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**Hiring incentives and labour force participation in Italy**

by Piero Cipollone, Corrado Di Maria and Anita Guelfi

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# HIRING INCENTIVES AND LABOUR FORCE PARTICIPATION IN ITALY

by Piero Cipollone*, Corrado Di Maria**, Anita Guelfi***

## Abstract

A long-standing economic tradition maintains that labour supply reacts to market tightness; its sensitivity to job quality has received less attention. If firms hire workers with both temporary and open-end contracts, does participation increase when more permanent jobs are available? We investigate this relationship within a policy evaluation framework; in particular, we examine how labour supply reacted in Italy to a recent subsidy in favour of open-end contracts. This subsidy increased labour force participation by 1.4% in 2001 and 2.1% in 2002. This increase was concentrated on males aged 35-54, with a low or at most a secondary schooling level, and might be due to the choice to leave underground economy.

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* Bank of Italy, Research Department
** Tilburg University, Department of Economics
*** Confindustria, Research Department, Roma

# 1. Introduction[1]

A long-standing economic tradition maintains that labour supply is sensitive to the tightness of the labour market. Increases in labour demand are not fully and immediately reflected in declines in the number of unemployed people because of a positive elasticity of supply to labour demand.

This empirical regularity is in part a statistical artifact because not all job seekers are included in the unemployment pool as defined by international standards. According to the generally accepted definition of unemployment (which is grounded on the ILO (1982) Resolution) a person is unemployed if, being above a specified age[2], has no occupation in the reference period, is available to start to work and has actively looked for a job during the four weeks preceding the reference period. The ambiguity comes from the fact that many people might be willing to work but are not searching according to the ILO definition. Jones-Riddell (1999) have found that in Canada this group – which they call the "marginally attached" – represents between 25 and 35 per cent of the unemployed. People belonging to this pool have a probability of transiting into employment which is lower compared to the unemployed but much higher compared to those who do no want to work. Thus they constitute an intermediate category between job seekers and those who are out of the labour force. Brandolini et al.(2003) found similar results for the European countries: the marginally attached (which they call potential workers) represent an important share of the working-age population, ranging from 1.2 per cent (in Ireland) to 3.5 per cent (in Finland). Moreover, they found that in the case of Italy people who search with less intensity than required to be classified as unemployed display the same behaviour of those who are classified as job seekers.

However, this phenomenon also has strong theoretical underpinnings. Shocks to labour demand increase the opportunity cost of home production through the channels illustrated by the traditional models of labour supply (Backer, 1965) or by the modern theory of search (Pissarides, 2000; Chapter 7). Traditional theory points to market wages as the link between labour demand and participation. Recent theoretical developments have concentrated on workers' search effort and on their decision to move into and out of the labour force.

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[2] 15 years old in the Italian case.

Less attention has been devoted to the reaction of labour supply to changes in the quality composition of labour demand. In a market where firms can hire workers with both temporary and open-end contracts, do more people enter the market when the chances of finding a permanent job get higher?

In this paper we investigate this relationship within a framework of policy evaluation. In particular we look at how labour supply tends to react to subsidies which reduce firms' labour costs. To this aim we examine a recent program introduced in Italy at the end of the year 2000, which provided a large subsidy to firms hiring workers with open-end contracts. This program, called "Credito d'Imposta", was started in October 2000 and originally granted the eligible firms a tax credit of about 400 euros per month for each worker, at least 25 years old, hired with an open-end contract from the hiring moment until the end of December 2003.

There are several recent theoretical contributions which relate participation to subsidies. Orszag-Snower (2003) study the optimal type of employment subsidies in an economy with heterogeneous workers. The central point in their analysis is that the subsidy does increase the value of participating to the labour market either as unemployed or as an employee[3]. In the present paper we propose a simple model showing that a subsidy to open-end contracts brings about a similar increase in the value of participation through a change in the composition of the pool of available jobs, even in the presence of the same number of jobs.

This result builds on the findings of previous analysis showing that the Italian tax credit was successful in reducing the share of temporary jobs in favour of permanent contracts, without changing total labour demand (Cipollone-Guelfi, 2003). The question we ask in this paper is whether more people entered the labour force in response to this larger availability of better jobs, even in the absence of larger employment opportunities.

To address this question we look at how the transitions from inactivity to participation were affected by the subsidy; we resort to the micro-data of the April waves of the Italian Labour Force Survey for the period 1995-2002, within a difference-in-differences framework.

Our results suggest the subsidy did have a non-trivial effect on the participation rate. The tax credit appears to have increased labour force participation of eligible inactive people by about 1.4% in 2001 and 2.1% in 2002 relative to non-eligible individuals. This increase was rather heterogeneous

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[3] Mortensen-Pissarides (2001) look at the same issue in a two-side search economy model; although they do not directly address the issue of labour supply, they show that employment subsidies increase both employment and wages especially for low-skilled workers.

across people. It seems indeed to have been mostly concentrated on individuals (especially males) aged 35-54, with a low or at most a secondary schooling level.

