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An Empirical Study in Italy*

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Abstract

The purpose of this study is to analyse a certain line of work on the interpretation of unemployment in the theoretical and empirical analysis of female labour supply in Italy. This is achieved by estimating two stochastic specification models for labour force participation which are valid under more general theoretical assumption than previous approaches: the Double Hurdle and the Sequential Probit models. The proposed methodology is applied to a sample of married women drawn from the 1995 Bank of Italy's Survey of Household Income and Wealth. The empirical results show that the persistence of relative regional unemployment rates has been particularly striking among overqualified married women in the South. They support the hypothesis that in absence of any information concerning demand-side constraints, labour force estimates can be misspecified. Finally, the estimation based on the sample-separation information provides some evidence of a widespread discouragement among married women "voluntarily" out of labour market (i.e. housewives), implying that a large proportion of individuals in the South of Italy would like to choose to participate if a job were available. In this respect, the notion of voluntary unemployment is unconvincing.

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1.1 Introduction

In recent years the estimation of labour supply has been one of the most active areas of research in labour economics. This estimation is based on the crucial assumption that individuals can freely choose whether or not to work. Specifically, if the real wage is equal to the marginal rate of substitution of income for leisure when hours of work are positive, then, by definition the individual decides to supply labour and unemployment does not occur. Conversely if her reservation wage is greater than the market wage, the individual decides to be out of the labour market¹.

However, two related considerations have made this assumption less defensible.

Firstly, a significant body of theoretical and empirical work has developed in which unemployment is not always a voluntary decision to be out of the labour force. Hence, on the theoretical ground, alternative states of participation should also be considered. They are mainly based on the notions of involuntary unemployment and discouragement effects among the non-participants.

Secondly, the number of unemployed, notably women in the South of Italy, has substantially grown over the past decade. In this regard, concerning measurement problems, the reliance on the conventional definitions and measures of “participation”, or “economic activity rate” or “job-seeking” could have been a convenient mean by which the size of labour reserve in the South has always been systematically and substantially understated².

The above mentioned considerations imply that the basic hypothesis that individuals experiencing unemployment are on their supply function need to be empirically tested. In fact, the already existing econometric evidence³ on constraints among British workers and non-workers seems not to support this assumption. Essentially, the argument is that labour participation estimates are sensitive to the inclusion of demand-side variables in the regression (e.g. regional unemployment rates, or indexes for human capital or working experience), so that neglecting the impact of these variables on the probability of working could involve a substantial misspecification as well as inconsistent estimates.

In this paper, we address the outlined issue by proposing and implementing a methodology of estimation for labour force participation which is valid under more general theoretical assumptions than previous approaches. It specifically consists of specifying two stochastic models: the Double Hurdle⁴ and the Sequential Probit models.

The empirical analysis will be carried out using 1993 data drawn from the Survey “I bilanci delle famiglie italiane” (The Bank of Italy's Survey of Household Income and Wealth) issued by the Bank of Italy in 1995. The reason for considering the Italian case is twofold. Firstly, Italy has always been characterised by a very high unemployment rate which averaged 12 per cent of the labour force in 1995, 0.7 point higher than in 1994. Furthermore, the Italian situation is quite peculiar compared to other European developed countries because of the strongest variation in unemployment composition according to age, sex and geographical area.

Secondly, considering the measurement problems outlined above, the Survey conducted by the Bank of Italy in 1993 made some attempt to take into account the deficiencies of the conventional approach to measuring unemployment. This attempt involved a series of questions to individual respondents about their past experiences, participation, present activity, future intentions. On the basis of this data survey, which allows us to define and distinguish among non-participants, job-seekers and people voluntarily out of labour force, this study will try to account for the “haziness” of the whole notion of voluntary unemployment by considering the extent of “discouragement” and passive unemployment in Italy.

1 See, Killingsworth (1986) for a survey.

2 See, for example, Sestito (1990).

3 See, for example, Blundell et al. (1991).

4 See Cragg (1971) and Blundell et al. (1991) for some applications.

The estimated results show that the persistence of relative regional unemployment rates has been particularly striking among overqualified married women in the South. They support the hypothesis that in the absence of any information concerning demand-side constraints, labour force estimates can be misspecified. Finally, the estimation based on the sample separation information provides some evidence of widespread discouragement among married women “voluntarily” out of labour market (i.e. housewives), implying that a large proportion of individuals in the South of Italy would like to choose to participate if a job were available.

The outline is as follows: Section 1.2 critically examines the standard approach to the problem of dealing with labour participation when some workers are unemployed and discusses some possible extensions of the standard model. Section 1.3 describes the method of estimation which could be appropriate when the sample contains unemployed workers. Then to place the analysis in its broader context, Section 2.1 and 2.2 explain why we chose to investigate unemployment in Italy. We examine the factors which have shaped the level and pattern of labour participation in Italy on the basis of time series and cross section data. Also we consider the micro-behavioural determinants of female economic activity, looking specifically at the features of the sample. Finally, Section 3.1 and 3.2 describe the stochastic specification of the models and provide estimates of the factors affecting the probability of being unemployed. A comparison of the alternative models is provided together with some concluding remarks and interpretations (Section 3.3).

1.2 The standard theory of labour participation and some criticism

As a starting point for the study of unemployment we briefly consider the neo-classical labour supply model that is conventionally used in studying married women labour force participation. From the standpoint of analysis of female labour supply, we refer to a static model that allows explicitly for the impact of family membership.

The conventional family labour supply model extends the analysis of the single individual by postulating a single decision-making unit, the family, which maximises a twice-differentiable quasi concave function:

$$U=U(G, L_f, L_m) \tag{1}$$

where L_f, L_m are the “leisure” time of the family members (the female and the male, respectively) and G is family consumption of a composite consumer good.

Let us assume furthermore that the utility function is additively separable so that the female chooses the amount of leisure to maximise her utility separately from her husband’s decision, treating the property income V and male hours as exogenously fixed:

$$U=U_F(G, L_f)+U_M(L_m)$$

Under the usual assumptions of convex preferences and linear budget constraint, the maximisation above is subject to the constraint that total family income - the sum of its exogenous income V and the earnings of its members- may not exceed the family’s total expenditure on the consumer good:

$$pG = V + w_f H_f + w_m H_m \tag{2}$$

where p is the price of one unit of the consumption good, V is the amount of “exogenous” income received by the family per period, and w and H are the wage and the hours of family members. Available time is divided between market work and leisure, so that $H+L=T$ where T is the total available time per period.

The formal characterisation of the solution is obtained by setting up the Lagrangean function:

$$L = U(G, L_f, L_m) - \lambda [pG - V - w_f H_f + w_m H_m]$$

The First Order Conditions for a maximum of (1) subject to (2) are:

$$pG = V + w_f H_f + w_m H_m \quad (3)$$

$$U_L - \lambda w_f = 0 \quad \text{with } > \text{ if } H_f = 0 \quad (4)$$

$$U_G - \lambda p = 0 \quad (5)$$

where λ is a Lagrange multiplier that may be interpreted as the marginal utility or income to the family, U_G is the partial derivative of utility with respect to G and U_L with respect to L .

The solution yields the labour supply function relating desired hours to (real) wages and unearned income levels, conditional on tastes t :

$$H = H_F(w_f/p, V/p; t)$$

This framework of analysis is useful to the neo-classical characterisation of unemployment.

The critical feature underlying the decision of participation is, as already pointed out, the notion of reservation wage, wR , defined as the amount of extra-earning the individual would require to be induced to give up one unit of leisure when he or she is not working at all. Thus a model of labour force participation can be specified by a function which determines the reservation wage as follows:

$$wR = - \frac{\frac{\partial U}{\partial L}}{\frac{\partial U}{\partial C}} \quad \text{at } L = \bar{L}$$

Under the usual assumptions of an upward sloping labour supply curve at 0 hours, there exists a market wage high enough so that the woman would choose to work. For any $w > wR$, the desired hours of work H_f which maximise her utility will exceed zero hours, because the utility of working is greater than the utility of not working (therefore the individual decides to participate).

Moreover, despite the analytical simplicity of the above definitions and the optimising-utility framework based on labour supply, the analysis of participation and the notion of voluntary unemployment in particular have resulted in many critiques and controversies, and have generated important logical difficulties.

The first highly dubious assumption underlying the search framework is that by remaining unemployed the workers' probability of finding a job is supposed to improve since the unemployed are investing in productive search. This analysis of labour market behaviour which is concerned with depicting most unemployment as voluntary "optimising" job-seeking⁵ should be tested. Furthermore, labelling unemployment as "voluntary" does not make it benign or socially inconsequential.

Other more serious versions of the voluntary unemployment thesis are based on the supposed unwillingness of the unemployed to take available employment. The reason is the existence of excessive aspirations or expectations on the part of potential worker, both in terms of the jobs he requires or is prepared to take, or the wage he wants to accept. But substantial and persistent regional differences in extensive unemployment cannot be explained within this framework. Why

5 For instance, Hall (1970) pointed out: "...the argument usually goes something like this: virtually everyone counted as unemployed could find some type of job at some wage; even if not, the option of self-employed is surely open; in the sense that there is some option open to all the unemployed, there is a voluntary component to all unemployment".

should the proportion of people whose reservation wages are close to their market wages differ substantially across regions?

