arbeidsmarktonderzoek

tion rate of 2 percent. Now we have a depreciation rate of a half percent. It should be noted, however, that the depreciation rate from Table 2 measures both depreciation as well as foregone experience (see also Fig. 1), while the depreciation rate from Table 3 only measures the pure atrophy rate, that is, the depreciation rate of human capital as a result of non-use. If both models are consistent with each other, it can be concluded that one additional year of foregone experience reduces the wage rate by one and a half percent.

5 SUMMARY AND CONCLUSIONS

In this article we tried to shed some light on the effects of interruptions of labour market participation and part-time work on women's gross wage rates. The most prominent economic explanation is put forward by the theory of human capital. Human capital is acquired mainly by investments in the form of formal education and training. These investments bring along costs (foregone earnings) as well as revenues (higher future earnings). We found a rate of return for investment in human capital of about 6 percent. Depreciation of human capital can be considered as disinvestments. This reveals itself most clearly in the percentage by which the stock of human capital depreciates during the period of nonparticipation on the labour market. This percentage amounts to a half percent per year. Women who interrupt their labour market careers do not only suffer from depreciation. Compared to women who don't interrupt their careers they are even more disadvantaged because every year they do not participate they miss experience. This effect of the foregone experience amounts to one and a half percent. Part-time work mitigates the depreciation of human capital. The expectation that part-time work - as opposed to full-time work - leads to a lower wage rate in the long run is confirmed.

The data set used restricted the empirical analyses. It was not suitable for the estimation of 'wage-change models' (only the wage rate at the moment the questionnaire was filled in was known). So it was neither possible to investigate the existence of rebound effects nor the distinction between short and long-term depreciation rates. Moreover, the data did not permit (to avoid the 'selectivity bias/simultaneous equation bias') conducting an integrated labour supply and wage-rate analysis. Such an analysis is only possible when one disposes of panel data. Research based on retrospective information like that described in this article can be considered a first step in the direction of such an integrated analysis.

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Summary

THE EFFECT OF INTERRUPTIONS AND PART-TIME WORK ON WOMEN'S WAGE RATE: A TEST OF THE VARIABLE-INTENSITY MODEL

In this article we investigated the effects of interruptions of labour market participation and part-time work on women's gross wage rates, using the variable-intensity model. Women who interrupt their labour market careers suffer not only from depreciation, which effects all workers. Every year they do not participate they also miss experience. Part-time work mitigates the depreciation of human capital compared to a situation of non-participation. The expectation that part-time work – as opposed to full-time work – leads in the long run to a lower wage rate is confirmed.