Such characteristics of new labour market entrants look quite surprising since they do not really match with the composition by age and schooling level of the group of people who contributed to most of the growth in the Italian labour supply in the years preceding the introduction of the tax credit. To shed some light on this result we investigate whether those who appear as new participants are in reality people who were previously working in the underground economy and took advantage of the subsidy to become regular declared workers.

The paper is organised as follows. Section 2 focuses on the tax credit by describing in some detail both its regulatory aspects and actual usage. Section 3 presents a simple theoretical framework illustrating a potential mechanism through which policy measures can influence people's choice to enter the labour market. The empirical exercise is described in Section 4, where we use a simple econometric framework to evaluate the impact of the tax credit on the propensity to join the labour force. A description of the data is also contained in this same section. The last part of the paper investigates the possibility that our estimates of the subsidy effect were actually due to the regularisation of previously hidden, irregular workers. Section 6 finally concludes.

## 2.  The tax credit[4]

*2.1 Regulation*

The seventh paragraph of the Italian Finance Law for the year 2001 (issued at the end of the year 2000) introduced a new hiring incentive in the form of a general, automatic and quite generous tax credit to all firms hiring workers with open-end contracts. In particular, the provision stated that, starting from October 2000, every firm (actually "employer") hiring a new worker on a permanent basis would be rewarded with a tax credit of about €413 per month and per worker from the moment of hiring until the end of December 2003.

For workers in the southern regions of the country, this monthly amount raises to about €620. Thus, for a worker hired in October 2000 in the South and retained until December 2003 each firm would receive about € 24,200[5]. Eligibility criteria look quite mild. A worker is eligible if she/he is at

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[4] This section heavily draws on Cipollone-Guelfi (2003).

[5] This general rule was true until an important regulatory change was suddenly introduced in the summer of 2002. Indeed, in July 2002 the Italian Government introduced a ceiling of about 652 million euros for the resources available for the new employment bonus. Since this ceiling had already been reached at the beginning of July, the tax credit was suspended. At the end of September 2002, the Government intervened again on this issue. It was decided that firms would have received a tax credit up to a given ceiling of employment growth and that all credits due for the period July-

least 25 years of age, provided she/he did not hold a permanent position in the 24 months preceding her/his hiring. A firm is eligible if the newly hired worker raises the overall level of permanent employment - at the firm level - above the average recorded between October 1999 and September 2000. The tax credit can be claimed against any kind of taxes, such as income tax, social security contributions, value-added tax. Furthermore, it can be passed on to different fiscal years and can be cumulated with other existing incentives. Finally, unlike previous similar measures, no other restrictions apply (e.g. disadvantaged areas, firm size thresholds, specific sectors, etc.).

Figure 1

**LABOUR COST REDUCTION INDUCED BY THE TAX CREDIT BY AREA AND SECTOR**
(Percentage points)
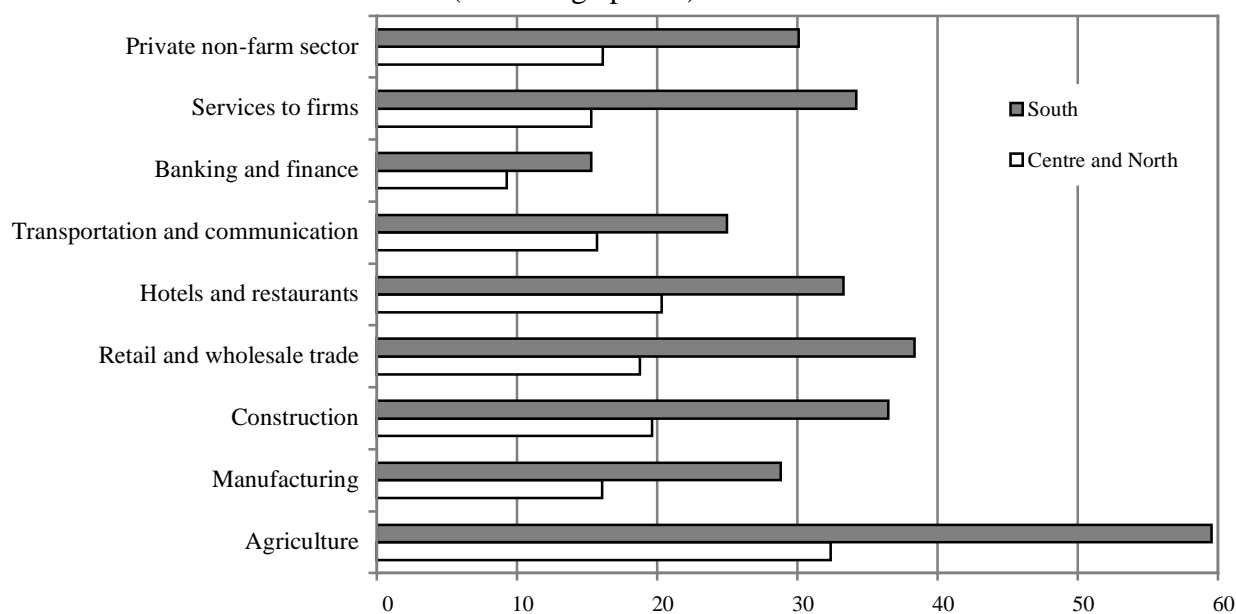


Source: Own calculations on Istat data.