Thirdly, the possibility of alternative states of non participation has long been recognised in the existing literature. The first alternative notion is the involuntary unemployment. Within the neo-classical tradition of labour supply if workers are off the labour supply curve (so that there is an excess supply of labour at the current real wage) then, by definition, there is involuntary unemployment. Therefore, within this paradigm of labour participation, the amount of involuntary unemployment is equal to the amount of excess labour supply. The position can be illustrated by the figure 1.2.1:

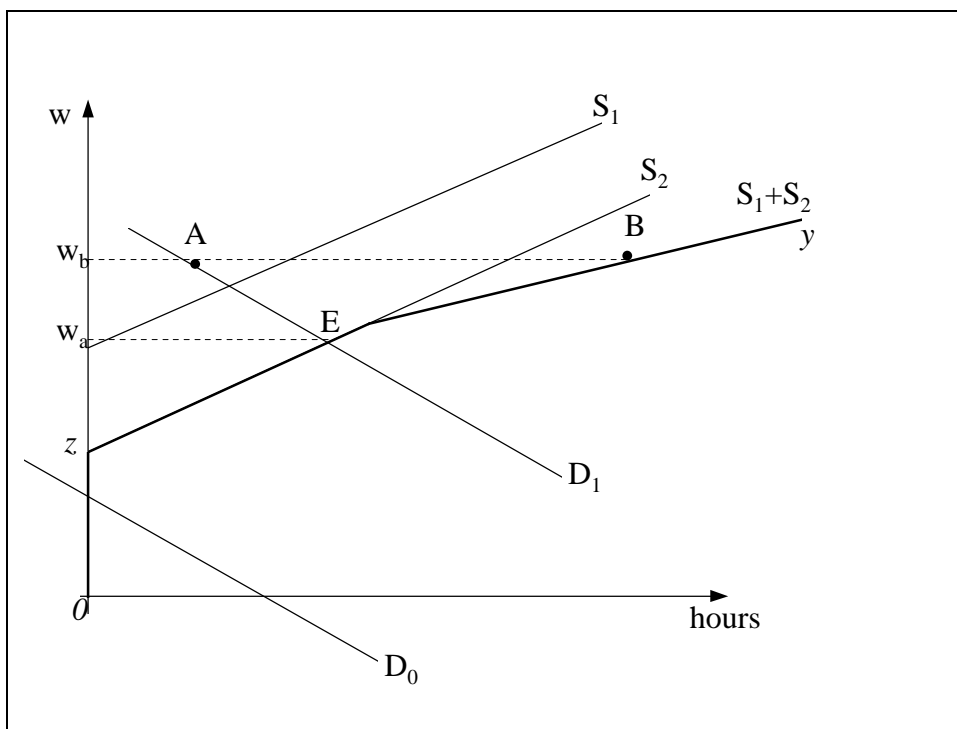


figure 1.2.1

Assuming heterogeneity of workers, we indicate labour supply curve for the first worker by S_1 , the labour supply curve for the second worker by S_2 , and the aggregate supply by the line Ozy (S_1+S_2). D_0 gives the demand relationship between the level of employment and real wage, which is determined at the level shown w_0 . D_1 gives the demand relationship between an alternative pair of employment/wage.

We distinguish two cases:

- suppose the demand is D_0 , the supplies of labour S_1 and S_2 . Both the individuals are voluntary unemployed (they are both on their supply curve). They are not willing to work at the prevailing wage.
- suppose that the demand is D_1 , the supplies of labour S_1 and S_2 , and the market wage is fixed to w_a . The wage and employment (hours of work) are determined so that the market clears only for individual 2; individual 1 is voluntary unemployed, in the sense that he is not willing to work at the prevailing wage in the market.

Moreover, if the demand is D_1 and the wage is fixed at w_b , the actual level of employment is at point A, while the hours of work desired are at point B, so the distance AB corresponds to

involuntary unemployment; the workers are willing to work at the going wage in the market, but have not so far found work; as a consequence, the short side of the market dominates.

The concept of involuntary unemployment, as illustrated in figure 1.2.1, enlightens the problem of “constraints” in the labour market on the part of the demand side. By definition, it admits that some individuals are willing to work but cannot find a job.

The second alternative state of non participation allows for the existence of discouraged workers through fixed or search costs. In this respect, the conventional approach to measuring the labour force or aggregate labour supply is to add the number of recorded unemployed to the number of workers employed. To translate this into participation or economic activity rate, the sum of the employed and unemployed is divided by the relevant population. This procedure raises all sorts of ambiguities and tends to result in a systematic understatement of the extent of reserve of labour in official statistics. Therefore in attempting to reclassify some of the discouraged or passive unemployed as part of the labour reserve, it seems worth shifting attention to what is regarded as voluntary unemployment and to investigate the extent to which the group of individuals classified as non-seekers or non-participants would be primarily affected by discouragement and therefore more likely to be passively unemployed than other groups.

Neither of the alternative states of non participation mentioned above (involuntary unemployment, discouragement effects) is consistent with the reservation wage characterisation of unemployment. This leads to consideration of the standard characterisation of non-participation as a quite restrictive one and implies the need for further considerations. Furthermore, it forms the basis of much criticism of the neo-classical model.

1.3 The estimation method

The empirical verification of the possible extensions of neo-classical model in the directions outlined above is described in some detail in this section. The following different related hypothesis are considered and tested:

- the first step consists in testing the standard theory of labour supply by allowing for unemployed workers; to do this, in particular, we try to assess whether some unemployment is involuntary by introducing an index probability function depending on a variety of macro and micro economic factors z_i that determine whether those individuals who want to work are employed or not. The key question is: Does the data support the hypothesis that individuals experiencing unemployment are on a labour supply function? If the answer to this question is negative, we would expect a substantial misspecification of the standard supply model.
- in the second step, in attempting to get an alternative characterisation of the labour supply model, we have to verify whether or not “adding” structure by introducing demand-side variables could help to define a better model for participation (Double Hurdle model)⁶. An alternative specification for non participation is also tried by adding structure even further (Sequential Probit model), by using the auxiliary sample separation information which derives from a particular way of measuring and defining voluntary and involuntary unemployed. It will be described in next sections. In the first of these models we explicitly consider involuntary unemployment as a possible alternative state of non participation; in the second one we consider both involuntary unemployment and discouragement effects on workers. The relevant question here is: Does the sample separation information about the unemployed allow the parameters of the employment probability index to be more efficiently estimated than in a Double Hurdle on the total employed/unemployed?

⁶ We follow the estimation procedure adopted by Blundell et al (1989, 1991) for detecting discouragement effects in labour force participation in U.K.

Turning first to the specification of the Double Hurdle, if we assume implicitly or explicitly that the labour market is demand-constrained, then the level of participation (and associated unemployment) depends on both supply and demand considerations. In fact, it may be that the individual chooses not to work, given her demographic circumstances. However, it may be that an individual who is observed not to work would like to work but is constrained from finding a job, given the constraints of the labour market. Hitherto, a richer characterisation of the model of labour supply behaviour would require two hurdles to be overcome. The Double Hurdle model structures the implied choices which result in the participation decision into two binary choices: firstly, a choice is made whether to work or not to work. Secondly, conditional on wanting to work, a choice is made between the possibility of being offered a job or not (we model a probability index which accounts for possible constraints on the demand side like regional unemployment rates, vacancies, demographics, measures of skill level or human capital).

Finally, turning to the specification of Sequential probit model, we can add some auxiliary information in terms of the assumptions required to structure the model. The decision process can be visualised as shown in figure 1.2.2:

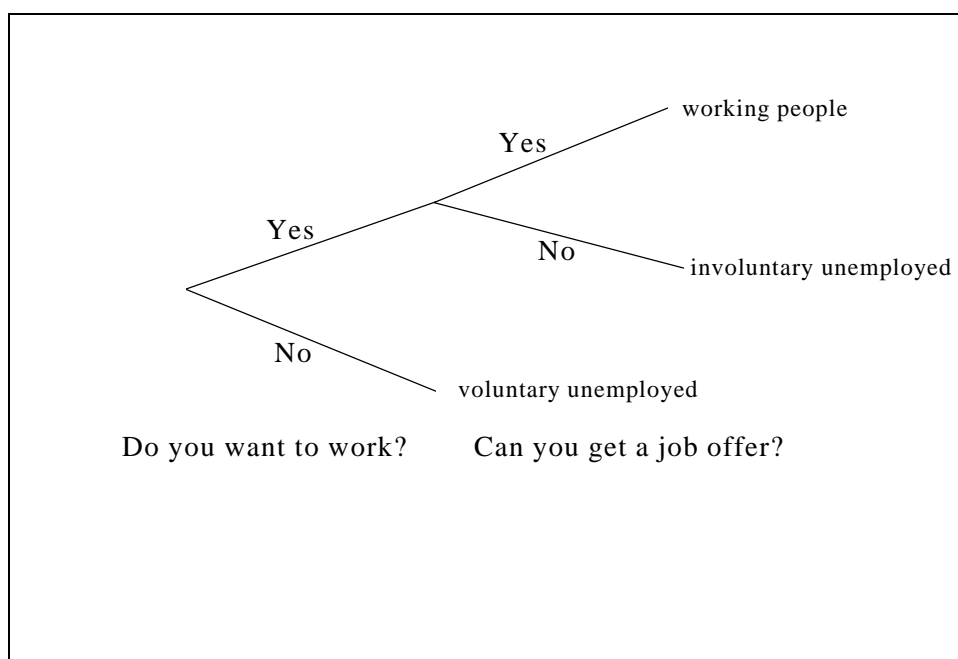


figure 1.2.2

The Sequential model requires, like the Double Hurdle, that the possible choices implied by the qualitative dependent variable can be separated into a sequence of binary choices. It differs from the Double Hurdle model, because it is possible to separate the involuntary unemployed from those who do not wish to work (notably job-seekers and workers versus people voluntarily out of labour force, i.e. housewife or student). In this way three labour force status are observed:

- non-participant (voluntary unemployed)
- involuntary unemployed (constrained workers)
- working people (unconstrained workers)

So far, the estimation procedure for this model will be conducted by estimating two separate Probit on the subsamples of non-participants (i.e. individuals voluntarily out of labour force: housewives, students, conventionally defined as d1) and constrained job-seekers (people seeking for job or unemployed, conventionally defined as d2).