*2.2 Magnitude*

The contribution provided by this subsidy looks quite generous. Figure 1 shows the percentage reduction in per-capita labour costs due to the tax credit (using data for the year 2000) by sector and geographical area. This reduction is variable because the tax credit is a fixed amount that only increases for southern workers, while the average labour cost differs across both sectors and

December 2002 should be claimed in 2003 and by instalments. The regulation of the subsidy for the hires taking place during the year 2003 were left instead to the new Financial Law, which simply extended the new September rules to the year 2003 for all firms already benefiting from the tax credit. Moreover it prolonged the functioning of the employment bonus up to 2006 though reducing significantly the granted monthly amounts

geographical areas. The evidence shows a labour cost reduction which ranges from 9.3 per cent in the banking sector in the central and northern regions to almost 60 per cent in the agricultural sector in the South. On average, in the private non-farm sector the reduction amounts to about 30 per cent in the South and 16 per cent in the central and northern regions. These estimates understate the effect of the tax credit because labour cost data refer to an average worker, while the correct reference should be the labour cost of a new young worker, which is usually below the average. It should be mentioned, however, that national accounts also include estimates of the labour cost in the underground economy, which is very likely smaller than the legal labour cost for a new entrant; however, this effect only attenuates underestimation.

*2.3 Usage*

The new tax credit seems to have been very successful in 2001 and even more so in 2002. We have two sources of information about the actual usage of this new instrument. The first source is the Italian Labour Force Survey (LFS), which provides data on the number of newly hired employees, distinguishing between open-end and fixed-term contracts. Figure 2 reports the quarterly absolute growth in total employees by type of contract with respect to the corresponding period of the previous year. It suggests that in January 2001[6] - i.e. the first survey since the new tax credit came into force - fixed-term contracts stopped increasing, having been the only source of payroll employment growth since 1993; in October 2001 the number of fixed-term contracts was smaller than one year earlier. However a slow-down had already occurred in the year 2000, although most of it was due to a strong labour demand which turned the labour market into a seller's market, especially in the northern regions, thereby allowing workers to negotiate hires with open-end contracts. In 2001, open-end contracts went up and fully compensated the slow down in fixed-term contracts. This was the largest increase in permanent employment since 1993 and looks quite remarkable given the sharp slow-down in economic activity in 2001 (the growth in value-added in the private sector fell from 4.2 to 2.5 per cent between 2000 and 2001). The resurgence of open-end contracts also characterised the year 2002, where they represented about 86 per cent of the overall increase in dependent employment. However, the graph also shows that starting from April 2002 the progressive worsening of labour market conditions was accompanied by a reappearance of fixed-term contracts

The second source of information is represented by the figures collected by the Ministry of Finance (and reported by the Ministry of Labour[7]), to assess the amount of revenues lost through the tax credit. Figure 3 shows these forgone revenues as a share of total social security contributions and

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[6] Italian Labour Force Surveys are conducted in the first weeks of January, April, July, and October, respectively.
[7] See Ministero del Lavoro e delle Politiche Sociali (2002).

the corresponding number of workers involved in 2001 and in the first five months of 2002. Between January and December 2001, the monthly flow of forgone revenues increased from zero to more than 0.7 per cent of the monthly flow of social contributions. This involved almost 221,000 workers in November 2001, i.e. about 1.4 per cent of total employees. The phenomenon looks even stronger in 2002: in May 2002, monthly flows of forgone revenues reached about 1.1 per cent of social security contributions, involving about 273,000 workers (1.8 per cent of total employees). These figures suggest the tax credit has been a great success, far beyond the 83,000 workers initially foreseen for the entire subsidized period, i.e. October 2000-December 2003.[8]

Figure 2

**EMPLOYMENT BY TYPE OF LABOUR CONTRACT**
(Changes, in '000, on the corresponding quarter)
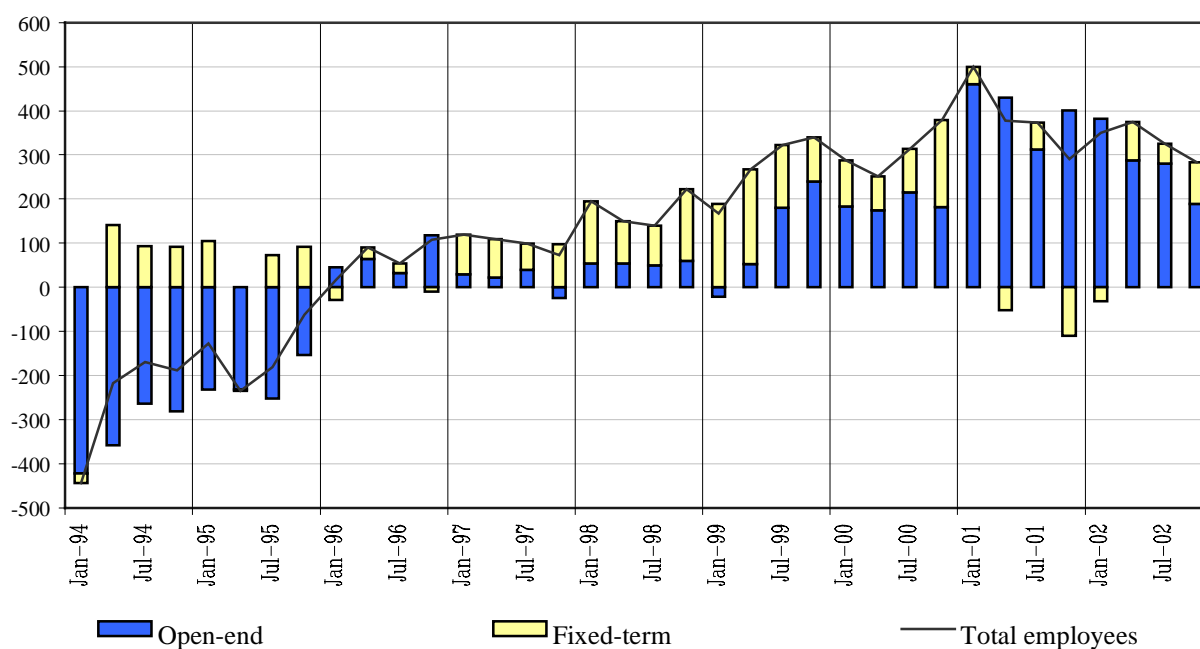


Source: Own calculations on Istat data .

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[8] See Bank of Italy (2001).

Figure 3

**TAX CREDIT USAGE: EVIDENCE FROM FISCAL DATA FROM JANUARY 2001 TO MAY 2002**
(Revenues figures are flows, workers figures are stocks)



- - - - - forgone revenues as share of social contributions ——— number of workers hired as % of employees
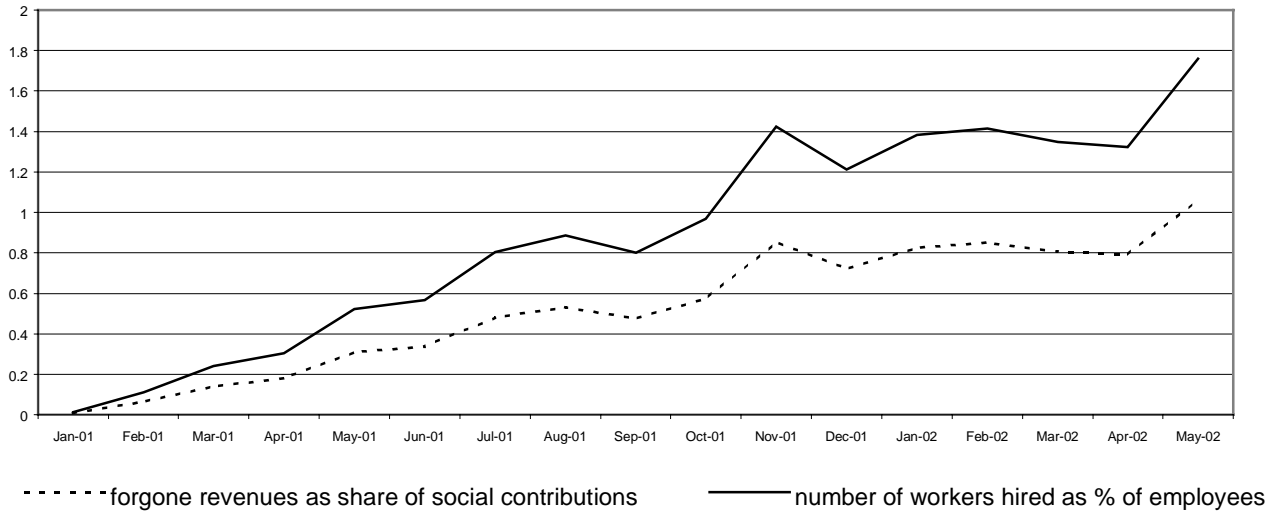
Source: Own calculations on Ministero del Lavoro e delle Politiche Sociali (2002) and Istat.

## 3. Choosing to participate: a theoretical framework

In this section we develop a simple model of the participating behaviour of the population. We aim at analysing the mechanism through which policy measures that improve the quality of the job pool can influence people's choice to enter the labour market.

Cipollone-Guelfi (2003) have modelled the effects of the tax credit on labour demand, thereby showing that fixed-term and open-end contracts do co-exist and the share of permanent jobs increases with the size of the tax credit. Here we take this composition effect as given and evaluate how workers react to the improved perspectives of getting a permanent job.

Pissarides (2000) has shown how market tightness affects labour supply. There are at least two channels at work. First of all, there exists a mechanical effect due to the fact that in a tighter labour market the value of unemployment increases and raises the participation rate for a given distribution of reservation utility. The additional channel impinges on the positive correlation between worker's search effort and labour market tightness. Higher labour demand enhances search productivity and thereby reduces its costs.

These two channels are still at work in our case even though we have a different underlying force. In our model, the value of participation increases because of the shift in labour demand toward better jobs rather than because of the greater tightness of the labour market.

Our model is a simple extension of Pissarides (2000)'s basic setting to the case of two types of available jobs.