2.1 The Unemployment in Italy: Some macroeconomic issues

The explanation of observed labour market patterns, particularly with respect to unemployment, job search and labour supply has become a major component of recent economic debate in Italy.

Today the unemployment rate hovers around 12.1%. Over the past decade, it has averaged 11.5% and has never fallen below 10%, three points higher than the 1980 value. The purpose of this section is to offer an overview of the main facts from a macroeconomic perspective. The first part assesses the relationship between unemployment and Italian economic performance in recent years, together with the structural changes that occurred in the composition of the employed population and its movements across different sectors of activity, firms and job categories. In particular, we focus our attention on the dramatic variations in regional economic performances. In the second part, we turn to the specific features of the sample on which this study is based.

Table 2.1.1 shows some of the key facts that need to be explained. In Italy, total employment has stopped falling after four years of uninterrupted decline confirming a typical trend of many European economies. This trend conceals divergent movements across sectors, firms and job categories. Employment in large industrial firms had declined by nearly 6 per cent until mid-1993, reflecting job losses in manufacturing. Within services, the retail and wholesale trade suffered most from employment losses, whereas banks, insurance companies and other financial institutions kept on hiring people, at a reduced rate. Agricultural employment also contracted.

Furthermore, the Italian data reveal substantial divergences in the unemployment composition according to age, sex and geographical area.

Data in Table 2.1.2 show that the divergences on labour market, either from a territorial point of view or from a composition of unemployment are conspicuous.

In the two areas of the country, the spread between male and female unemployment rates also widened, with unemployment rates ranging from 7.8% in the North to 21% in the South in 1995⁷. Differentials of this size attest to a low measure of geographical mobility of labourers and jobs⁸.

Table 2.1.3 presents unemployment rates for various subgroups of the population in 1995, with the total unemployment rate being a weighted average of the unemployment rates of different demographic groups with weights depending on their shares of the labour force.

The most relevant unemployment rates have occurred among prime-aged males and females. In particular in the South the aggregate rate raises to 16.8% for men and 29.7% for women. The relative unemployment rate is smaller for men than for women.

Data on unemployment rates for different marital status groups reveals the highest levels among single and married women, particularly in the South.

The level of unemployment is not monotonically related to education. People receiving high school training have significantly higher unemployment rates than do high school drop-outs.

Difference in unemployment rates could also reflect differences in labour market conditions that constrain the labour supply⁹.

Conclusively, Table 2.1.4 presents the unemployment and unemployment rates by region, and sex.

⁷ The incidence of structural unemployment, which is concentrated among young people and women living in the South, reflects a number of institutional factors: the restrictive employment rules, and rather generous transfer payments to large segments of companies and households have often been invoked to explain the reason why the supply price of labour is relatively high.

⁸ See Padoa-Schioppa (1991).

⁹ One common explanation for regional unemployment differentials is differences in industrial composition. For instance, the strength of the North Central area is often attributed to its heavy reliance on manufacturing and industrial composition, while traditionally the Southern economy is agricultural.

Table 2.1.1- Sectored employment trends (% change)

	Employment share (1994)	Total employment				
		'92	'93	'94	'95	'96
Agriculture	8.5	-4.7	-7.3	-4.2	-3.5	-3.7
Industry	28.5	-2.5	-4.1	-1.6	-1.3	-1.2
Manufacturing	21.3	-3.6	-5.0	-0.6	-1.2	-0.8
Construction	7.2	1.1	-1.5	-3.9	-1.3	-2.4
Market services	43.6	-0.2	-2.1	-1.3	0.7	1.6
Commerce	21.8	-0.2	-2.2	-1.5	-0.1	...
Transport	6.4	-0.8	-1.1	-2.6	-1.5	...
Credit	2.0	1.1	0.0	-0.3	-1.0	...
Other	13.4	0.0	-3.0	-0.4	3.3	...
Non-market services	19.3	1.1	-0.6	-0.7	-0.4	0.3
Total	100.00	-1.0	-2.9	-1.5	-0.4	0.1

Source: OECD Economic Surveys -Italy 1997

Table 2.1.2 - Indicators of labour market performances (selected years)

A. Evolution	1970	1980	1990	1995
Standardised Unemployment rate	5.3	7.5	10.3	12.2
Total	3.2	7.5	11.4	11.9
Male	2.9	4.8	7.8	9.3
Female	4.0	13.2	17.6	16.2
Youth	10.2	25.2	31.5	23
Regional unemployment rate	n.a	n.a		
North-Centre	n.a	n.a	6.7	7.8
South	n.a	n.a	20.7	21
B. Structural or institutional characteristics	1970	1980	1990	1995
Participation rates				
Global	54.6	59.5	58.6	58.1
Male	81.5	80.6	77.2	73.9
Female	29.1	39.2	40.6	42.9
C. Employment	1970-80	1980-1985	1985-90	1990-95
Total	0.7	0.2	1.5	-0.1
Agriculture	-2.3	-2.9	-2.8	-4.0
Manufacturing	1.0	-3.2	0.3	-2.5
Services	2.6	3.3	1.5	-0.1

Source: OECD Economic Surveys -Italy 1997

Table 2.1.3 - Demographic composition of the unemployed, 1995

Category	NORTH	CENTRE	SOUTH
Age-sex			
Males, 15-24	2	3.1	6.4
Males, 25-29	0.8	1.6	3.81
All males	4.43	7.3	16.8
Females, 15-24	4	5.6	11.4
Females, 25-29	2.1	3.6	7.02
All females	10.3	15	29.7
Marital status			
Single men	3.3	5.5	11
Married men	1	1.7	5.6
Divorced/ widowed men	0.2	0.1	0.2
Single women	5.9	8.9	17.5
Married women	3.8	5.4	11.4
Divorced women	0.5	0.7	0.8
Education			
4 or more years of college	0.5	0.8	0.9
1 to 3 years college	0.04	0.06	0.1
4 years of high school	2	3.9	6.3
1-3 years of high school	0.7	0.7	1
5 to 8 years	2.7	3.7	9
Less than 5 years	0.8	1.1	3.7

Source: Calculation based on data from "Indagine sulle forze di lavoro"- ISTAT, 1995.

Table 2.1.4 - Male Employment/Unemployment ratios by regions - Average 1993 (* in thousands)

Regions	Labour Force		Employed		Unemployed		Non Labour force		Population
	Number	%	Number	%	Number	%	Number	%	
<i>Men</i>									
Piemonte	1116	54.14	1061	95.07	56	5.01	945	45.85	2061
Valle d'Aosta	31	54.38	30	96.77	1	3.22	26	45.61	57
Lombardia	2376	55.99	2281	96.00	95	3.99	1867	44.00	4243
Trentino	245	57.10	238	97.14	7	2.85	184	42.89	429
Veneto	1181	56.05	1139	96.44	42	3.55	926	43.94	2107
Friuli Venezia G.	298	53.11	286	95.97	12	4.02	263	46.88	561
Liguria	410	52.22	382	93.17	27	6.58	375	47.77	785
Emilia Romagna	1044	55.76	1005	96.26	39	3.73	828	44.23	1872
North	6701	55.31	6422	95.83	279	4.16	5414	44.68	12115
Toscana	906	53.89	858	94.70	47	5.18	775	46.10	1681
Umbria	203	51.78	193	95.07	10	4.92	189	48.21	392
Marche	361	52.39	346	95.84	16	4.43	328	47.60	689
Lazio	1312	53.31	1220	92.98	92	7.01	1149	46.68	2461
Centre	2782	53.26	2617	94.06	165	5.93	2441	46.73	5223
Abruzzi	306	50.75	286	93.46	20	6.53	297	49.25	603
Mlise	81	50.63	74	91.35	8	9.87	79	49.37	160
Campania	1340	48.53	1131	84.40	209	15.59	1421	51.46	2761
Puglia	957	49.32	847	88.50	109	11.38	983	50.67	1940
Basilicata	140	46.82	124	88.57	16	11.42	159	53.17	299
Calabria	478	47.8	403	84.30	76	15.89	522	52.2	1000
Sicilia	1172	48.89	995	84.89	177	15.10	1225	51.10	2397
Sardegna	406	50.43	349	85.96	57	14.03	399	49.56	805
South	4880	48.97	4209	86.25	672	13.77	5085	51.02	9965