We describe the behaviour of a labour market in which transitions between being out of the labour force and employment are always mediated by an intermediate step into unemployment. This is in line with the standard setting of search models. More recently, Garibaldi-Wasmer (2003) developed a general equilibrium model where workers are allowed to move freely among the three labour market statuses. An additional characteristic of our model is that participating people supply an inelastic amount of work. This implies that labour supply can only vary at the extensive margin - because of a larger number of participating people - rather than at the intensive margin (more hours supplied by the same number of workers).

We begin by illustrating the first channel and assume that an individual choosing to stay out of the labour force has a reservation utility $U_o = \delta_o/r$, where $\delta_o$ is the stream of real returns from non-participation and $r$ is the discount rate. It can be thought as the value of home production. We assume that $\delta_o$ is a drawing from a distribution with cumulative density $F(\delta_o)$ defined over the support $[\underline{\delta}, \overline{\delta}]$. Let $U$ be the utility of unemployment. A worker will participate if $U > U_o$. The size of labour supply is then $F(rU)$, which increases with the value of unemployment. We need to show that this quantity increases as the probability of being hired with an open-end job increases. As a first step we need to show that $U$ rises when the share of permanent contracts increases. To this end let us write the value functions for unemployment and employment. As in Pissarides (2000), the return on being unemployed for a given worker endowed with a given level of productivity is the sum of the flow of income and the expected value from moving into employment

(1) $$rU = b + \alpha(V - U)$$

We impose that b does not include the flow of income that accrues to the worker while out of the labour force. V is the present discounted value of holding a job. The parameter $\alpha$ represents the probability of finding a job. We assume that this value is given, since we are not interested in the effect of the level of labour demand but in the effect of its composition.[9] The value of being at work, V, is an average between working with a fixed-term contract and an open-end one:

(2) $$V = \pi^{oe}V^{oe} + \pi^{ft}V^{ft}$$

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[9] In equilibrium, the probability $\alpha$ is jointly determined with the wage. Our assumption that the probability of being hired is not affected by the size of the tax credit is also justified by the empirical findings that the tax credit had no effect on the level of labour demand ( Cipollone-Guelfi, 2003).

where πoe and πft are the probabilities of being hired with an open-end and a fixed-term contract, respectively. The flow of value accruing to job holders is the sum of the wage and the expected gain (or loss) from moving into unemployment

(3)
$$rV^i = w + \lambda^i (U - V^i) \text{ with } i = oe, ft$$

where λi is the exogenous probability of being fired, that we assume to be larger for fixed-term jobs because of the firing costs associated with open-end contracts. Open-end contracts are more valuable than fixed-term contracts as long as the labour market is "viable"[10], that is as long as w>b.

The first step of our reasoning requires proving that the value of unemployment rises when the quality of jobs improves; that is, we need to show that

$$\frac{\partial U}{\partial \pi^{oe}} > 0$$

(4)

holding constant r, w, b, α, λoe, and λft. Using (3) into (2) in order to find an expression for V as a function of U, and then inserting it into (1), one can find the following expression for U :

(5)
$$U = \frac{b(r+\lambda^{oe})(r+\lambda^{ft}) + \alpha w[\pi^{oe}(r+\lambda^{ft}) + \pi^{ft}(r+\lambda^{oe})]}{(r+\alpha)(r+\lambda^{oe})(r+\lambda^{ft}) - \alpha[\pi^{oe}\lambda^{oe}(r+\lambda^{ft}) + \pi^{ft}\lambda^{ft}(r+\lambda^{oe})]}$$

from which one can verify that condition (4) holds for any type of workers if the market is viable, that is if w>b. Given this result, it is immediate to recognise that labour market participation rate F(rU) increases with πoe because, by definition, a cumulative function is not decreasing in its argument. The economic intuition is straightforward. A worker who is indifferent between participating and staying out of the labour force, will enter the market when the value of this choice increases above that of the alternative. The magnitude of the rise in participation for a given increase in πoe depends on the initial level of labour supply and on the distribution function.

In conclusion, this discussion suggests that the tax credit has a positive effect on labour supply even if it does not change labour demand, thereby proving that our intuition holds true in a more formalised setting.

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[10] In Pissarides' model the condition of viable labour markets ensures that the value of employment is larger than the value of unemployment.

Next we show that in our setting the second channel mentioned above is also at work, so that the tax credit increases labour force participation by raising workers' search effort. Again, we extend Pissarides (2000)'s model of search intensity to the case of two types of contract.

The basic system of value functions looks like equations (1)-(3) with two modifications. The flow of income accruing to unemployed workers has changed into a function σ(c,b) ( σc(c,b) <0, σcc(c,b) <0, σb(c,b) <0 ), which describes the net income for a worker with a gross income b and a search intensity c. In addition, we assume that the probability of finding a job is no longer constant but depends on the search intensity : α(c) , α'>0.  Therefore, we modify equation (1) as:

(1bis) $$rU = \sigma(c,b) + \alpha(c)(V - U)$$

Pissarides shows that the optimal level of search is such that:

(6) $$\sigma_c(c,b) + \frac{\alpha(c)}{c}(V - U) = 0$$

We want to show that $\frac{\partial c}{\partial \pi^{oe}} > 0$; therefore, we fully differentiate (6) with respect to $c$ and $\pi^{oe}$ to get

(7) $$[\sigma_{cc} + \frac{\alpha(c)}{c}\frac{(\eta - 1)}{c}(V - U) + \frac{\alpha(c)}{c}\frac{\delta(V - U)}{\delta c}]dc = -[\frac{\alpha(c)}{c}\frac{\delta(V - U)}{\delta \pi^{oe}}]d\pi^{oe}$$

where $\eta = \frac{\delta \alpha(c)}{\delta c}\frac{c}{\alpha(c)}$ is a value which lies between 0 and 1[11]. In this equation, the coefficient of $d\pi^{oe}$ is negative and those of $dc$ are all negative except the last one. Therefore, we can conclude that the condition $\frac{dc}{d\pi^{oe}} > 0$   is satisfied if the value of the capital gain *(V-U)* does not increase too rapidly with the search effort.

## 4. The effect of the tax credit on labour supply: data description and empirical results

*4.1 Empirical specification and identification strategies*

In order to evaluate whether the tax credit has indeed encouraged inactive people to enter the labour force, we adopt a simple econometric framework. In particular, we address here two questions, namely whether the introduction of the subsidy has raised the probability of entering the labour market for an average, but eligible, inactive person and whether this increase has been homogeneous across people with different personal characteristics.

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[11] See Pissarides (2000), page 126, equation 5.7.

To this end we estimate a probit model, where the probability of entering the labour force depends on a set of dummies which take value one if the person is eligible for the subsidy (there are two of such variables, one for the year 2001 and one for the year 2002), some demographic characteristics including age and education (measured by the years of schooling), year dummies. The two eligibility dummies are also included in interaction with the education level. Thus, our empirical framework looks as follows:

$$Pr(\text{ Entering the labour force }) = \Phi\left(x'_{it}\beta\right)$$

$$
\begin{aligned}
x'_{it}\beta = {} & \beta_o + \beta_1 eligible\,2001_i + \beta_2 eligible\,2002_i + \beta_3 eligible\,2001_i * (educ_{it} - mean(educ)) \\
(8) \quad & + \beta_4 eligible\,2002_i * (educ_{it} - mean(educ)) + g(educ_{it}, age_{it}) + other\ demographic \\
& characteristics_{it} + year\ dummies
\end{aligned}
$$

In this specification, the marginal effects associated with the coefficients $\beta_1$ and $\beta_2$ provide an answer to the question whether the introduction of the tax credit has raised the probability of participating to the labour market in 2001 and 2002, respectively. On the other hand, coefficients $\beta_3$ and $\beta_4$ measure the differential effect of a given level of education (different from the mean) on the probability that an inactive eligible person enters the labour force. Furthermore, the $g(.)$ function is specified as a cubic in age, a quadratic in schooling and includes the interaction between the linear terms of these two variables. Finally, "other demographic characteristics" include gender, marital status, regional dummies and the inactivity status 12 months before the interview.

A similar setting was adopted in Cipollone-Guelfi (2003) to evaluate the effect of the tax credit only on the composition of labour demand (not on the level) by type of contract (fixed-term and open-end). In that case the conditioning population referred to newly hired workers, regardless of their previous labour market status. Here we address a completely different issue. Our problem is to evaluate whether labour supply reacted to the improved quality of available jobs. Thus, we look at the changes in the transition rate from out of the labour force to participation due to the tax credit, ignoring all moves from unemployment to employment.

We carry out our estimation through a "diff-in-diff" estimator which identifies the effect of the subsidy as the change occurred in 2001 and 2002 (that is, after the tax credit was introduced) with respect to a reference year in the difference between the share of labour force entrants eligible for the tax credit (the "eligible" group) and the analogous measure for those excluded from this provision (the "control" group). According to the law that regulates the subsidy, all people older than 24 in

either 2001 or 2002 are potentially eligible for the tax credit provided they did not hold a permanent position in the 24 months preceding their hiring.

The pool of potentially eligible workers includes age cohorts with very different demographic and economic characteristics, and cannot therefore be easily compared with a control group of young people (up to 24 years of age).  We did not have any particular way of identifying the maximum age of the eligible group that would make the comparison reasonable. Therefore we adopted a modular strategy which entails comparing two groups very close in age and then allowing for more heterogeneity by adding older people to the eligible group.  Thus, we started by restricting the analysis just around the eligibility threshold, in that we only focussed on the subsidy effects on people aged 25-26 (the "eligible" group) compared with those aged 20-24 (the "control" group). Keeping constant the control group[12], we then added to the eligible group those aged 27 and re-estimated the usual equation. We repeated this procedure adding every time one more year of age until the whole cohort of eligible workers (i.e. those older than 24) was covered. This strategy embeds an implicit robustness check of our results since it secures them against the choice of a particular eligible group.

## 4.2 Data description

We estimate our model using the Italian Labour Force Survey micro-data from 1995 to 2002. The sample includes all people present in the survey at the time of the interview, who in the previous period were inactive for reasons other than disability or mandatory military service. The definitions of labour market statuses (out of the labour force, unemployed, employed) adopted here are those provided by the Italian Statistical Institute (ISTAT), which fully reflect the ILO definitions.