Source: Calculations based on Istat - Bollettino Mensile di Statistica - June 1994

Table 2.1.4 - Female Employment/Unemployment ratios by regions - Average 1993 (* in thousands)

Regions	Labour Force		Employed		Unemployed		Non Labour force		Population
	Number	%	Number	%	Number	%	Number	%	
<i>Women</i>									
Piemonte	734	33.68	657	89.50	77	10.49	1445	66.31	2179
Valle d'Aosta	22	37.93	21	95.45	2	9.09	36	62.06	58
Lombardia	1534	33.98	1402	91.39	133	8.67	2980	66.01	4514
Trentino	151	33.63	143	94.70	9	5.96	298	66.36	449
Veneto	720	32.41	658	91.38	62	8.61	1501	67.58	2221
Friuli Venezia G.	191	31.00	169	88.48	22	11.51	425	68.99	616
Liguria	249	28.75	214	85.94	35	14.05	617	71.24	866
Emilia Romagna	756	37.85	687	90.87	69	9.12	1241	62.14	1997
North	4357	33.77	3951	90.68	409	9.38	8543	66.22	12900
Toscana	592	32.72	515	86.99	77	13.0	1217	67.27	1809
Umbria	125	30.33	111	88.8	13	10.4	287	69.66	412
Marche	245	33.65	219	89.38	26	10.6	483	66.34	728
Lazio	749	28.60	636	84.91	113	15.0	1869	71.39	2618
Centre	1711	30.73	1481	86.55	229	13.3	3856	69.26	5567
Abruzzi	181	28.50	157	86.74	24	13.2	454	71.49	635
Molise	49	29.16	39	79.59	10	20.4	119	70.83	168
Campania	632	22.36	454	71.83	178	28.1	2194	77.63	2826
Puglia	429	20.94	352	82.05	87	20.2	1619	79.05	2048
Basilicata	75	24.67	58	77.33	17	22.6	229	75.32	304
Calabria	257	24.92	183	71.20	75	29.1	774	75.07	1031
Sicilia	517	20.60	358	69.24	158	30.5	1992	79.39	2509
Sardegna	205	24.75	148	72.19	57	27.8	623	75.24	828
South	2345	22.65	1749	74.58	606	25.8	8004	77.34	10349
Italy	22776	40.58	20429	89.69	2360	10.3	33343	59.41	56119

Source: Calculations based on Istat - Bollettino Mensile di Statistica - June 1994

The main result of this section seems to suggest that over the past 30 years, increases in unemployment during cyclical downturns have not been fully reversed during subsequent upswings. This casts doubts on the explanation of unemployment as normal turnover that is inevitable in a dynamic economy where some sectors are expanding and others are contracting. Unemployment can indeed increase for either cyclical or structural reasons. The additional unemployment is concentrated among women and in the South of the country. Much of the differences in unemployment rates across regions could be due to differences in the performances of given industries or to differences in the industrial composition of regions. The dramatic variations in regional economic performance seem to be linked to structural, institutional and historical North-South differences more than to lack of skills on the part of workers or their educational attainments. This conclusion puts forward the argument that the divergence in unemployment rates could reflect differences in labour market conditions that substantially affect the willingness to supply labour. In other words, a large number of people out of labour force are sensitive to job opportunities, and would like to choose to work if a job were available.

Moreover, in analysing recent changes in unemployment in Italy, it is not enough to focus on the determination of the total level of employment/unemployment. It is also necessary to examine at a microeconomic level the composition of labour force, employed and not employed people, and to consider the response of individual participation to economic opportunities in an attempt to verify the impact of demand-side constraints on it. This is precisely the aim of next section.

2.2 Data description

The Survey which has been used in this study is “I Bilanci delle Famiglie Italiane” issued by Bank of Italy in 1995. It has been composed from about 8.089 households and 24.013 individuals, of whom 14.395 are income recipients.

On the basis of the data set, the household consists on average of 2.97 members and 1.77 income recipients. The household is larger in the South and Islands. The average number of income recipients is greater in the North and Centre. The head of household is male in 72.5% of cases. Most people in the sample has completed 5 years of full time education (34.6%); in 10.2% of cases the household received no education, while only 6.1% are college graduates¹⁰.

Turning specifically to the analysis of unemployment, we define the following dependent dummy variables: *d1* is a dummy accounting for voluntary unemployment and is coded 1 if survey respondents are housewives or students, 0 otherwise; *d2* is the dummy accounting for involuntary unemployment and is coded 1 if survey respondents are either job-seekers or not employed and 0 otherwise. Finally *d*, the dummy for total unemployment is coded 1 if $d1+d2=1$, 0 otherwise.

The following tables have been realised basing on the subsample of unemployed (men and women) in their working age. They show how involuntarily unemployed are distributed in the sample according to the categories of sex, class of age and education.

Table 2.2.5 -Unemployment by sex

	seeking for first job	unemployed	Total
male	657	304	961
			55.7%
female	558	207	765
			44.3%
Total	1215	511	1726
	70.4%	29.6%	

Table 2.2.6 -Unemployment by class of age

	seeking for first job	unemployed	Total
younger than 30	1141	208	1349
			78.2%
31-40	69	142	266
			12.2%
41-50	3	94	97
			5.6%
51-65	2	67	69
			3.9%
Total	1215	511	1726
	70.4%	29.6%	

10 Concerning the socio-economic group, the household is more often a dependent employee than a self-employee (39% vs 14.5%); 46% of cases consists of non working people (e.g. retired 40.1%). Considering the territorial distribution, 49.3% of households lives in the North, 18.7% in the Centre and 32% in the South. The annual property income in 1993 is 39,6 millions of Italian lire. Again in the North and Centre it is higher than that in South and Islands (43.5 and 44% vs 30.9%). The distribution of incomes shows the typical asymmetric form with a frequency relatively low for low incomes (6.7% up to 10 millions), higher frequencies for middle incomes (48% in the range 10-35 millions), lower for high incomes. Incomes lower than 10 millions are more frequent in household with one member (22.9%) and where the head of family has no education (18.5%), no skills (11.1%), is female (14.4%) and older than 65 years (11.3%). Conversely incomes higher than 60 millions are more frequent in households consisting of 4 or more workers (64.7%), living in larger cities (500.000 inhabitants) (24,3%), where the head of household is a college graduate (61.4%), is either an entrepreneur, a professional worker (46.9%), or a manager (69.2%).

Table 2.2.7 - Unemployment by education

	seeking for first job	unemployed	Total
no education	10	20	30 1.7%
primary education (6-10)	105	126	231 13.4%
primary education (11-13)	530	229	759 44%
high school	475	122	597 34.6%
bachelor degree	91	13	104 6%
post-graduate studies	4	1	5 0.3%
Total	1215 70.4%	511 29.6%	1726

Unemployment is mostly concentrated among males, younger than 30, and people who completed primary education or high school.

Focusing on the sample of married women which specifically constitutes the object of this analysis, we analysed the incidence of demographics and individual characteristics on the married women's participation process.

One of the social features of Italy, mostly associated with its history and economic situation, is the family structure which could eventually account for disincentives in female labour supply.

In Italy, the institution of marriage and the family structure contribute to the labour force commitment of men by providing a wide set of consumption needs. Empirical studies have consistently shown that married men have higher labour force participation rates than their wives, who are forced into a position of dependency. Furthermore, the pattern of labour supply can be expected to have been influenced by the presence of children, notably in large families in southern areas of the country. For example (figure 2.2.1), in the subsample of unemployed married women-43.5% of the survey respondents had more than 4 children. In particular, among the voluntary unemployed, 14.8% of women had children under 5 years old, while the percentage is substantially lower in the case of involuntary unemployed women (1.49%).

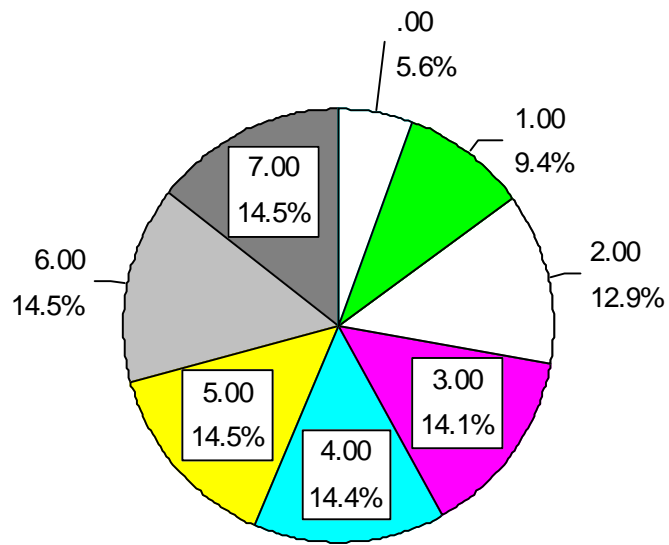
Also, for voluntary unemployed, the existence of other workers (20.2% of cases) could be expected to encourage lower levels of employment commitment. In addition, only 1.1% of wives are welfare recipients.