Unfortunately, the Italian LFS asks the question about previous labour market statuses only once a year, namely in the April wave, and restricts the enquiry to the status possessed in the same month of the preceding year. Thus, our sample comprises all people interviewed in the April wave surveys conducted between 1995 and 2002 who, in the same month of the year preceding the interview, were inactive (for reasons other than disability or mandatory military service). We exclude both agricultural workers (because of the specificities characterising this sector) and public employees (who are not eligible for the subsidy).

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[12] According to the age, the group of non-eligible workers would consist of all people younger than 25, thus including also those aged 15-19. However, we chose to restrict the control group to the 20-24 cohort in all estimations under the assumption that the non-treatment effects would be more evident for people just below the eligibility cut-off point.

We are interested in evaluating how many of these people left inactivity because of the stimulus provided by the subsidy. These selection rules posit a preliminary question on the treatment of those who left inactivity but entered the labour market as self-employed. They were included in the sample but treated as if they were still out of labour force. The reason behind this choice is that the decision of entering as self-employed should not be affected by the encouraging effect of the subsidy we are analysing.

Tables 1a and 1b describe the basic characteristics of our sample in some detail. Our sample is representative of a large share of the Italian population: from about 15.5 millions in 1995 to 14.9 in 2002. Among these people, the number of those entering the labour force (excluding self-employed workers) ranges from a minimum of about 1.04 million people in 1995 to a maximum of about 1.26 in 2002 (Table 1b). The transition rate towards the labour force ranges from 8 per cent in 1995 up to 10.8 per cent in 2002

In 2002 the majority of individuals entering the labour force were especially women (about 63 per cent), in the central classes of age (56 per cent between 35 and 44 years of age, 25.7 per cent younger than 25), with at least a high-school diploma (55 per cent), and who before entering the market were mainly housewives (40 per cent) or students (34.1 per cent). This composition changed significantly over the considered time-span. In 1995 the women share was about 70.2 per cent, entrants younger than 35 amounted to about 70 per cent (of which more than 43 per cent between 15 and 24 years of age), high-school degree holders were less than 50 per cent, while around 87 per cent were originally either housewives (44.3 per cent) or students (42.6 per cent)

Most of these changes occurred because of the Italian demographic evolution, such as the ageing of the population and the progressive improvement in educational attainment. Other changes however seem to coincide with the operation of the subsidy, since they took place in 2001 and especially in 2002. For example, the large increase in the male share of new labour force entrants in 2001 and 2002 (5 and 8 percentage points with respect to the year 2000; Table 1b) is not paralleled by an analogous increase in their share of the reference population (1.4 and 1.6 percentage points with respect to the year 2000; Table 1a). Such a strong composition effect was not observed before. A similar striking change can be found by looking at the age composition: people older than 34 increased their share among the new entrants by about 9 percentage points between April 2000 and April 2002, while their share in the reference population stayed almost constant. Similarly, it is quite surprising that labour force entry of housewives and retired people rose considerably in the analysed period (2 and 9 percentage points, respectively), given that their weight in the population as a whole changed only marginally.

Overall, this preliminary overview of our data suggests that some important change actually occurred in the transition pattern between inactivity and activity in the labour market. The direction of these changes looks compatible with the possible effect of the subsidy.

Table 1a

## BASIC SAMPLE CHARACTERISTICS
### (Percentage points)

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|
| | Characteristics of the whole sample | | | | | | | |
| *By labour market status* | | | | | | | | |
| Employee | 2.2 | 2.5 | 2.8 | 2.7 | 3.0 | 2.8 | 3.5 | 4.5 |
| Self-employed | 1.4 | 1.6 | 1.7 | 1.9 | 1.8 | 1.3 | 2.1 | 2.3 |
| Persons looking for a job | 4.5 | 4.4 | 4.5 | 4.7 | 4.4 | 4.7 | 3.8 | 3.9 |
| Inactive | 91.9 | 91.5 | 91.0 | 90.6 | 90.8 | 91.2 | 90.5 | 89.2 |
| | | | | | | | | |
| *By gender* | | | | | | | | |
| Male | 28.4 | 28.9 | 29.1 | 29.5 | 29.9 | 30.1 | 31.5 | 31.6 |
| Female | 71.7 | 71.1 | 70.9 | 70.5 | 70.1 | 69.9 | 68.5 | 68.4 |
| | | | | | | | | |
| *By Age* | | | | | | | | |
| 15-24 | 31.9 | 30.8 | 30.4 | 29.7 | 29.3 | 28.7 | 28.3 | 28.4 |
| 25-34 | 14.1 | 14.2 | 14.4 | 14.6 | 14.7 | 14.9 | 14.6 | 14.4 |
| 35-44 | 11.3 | 11.2 | 11.6 | 11.5 | 11.6 | 11.6 | 12.0 | 12.4 |
| 45-54 | 15.1 | 15.5 | 15.4 | 15.5 | 15.2 | 15.3 | 14.9 | 14.9 |
| 55 and over | 27.7 | 28.3 | 28.2 | 28.8 | 29.3 | 29.6 | 30.2 | 29.8 |
| | | | | | | | | |
| *By area* | | | | | | | | |
| North | 47.4 | 47.5 | 47.3 | 47.2 | 47.6 | 47.1 | 47.1 | 46.2 |
| Centre | 39.4 | 39.6 | 39.5 | 39.4 | 39.4 | 39.8 | 39.9 | 39.9 |
| South | 13.1 | 12.9 | 13.2 | 13.4 | 13.0 | 13.1 | 13.0 | 13.9 |
| | | | | | | | | |
| *By education* | | | | | | | | |
| Less than high-school | 75.0 | 74.1 | 72.9 | 71.5 | 70.9 | 70.3 | 69.7 | 68.6 |
| High-school diploma | 22.8 | 23.5 | 24.5 | 25.7 | 26.0 | 26.6 | 26.8 | 27.6 |
| College degree | 2.2 | 2.5 | 2.6 | 2.8 | 3.1 | 3.2 | 3.5 | 3.8 |
| | | | | | | | | |
| *By inactivity status 12 months before entering labour force* | | | | | | | | |
| Future activity to start | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.9 | 0.6 | 0.7 |
| Housewife | 45.4 | 44.8 | 44.8 | 44.5 | 43.9 | 43.2 | 43.2 | 42.8 |
| Student | 32.9 | 32.3 | 32.2 | 32.0 | 31.9 | 31.8 | 31.4 | 31.0 |
| Retired | 20.0 | 20.9 | 20.9 | 21.8 | 22.0 | 21.7 | 22.3 | 22.9 |
| Others | 1.1 | 1.3 | 1.4 | 1.0 | 1.5 | 2.4 | 2.4 | 2.6 |