Turning next to education, the unemployed with no schooling or with some primary education had the lowest recorded percentages. This is confirmed in the Southern regions; indeed, in the Central- Northern area, the percentage of women with primary education is conspicuously low (40.1% vs 10.7%).

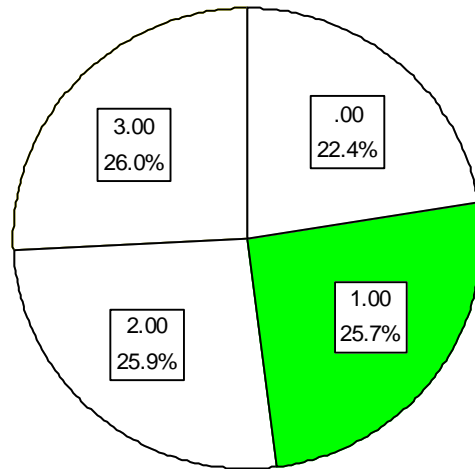
The most interesting feature in the pattern of educational attainments is the sharp contrast among levels of education across the different geographical areas of the country: unemployed women in the South have relatively higher level of education compared with those in the North, this finding suggests an higher propensity for investment in human capital (22.8% of survey respondents in the South completed graduate studies against the 1.4% in the North).

Figure 2.2.1. Children Dependency in the subsample of married women out of labour force

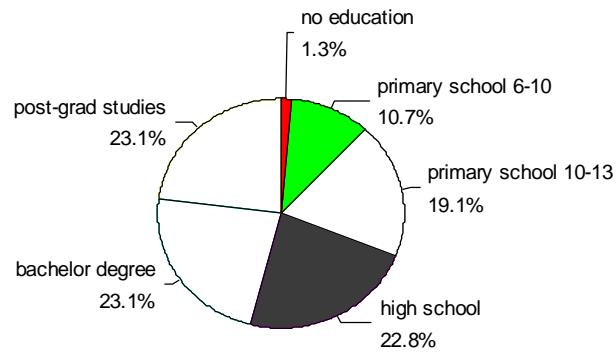
Number of children



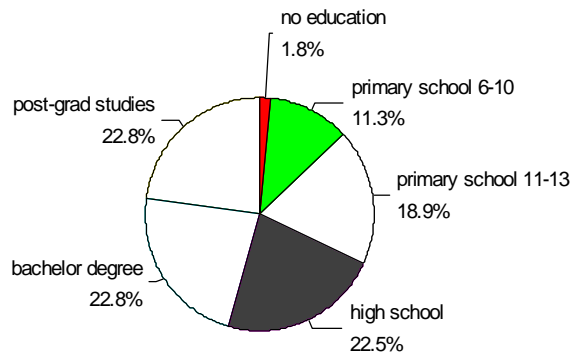
Number of children aged 3-5



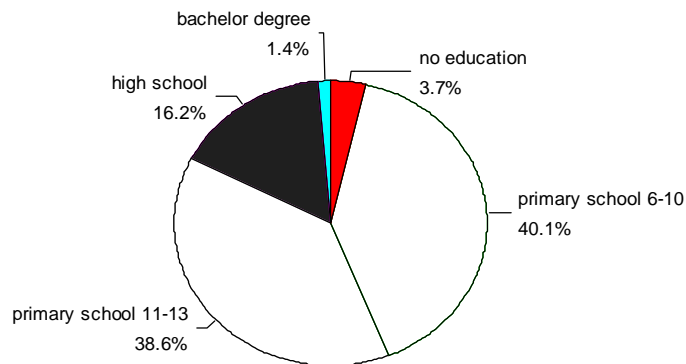
**Figure 2.2.2-Education in the sample of the wives out of labour force
Italy**



South



Centre-north



Two features are worth noting here:

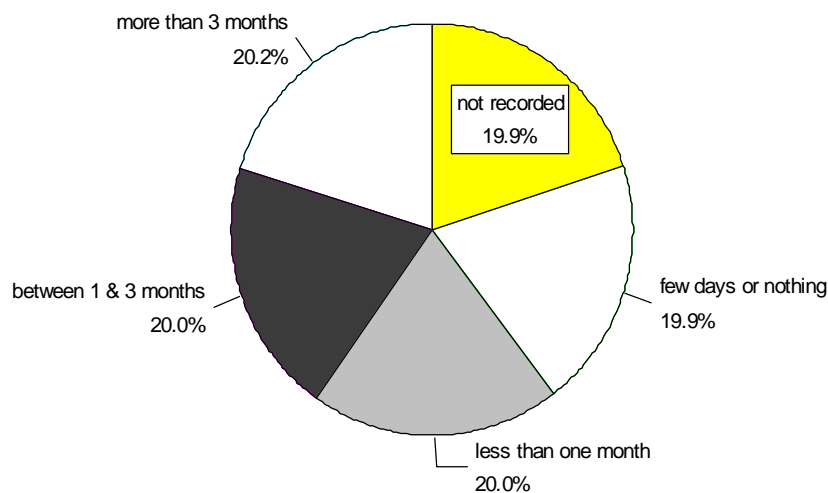
- compared with the level of education attained by married women over the entire sample, it turns out that unemployed married women have invested more in graduate education (23.1% vs 5.5%) and in post-graduate studies (23.1 vs 0.1%).
- notably among the voluntary unemployed, the percentage of those with no schooling or primary education is substantially larger with respect to higher level of education.

In this respect, it is possible to state that the incidence of studying, notably in the South could be considered a reason for not being available for employment, implying a prolonged period of unemployment.

Further information of unemployment patterns can be gleaned from data on changes in the composition of unemployment by duration and occupational skills.

Figure 2.2.3 suggests that people out of work for more than 3 months are 20.2% of the sample. The experience of prolonged unemployment can be considered a further cause of discouragement and labour force withdrawal. To the question: Did you actively search for work during 1993?, only the 10.2% of individuals voluntarily out of labour force, answered in the affirmative.

Figure 2.2.3- Unemployment by duration



It has to be pointed out that there is some difficulty in interpreting data on unemployment duration, because of the high incidence of reporting errors and the very few answers. Nonetheless, the available information seems to suggest that most of the long term unemployment is concentrated among married women in the age groups 31-40 and 41-50 years.

Finally it is worth noticing that - in the subsample of people out of the labour force- only 0.17% of the survey respondents resident in depressed areas turn out to be long-term unemployed, albeit most of the non participants are recorded in the South (47.4%).

Table 2.2.8-Duration of Unemployment by geographical area

	0	few days	less than 1 month	between 1 and 3 months	more than 3 months
North	31.5%	0.1%	0.1%	0.13%	0.46%
Centre	19.4%	0.04%	-	0.13%	0.46%
South	47.4	-	0.04%	-	0.17%

This may account for a more systematic component of voluntary unemployment in the South, where also the structure of the family is more rigid and can induce labour force withdrawal. Or, as an alternative explanation, it could account for discouragement effects, so that married women are more likely to be passive not participants or voluntary unemployed with respect to other groups.

Since people are counted as unemployed if they report being available for work, the seeking-work criterion can be useful to distinguish the incidence of job-seeking over the whole sample of unemployed (which includes women looking for work, keeping house, in school or others). In the survey used for the present research, all those reporting themselves as available for unemployment had been asked which methods of securing work they had attempted.

Table 2.2.9- Method of searching for work

None	14.1%
by Government Employment Bureau	14.2%
by national competition in public sector	14.2%
by asking friends	14.3%
by starting a own economic activity	14.4%
by working with a relative	14.4%
by direct and specific contact from employee	14.4%

As we can see, most of the survey respondents relied on a clearly identifiable method, although the informality of much of the job -searching is quite evident.

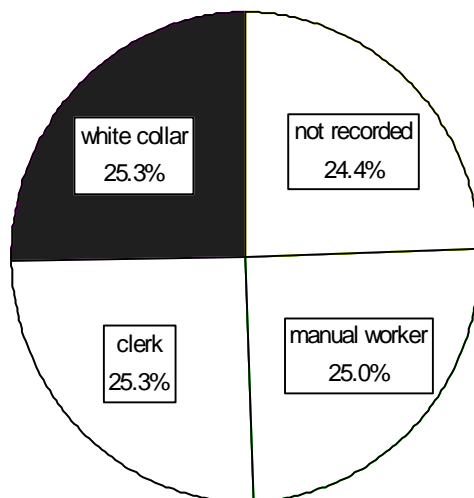
Figure 2.2.9 shows that, among women seeking work, 25% are manual workers, 25.3% are clerical and 25.3% are white collar.

There is a sharp difference in the Southern regions where unemployment is notably concentrated among manual workers (33.5%) or clerks (33.6%).

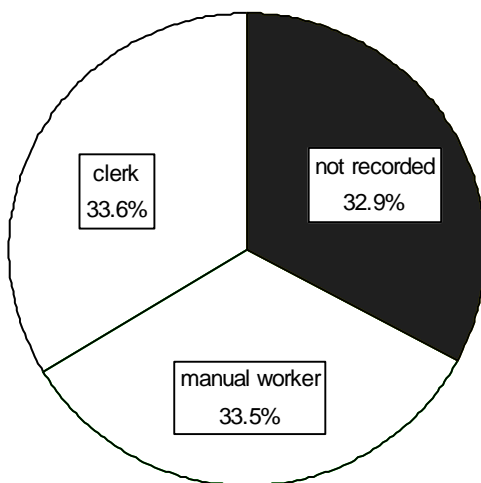
It is also worth noting that a large percentage of unemployment still persists among skilled technical workers.

Figure 2.2.3- Unemployment by occupational skills

Italy



South



3.1 The stochastic specification of the model

This section proposes and describes in some detail, a method of estimating the labour supply which is appropriate when the sample contains unemployed workers. The general ideas underlying the following stochastic specification were explained in the Section 1.3.

The starting point is testing whether ignoring constrained workers could lead to biases in traditional labour supply estimates.

To test this hypothesis we use a simple Probit on the sample of total unemployed, including also the demand-side variables. No theoretical assumptions are required to carry out this initial estimation.

Secondly, having verified through the use of the Probit, that parameters could be biased in absence of any information concerning demand side variables, we consider an alternative to the standard Probit for labour supply, the Double Hurdle model. This extension is based on the theoretical assumption that an individual cannot find employment at her market wage with certainty, so that it is necessary to model an index probability function accounting for the probability that some individuals who are willing to participate cannot get an offer on the market. The estimation will be carried out over the whole sample of unemployed, by using non linear optimisation methods. Thirdly, in order to check for an alternative specification and to verify the consistency of the Double Hurdle model, we propose and implement a model of labour supply (Sequential Probit) based on auxiliary sample separation information. The additional assumption here is the separation of unemployed from the non-participants so that the estimation consists of two separate probit on the subsamples of voluntary (or non-participants) and involuntary unemployed.

The details of model structures and the different theoretical assumptions made about the stochastic models are given below.

3.1.1 Probit for participation

This model includes demand-side variables as additional regressors, as it is given in the following participation equation¹¹:

$$\begin{aligned} d_i=1 & \quad \text{if} \quad y_i^* = w_i \mathbf{d} + \mathbf{e}_i < 0 \\ d_i=0 & \quad \text{if} \quad y_i^* = w_i \mathbf{d} + \mathbf{e}_i > 0 \quad i=1, \dots, N \end{aligned}$$

where d is a dummy variable for total unemployment which is coded 1 if individuals do not participate, 0 otherwise .

Then, we may model participation by using the Probit analysis, on the entire sample of working and not working people: the maximum likelihood procedure solves for the parameter vector which is most likely to have generated the data. Within this framework, for any vector \mathbf{d} , the probability of observing the discrete outcome $d=0$ or $d=1$, conditional on w , is:

$$\Pr\{d = 1 \mid w_i\} = \Pr\{y_i^* < 0\} = \Pr\{\mathbf{e}_i < -w_i \mathbf{d}\} = \Phi[-w_i \mathbf{d}]$$

and

11 A common approach to the specification of discrete choice model is based on the definition of some “latent” response to circumstances people might have. The “latent relationship” can be formalised as follows: $y_i^* = w_i \delta + \varepsilon_i$, where w_i is a vector of regressors, δ is the corresponding unknown coefficient vector, N is the total number of individuals, and ε_i is the normally distributed “taste for work” random variable with mean zero and variance σ^2 .

$$\Pr\{d = 0 \mid w_i\} = \Pr\{y_i^* > 0\} = \Pr\{e_i > -w_i' d\} = 1 - \Phi[-w_i' d]$$

Having specified the stochastic form of the discrete choice model, the joint probability of the event of labour non participation occur (assuming independence across observations) can be maximised by using Maximum Likelihood techniques:

$$L(\mathbf{d}) = \prod_{d_i=1} \{\Phi[-w_i' d]\}^{d_i} \cdot \prod_{d_i=0} \{1 - \Phi[-w_i' d]\}^{(1-d_i)}$$

where $d=1$ indicate the non-working women and $d=0$ the working women.

3.1.2 Double-Hurdle model

To define the Double Hurdle, we consider a general model for participation where there are two groups of individuals:

- (1) workers not experiencing unemployment
- (2) those experiencing unemployment (either those “voluntarily” out of labour force, non-participants, or “involuntary” unemployed).

Individuals have the following desired supply function:

$$\begin{aligned} d1_i &= 1 && \text{if } x_i' \mathbf{b} + u_i < 0 && i = 1, \dots, N \\ d1_i &= 0 && \text{otherwise} \end{aligned}$$

where $d1$ is a dummy variable for voluntary unemployment which codes 1 if the individual is either housewife or student ; 0 otherwise.

Assume that workers wishing to work cannot find a job if $I_i^* = z_i' \mathbf{g} + \mathbf{n}_i < 0$ where I_i^* is a random variable determining whether the worker can get a job offer or not. This corresponds to an index of probability of being either “constrained” in the choice of participation or unconstrained so that, associated with each individual, there is a positive probability of being in each of the two regimes.

Defining $d2$ as a dummy for involuntary unemployment which codes 1 if the individual is seeking for first job, for another work or is not employed, we can write:

$$\begin{aligned} d2_i &= 1 && \text{if } I_i^* = z_i' \mathbf{g} + \mathbf{n}_i < 0 && i = 1, \dots, N \\ d2_i &= 0 && \text{otherwise} \end{aligned}$$

Now define d as a dummy variable for total unemployment (either voluntary or involuntary) which codes 1 if $d1+d2=1$; 0 otherwise. Considering the two distinct observability rule for d_i , where the structural latent relationship accounting either for individual characteristics or demand-side constraints are of the form:

- (1) $d_i^* = x_i' \mathbf{b} + u_i$
- (2) $I_i^* = z_i' \mathbf{g} + v_i$

the general Double Hurdle model becomes:

$$d_i = 1 \quad \text{if } d_i^* < 0 \quad \text{and} \quad I_i^* < 0 \quad i = 1, \dots, N$$

$d_i=0$

otherwise

As we can see from the general formulation of the model, two hurdles have to be overcome before the outcome $d=1$ is observed. A discrete choice first has to be made about whether to want to work or not to work. Second, favourable circumstances have to arise for the positive decision of working to be carried out (e.g. low unemployment rates, vacancies, measures of skill level or human capital).

In this model it is additionally assumed that disturbance terms u_i and v_i have a joint normal distribution, where

$$(u_i, v_i) \approx BVN(0, \Sigma)$$

and furthermore u, v are independent.

Based on the above framework, we can define the probability of observing unemployed as:

$$\begin{aligned} \Pr\{d = 1 \mid z_i, x_i\} &= \Pr\{I_i^* < 0 \text{ and } d_i^* < 0\} = \Pr\{v_i < -z_i'g \text{ and } u_i < -x_i'b\} = \\ &= \Phi[-z_i'g] \cdot \Phi[-x_i'b] \end{aligned}$$

while the probability of observing unconstrained workers can be defined as follows:

$$\begin{aligned} \Pr\{d = 0 \mid z_i, x_i\} &= \Pr\{I_i^* > 0 \text{ and } d_i^* > 0\} = \Pr\{v_i > -z_i'g \text{ and } u_i > -x_i'b\} = \\ &= 1 - \Phi[-z_i'g] \cdot \Phi[-x_i'b] \end{aligned}$$

where x_i is a vector of observable variables including unearned income and individual characteristics and z_i is a vector of observable variables including market conditions, demographics such as occupation and skills or variables capturing the conditions of regional labour markets. Finally, $\Phi[u, v]$ represents a bivariate cumulative distribution evaluated at v, u .

Assuming that no correlation exists between the two latent unobservables and combining the two previous expressions for the probabilities, the Double Hurdle model corresponds to a sample likelihood of the form:

$$L(\mathbf{b}, \mathbf{g}) = \prod_{d_i=1} \{\Phi[-z_i'g] \cdot \Phi[-x_i'b]\}^{d_i} \cdot \prod_{d_i=0} \{1 - \Phi[-z_i'g] \cdot \Phi[-x_i'b]\}^{(1-d_i)}$$

Maximum likelihood estimates may be calculated by iterative methods¹² since no direct way of solving the highly non linear equations for F.O.C is available.

Using methods of non linear optimisation, we can then minimise the joint likelihood function over the whole sample and obtain the relevant estimates of parameters.

In such a model if $\Phi[-z'g]=1$ for all observations, then the Double Hurdle degenerates to the standard probit model for labour supply, where the assumption is that all the individuals are unconstrained. If, indeed, $\Phi[-z'g] \neq 1$, then we have the double Hurdle. The latter specification implies that all working individuals are on their labour supply functions but some of the non workers are willing to work and cannot get a job.

12 The starting values for the minimisation of sample likelihood function are retrieved from the estimation of two separate probit respectively over the sample of voluntary unemployed (dependent variable=d1) and involuntary unemployed (dependent variable=d2).

3.1.3 Sequential Probit model

To describe the formulation of the sequential model, we consider the sample of data $\{d1, d2, x_i, z_i\}$ for $i=1, \dots, N$ where $d1$ assumes value equal to one if the individual is voluntary unemployed (i.e. housewife or student) and $d2$ (which is a dummy accounting for job seekers and not employed) represents a second binary choice variable indicating the second discrete choice; it is observed only for the n_1 observations where $d1=0$.

We assume further that the set of k_1 explanatory variables x_i influence the first choice, and the set of k_2 explanatory variables z_i influence the second choice.

We can model the first stage in this sequence of choices using standard binary choice techniques.

$$\begin{aligned} d1_i &= 1 && \text{if } d_i < 0 && i = 1, \dots, N \\ d1_i &= 0 && \text{otherwise} \end{aligned}$$

where the latent relationship is of the form $d_i^* = x_i' \mathbf{b} + u_i$

Based on this specification, the first stage probability can be derived as:

$$\Pr\{d1 = 1 \mid x_i\} = \Pr\{d_i^* > 0\} = \Pr\{u_i > -x_i' \mathbf{b}\} = \Phi[-x_i' \mathbf{b}]$$

Estimation by MLE on the sample yields ML estimates.

Turning to the second binary choice, the joint probability which leads to the upper branch of the tree presented in figure 1.2.2 (p.7) can be decomposed into the product of the marginal probability and the conditional probability:

$$\Pr\{d1 = 0, d2 = 0\} = \Pr\{d1 = 0\} \cdot \Pr\{d2 = 0 \mid d1\}$$

and

$$\Pr\{d1 = 0, d2 = 1\} = \Pr\{d1 = 0\} \cdot \Pr\{d2 = 1 \mid d1\}$$

Then, we can estimate the second conditional probability in the same fashion as the first one - based on a selected sample of n_1 observations where $d1=0$. By so doing, we effectively condition the second outcome on the first.

Finally, by defining the second latent relationship for involuntary unemployment as:

$$d2_i^* = z_i' \mathbf{g} + v_i$$

we can get the three components which allow to specify the overall probabilities of 3 possible outcomes:

$$\Pr\{d1 = 1 \mid x_i\} = \Phi[-x_i' \mathbf{b}]$$

$$\Pr\{d1 = 0, d2 = 1 \mid x_i, z_i\} = \Phi[x_i' \mathbf{b}] \Phi[-z_i' \mathbf{g}]$$

$$\Pr\{d1 = 0, d2 = 0 \mid x_i, z_i\} = \Phi[x_i' \mathbf{b}] \Phi[z_i' \mathbf{g}]$$

and the sample likelihood function as:

$$L(\mathbf{b}, \mathbf{g}) = \prod_{d1_i=1} \{\Phi[-x_i' \mathbf{b}]\}^{d1_i} \cdot \prod_{d2_i=1} \{\Phi[-z_i' \mathbf{g}] \cdot \Phi[x_i' \mathbf{b}]\}^{d2_i} \cdot \prod_{d_i=0} \{\Phi[z_i' \mathbf{g}] \cdot \Phi[x_i' \mathbf{b}]\}^{(1-d1_i-d2_i)}$$

3.2 Estimation results and Tests

The empirical results presented in this section refer to a sample of 3810 married women from 1993 Bank of Italy's Survey of Household Income and Wealth.

• Before estimating the stochastic models described in Section 3.1, we first regress a standard probit equation for participation, as a benchmark equation, where the demand side variables have not been included. According to the utility-optimising framework, the model is assumed to have the following general structure¹³:

$$\Pr(d = 1) = \Phi \left[\mathbf{I}_0 + \mathbf{I}_1 \textit{kid} + \mathbf{I}_2 \textit{ncomp} + \mathbf{I}_3 \textit{edyears} + \mathbf{I}_4 \textit{prin} + \mathbf{I}_5 \textit{region} + \mathbf{n}_i \right]$$

where d is the dummy variable accounting for both voluntary and involuntary unemployed. Estimation results are listed in Table 3.2.1.

As an initial check on the model, we performed some diagnostic tests for checking if omissions of variables in this standard model are significant, when demand side variables are appended as additional regressors in the model described so far. If these are significant then there may be some evidence of inconsistency of estimated coefficients when unemployment rate or demand side characteristics are omitted¹⁴.

We next turn to the general "unemployment" specification described in sections above.

In next steps, we first carry out the estimation by including demand side characteristics in the estimation of participation (model A).

Then we add theoretical structure to the previous model by modelling an index probability accounting for "constrained" unemployed workers (model B).

Thirdly, a sequential Probit is estimated (model C). This allows us to separate the unemployed from those who do not wish to work (not participants) through auxiliary information in the sample.

Finally, a comparison of the three models will provide a simple test of the reliability of such sample separation information as well as the hypothesis of constraints on the part of the demand.

13 The set of regressors contains: kid = number of children from 6 to 18 years old; ncomp = number of members in the household; edyears = educational level expressed in years; prin = property non-labour income; region = variable for the three macro-regions, north, centre, and south; urate = regional unemployment rate; etalav = woman's age at the time of her first job experience; demand2 = percentage variation in the demand by sector of activity; wskiled = variable accounting for the cross interactions between skills and experience; wexper = wife's working experience; duresp = number of years worked within the same sector of activity.

14 The results of diagnostic tests showed that normality is very strongly rejected, especially through the skewness test. This signals a model misspecification of the kind we might expect in the standard labour supply model. The clear rejection of heteroskedasticity and normality would leave us with little faith in the reliability of this model specification.

- The first estimation described in Section 3.1 is implemented by a Probit for non participation on the sample of married women in the age group 18-64 (3810 cases) as it is presented below.

$$\Pr(d = 1) = \Phi \left[\mathbf{d}_0 + \mathbf{d}_1kid + \mathbf{d}_2ncomp + \mathbf{d}_3edyears + \mathbf{d}_4prin + \mathbf{d}_5urate + \mathbf{d}_7etalav + \mathbf{d}_8demand2 + \mathbf{d}_9wexper + \mathbf{d}_{10}duresp + \mathbf{e}_i \right]$$

The dummy variable d which accounts for both voluntary and involuntary unemployed is regressed against a number of conventional variables and demand-side variables, such as regional unemployment rate ($urate$), women's age at the time of first job ($etalav$), a variable accounting for change in the demand by sector of activity ($demand2$), the wife's working experience ($wexper$) and the duration of the experience within the same sector of activity ($duresp$). Estimated coefficients are listed in Table 3.2.1 (second column). As one can see from the t-ratios of estimated parameters and from the frequencies of actual and predicted outcomes (98% exactly predicted), the results appear satisfactory. Further measures of fit are provided: the Pseudo- R^2 by Mckelvey-Zavoina and the the Pseudo- R^2 by Mcfadden, respectively 0.8754 and 0.8928. Looking at the determinants of the probability of not working, labour force not participation turns out to be related to educational attainment, with greater schooling being associated with decreases in the probability of being out of labour force, number of children, age at the time of first job, work experience and length of experience, as expected¹⁵.

Also probability of not participation is positively related to the number of adults in the family, property income (albeit the coefficient is not significant), unemployment rate and demand¹⁶.

The probability of not working is quite sensitive with respect to variations in the woman's education, as well as to her age at the time of first job and to the number of members in the household.

15 In order to check for the validity of the Probit specification (model A), we carried on some tests using the Likelihood Ratio for various sources of misspecifications: heteroskedasticity, omitted variables or regression misspecification, incorrect distribution assumptions. The model is robust to all the tests performed.

16 However, to evaluate not only the sign of the effects of single variables on LFP, but also their magnitudes, it is useful to calculate some elasticities of parameters:

Elasticity of LFP to other members in the household = 0.7417

Elasticity of LFP to the lenght of working experience= -0.1948

Elasticity of LFP to unemployment rate) = 0.1490

Elasticity of LFP to the woman's education) = -0.8784

Elasticity of LFP to the woman's age at the time of first job) = -0.7330

Table 3.2.1 - Alternative estimates of the not participation model

Variable*	Probit (no demand- side variables are included)	Model A Probit (demand-side variables are included)	Model B Double Hurdle model	Model C Sequential Probit model
	Dep. Variable (~)	Dep. Variable (~)	Dep. Variable (~)	Dep. Variable (~)
Constant	0.62560 (0.10830)	1.9223 (0.36053)	3.5093 (4.4661)	0.51253 (0.10799)
Kid	-0.99337E-02 (0.26769E-01)	-0.17576 (0.84017E-01)	0.53589E-02 (1.0908)	-0.16770E-01 (0.26496E-01)
Ncomp	0.89341E-01 (0.26722E-01)	0.36272 (0.91444E-01)	0.53922 (0.87935)	0.10250 (0.26160E-01)
Edyears	-0.15569E-02 (0.58872E-02)	-0.12853 (0.22539E-01)	-0.20427 (0.16215)	-0.16175 (0.60587E-02)
Prin	0.15569E-02 (0.78362E-03)	0.11973E-04 0.32399E-02	-0.30950E-02 0.14490E-01	0.27544E-02 (0.74919E-03)
Region	0.28663 (0.27840E-01)	-----	-0.42151E-01 (0.46355)	0.27081 (0.27715E-01)
Urate	-----	0.27664E-01 (0.99890E-02)	0.32550E-01 0.11045E-01	0.30610E-01 0.14384E-01
Etalav	-----	-0.12567 (0.65698E-02)	-0.10432 (0.75420E-02)	-0.93367E-01 (0.96112E-02)
demand2	-----	0.16007 (0.21423E-01)	0.11869 (0.22798E-01)	-0.58755E-01 (0.27166E-01)
wskiled	-----	-----	-0.90502E-01 0.76867-02	-0.23880E-01 0.10477E-01
wexper	-----	-0.56712E-01 (0.65545E-02)	-0.45419E-01 (0.71143E-02)	-0.40508E-01 (0.94310E-02)
duresp	-----	-0.42416 (0.75024E-01)	-0.42024 (0.82596E-01)	-0.25357 (0.10783)
Log-likelihood	-2031.682	-235.3075	+235.9133	+2219.739

*The set of regressors contains: kid = number of children from 6 to 18 years old; ncomp = number of members in the household; edyears = educational level expressed in years; prin = property non-labour income; region = variable for the three macro-regions, north, centre, and south; urate = regional unemployment rate; etalav = woman's age at the time of her first job experience; demand2 = percentage variation in the demand by sector of activity; wskiled = variable accounting for the cross interactions between skills and experience; wexper = wife's working experience; duresp = number of years worked within the same sector of activity.

~ Standard errors in parenthesis.

' Critical values for the relevant distributions in parenthesis.

- The estimates in table 3.2.1, in the third column, refer to the parameters of Double Hurdle model.

Looking at the estimated coefficients (and their standard errors), we find an important impact of the demand side characteristics on the probability of being unemployed.

Since the biases go in the direction that would be predicted by the hypothesis that the unemployed are constrained, the result support this hypothesis.

- Finally a second specification of the model for labour participation based upon the sample separation information is tried (Sequential Probit), the results being shown in table 3.2.1, in the forth column. The impact of auxiliary information on job- seekers provided by Bank of Italy Survey is utilised in this model. The new specification is in fact based upon the estimation of two separate

Probit on the subsample of voluntary and involuntary unemployed (results for auxiliary Probit for voluntary and involuntary unemployment are listed in table A.1 in the Appendix A)¹⁷.

On the whole the estimates are quite plausible and well determined. They generally tend toward the Double Hurdle model but seem to fall between these and the probit estimates. They are more precise as we may expect given the use of auxiliary sample separation information. Provided that sample separation (way of measuring $d1$ and $d2$) is correct and the probability term for non-searchers is accurately represented by I^* the Sequential Probit could be termed the “correct” model.

We now turn to an evaluation of the three stochastic models described so far. We can contrast the model A, B and C through the effects that the demand-side characteristics have on actual employment and their implications in terms of unemployment.

In the three models the variables accounting for “constraints” on the part of the potential worker have strong impact on the decision of participation. In the Double Hurdle, they have a direct impact only through the second hurdle unemployment probability index I^* . In contrast, the Sequential Probit model forces the demand-side variables to work on the entire sample separately for voluntarily out of labour market individuals and job seekers (involuntarily unemployed). As we have shown, the separate Probit models are robust to all the test performed. This finding introduces the possibility that also the observed “non participation” could represent unemployment. Indeed in the neo-classical model of labour supply, all the non participants are assumed not to want to work and no role is played by “constraints” imposed by demand conditions. However, if there are discouraged workers among the non seekers, the Double Hurdle model would be incorrect, and therefore we reject model B in favour of model C.

Moreover we have checked out this idea looking at the impact of demand-side variables directly on the probability of being out of labour market, as presented at Table A.1, in the Appendix (third column) where the estimated coefficients, their standard errors are listed, together with the marginal effects. As we can note, all the coefficients are very significant at the conventional significance level and overall precise. Also the signs are as expected.

Thus implementing this procedure precisely suggests that the presence of discouraged workers among “non participants” can be quite significant. This casts doubts about the notion of “voluntary unemployed”, according to the common view and puts, indeed, forward the alternative interpretation of constraints which specifically account for “discouragement” effects.

3.3 Concluding remarks

In this work we have been concerned about female labour employment, by analysing the case of married women in Italy. In the previous sections we have set out the theoretical framework for the present analysis and specified the stochastic models for empirical estimations. We have discussed limitations and problems with estimation methods and theoretical framework so far

17 The Probit for not participation (or voluntary unemployment) has the following structure:

$$\Pr(d1 = 1) = \Phi \left[\mathbf{b}_0 + \mathbf{b}_1kid + \mathbf{b}_2ncomp + \mathbf{b}_3edyears + \mathbf{b}_4prin + \mathbf{b}_5region + u_i \right]$$

Results corrected for heteroskedasticity are listed in the Appendix A (Table A.1- first column). The t-ratios of the estimated coefficients indicate that they are overall precise. The signs of the coefficients are as expected. The Bera-Jarque test for misspecification and normality of errors is carried out on the regression, the result implying that the null hypothesis can not be rejected at the significance level of 5%. Also the diagnostic tests for the omission variables are insignificant.

The second probit for involuntary unemployment is assumed to be as follows:

$$\Pr(d2 = 1) = \Phi \left[\mathbf{g}_0 + \mathbf{g}_1urate + \mathbf{g}_2etalav + \mathbf{g}_3demand2 + \mathbf{g}_4wskiled + \mathbf{g}_5wexper + \mathbf{g}_6duresp + \mathbf{u} \right]$$

The estimation is carried over the subsample of individuals seeking for a the first job or for another job, and currently not employed. The results of the Probit model for the involuntary unemployment equation corrected for heteroskedasticity are listed in Appendix A (Table A.1-second column). The coefficients are significant overall and have the right sign.

adopted in previous studies. Now we briefly conclude our discussion by providing a summary of the empirical findings. This study has proposed and implemented two stochastic models for labour participation which are valid under different assumptions than previous approaches. The Double Hurdle model is an extension of Heckman's procedure. The empirical results are favourable to the acceptance of the hypothesis that unemployed are constrained. The first result thus indicates that the standard approach to estimating labour participation which treats unemployed workers as if they are on a supply function leads to an estimating equation that is misspecified. Further the parameter estimates indicate that controlling for unemployment by simply introducing a "probability" index does not produce a satisfactory empirical model of labour participation and thus other approaches must be considered. One is to estimate a Sequential Probit which allows for a sample separation information. From the comparison between the D.H and the Sequential it appears that the observed "non participation" could also represent unemployment. This seems to account of a sort of widespread discouragement, so that the induced labour force withdrawal understates the potential labour reserve, notably in the Southern region's labour market, where unemployment rates are extraordinarily high. This is because much of the latent labour reserve consists of housewife (often overqualified) and students who would enter the labour market in response to any prospect of employment. Consequently the hypothesis that the labour reserve in Italy is much greater than implied by conventional measures of unemployment since a large proportion of that reserve is passively or "constrained" unemployed is supported by the data. This could imply that the notion of voluntary unemployment is a convenient device for shifting the responsibility for their being out of the market to the unemployed themselves rather than focusing on the real, structural causes of unemployment. In this sense the common view that attempts to reduce the significance of the unemployment by citing voluntary unemployment is unconvincing. Accordingly, it is worthwhile attempting to integrate the strands of the existing analysis to identify not only the behavioural determinants of labour force participation but also focusing on aspects as job opportunities and discouragement effects.

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Appendix A

Table A.1 - Probit estimates for voluntary and involuntary unemployment

Variable*	Probit for voluntary unemployment (no demand-side variables included)	Probit for involuntary unemployment	Probit for voluntary unemployment (demand-side variables included)
	Dep. Variable D1~	Dep. Variable D2~	Dep. Variable D1~
Constant	0.51255 (0.10903)	-2.1836 (0.12677)	1.2921 (0.22252)
kid	-0.16769E-01 (0.26808E-01)	-----	-0.98613E-01 (0.59478E-01)
ncomp	0.10250 (0.27251E-01)	-----	0.21985 (0.57459E-01)
edyears	-0.16175 (0.61879E-02)	-----	-0.11209 (0.13498E-01)
prin	0.27540E-02 (0.84416E-03)	-----	0.70922E-02 (0.21070E-02)
region	0.27080 (0.27125E-01)	-----	-0.97494E-01 (0.89966E-01)
urate	-----	0.10783E-01 (0.59486E-02)	0.26974E-01 (0.10013E-01)
etalav	-----	-0.74221E-01 (0.11382E-01)	-0.11409 (0.58711E-02)
demand2	-----	-0.31075 (0.22394E-01)	
wskiled	-----	0.48108E-01 (0.71464E02)	
wexper	-----	-0.32958E-01 (0.10188E-01)	-0.59268E-01 (0.64530E-02)
duresp	-----	-0.10993 (0.74218E-01)	-0.48171 (0.63454E-01)
Log-likelihood	-2062.886	-380.7329	-504.9048
Tests			
Heteroskedasti	-2050.113 (a)	-328.5485 (b)	
city [^]			
Bera-Jarque- Lee	-2048.224	-3.26.0047	
Omitted variables ^{^^}	-2047.638 (a)	-291.5019 (b)	

* For the definition of the variables used in the regression the footnote 9 is valid.

~ Standard errors corrected for heteroskedasticity in parenthesis.

[^] Heteroskedasticity test variables considered:

(a) Ncomp, Kid, Edyears, Prin, Region, (b) Etalav, Wexper, wskiled, Urate, Duresp, Demand2.

^{^^} Omitted variables considered:

(a) cit=1 if the respondent lives in a city, 0 otherwise, (b) wagewom= woman's wage.