Source: Own computations on Istat data.

## BASIC SAMPLE CHARACTERISTICS
(Percentage points)

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|
| Characteristics of labour force entrants (without self-employed) | | | | | | | | |
| *By gender* | | | | | | | | |
| Male | 29.8 | 29.5 | 28.9 | 30.6 | 30.2 | 28.6 | 33.5 | 36.7 |
| Female | 70.2 | 70.5 | 71.1 | 69.4 | 69.8 | 71.4 | 66.5 | 63.3 |
| *By Age* | | | | | | | | |
| 15-24 | 43.2 | 38.4 | 36.3 | 34.5 | 33.6 | 34.1 | 29.5 | 25.7 |
| 25-34 | 29.6 | 31.3 | 30.7 | 33.0 | 33.2 | 34.0 | 33.3 | 33.2 |
| 35-44 | 16.4 | 17.1 | 19.2 | 18.7 | 19.8 | 18.5 | 22.5 | 22.8 |
| 45-54 | 7.6 | 9.7 | 10.7 | 10.7 | 9.9 | 10.1 | 11.5 | 14.1 |
| 55 and over | 3.2 | 3.5 | 3.1 | 3.0 | 3.6 | 3.4 | 3.2 | 4.2 |
| *By area* | | | | | | | | |
| North | 47.0 | 48.4 | 50.5 | 47.4 | 52.1 | 47.7 | 49.5 | 47.1 |
| Centre | 41.0 | 39.8 | 37.3 | 39.9 | 36.8 | 40.3 | 38.5 | 35.2 |
| South | 12.0 | 11.8 | 12.2 | 12.7 | 11.1 | 12.0 | 12.0 | 17.7 |
| *By education* | | | | | | | | |
| Less than high-school | 50.2 | 46.4 | 47.6 | 45.1 | 43.7 | 43.8 | 43.4 | 44.9 |
| High-school diploma | 41.6 | 43.9 | 43.0 | 45.3 | 45.7 | 46.0 | 45.8 | 43.0 |
| College degree | 8.3 | 9.7 | 9.4 | 9.6 | 10.6 | 10.2 | 10.8 | 12.1 |
| *By inactivity status 12 months before entering labour force* | | | | | | | | |
| Future activity to start | 5.8 | 5.6 | 4.9 | 6.1 | 6.0 | 7.8 | 5.2 | 5.8 |
| Housewife | 44.3 | 42.1 | 44.4 | 41.5 | 40.6 | 38.1 | 41.4 | 40.0 |
| Student | 42.6 | 41.8 | 38.3 | 40.8 | 40.1 | 43.4 | 39.4 | 34.1 |
| Retired | 5.7 | 7.9 | 8.6 | 9.9 | 11.1 | 2.8 | 6.3 | 11.7 |
| Other | 1.6 | 2.6 | 3.8 | 1.8 | 2.2 | 7.9 | 7.8 | 8.3 |
| All labour force entrants (1) | 1042 | 1068 | 1126 | 1144 | 1123 | 1123 | 1100 | 1256 |
| All inactive (1) | 14281 | 14215 | 14040 | 13921 | 13711 | 13615 | 13505 | 13321 |
| Whole sample people (1) | 15546 | 15536 | 15424 | 15363 | 15099 | 14932 | 14915 | 14927 |
| Whole sample Observations (1) | 55.4 | 55.1 | 54.6 | 54.5 | 53.4 | 53.1 | 51.8 | 50.8 |

Source: Own computations on Istat data.
(1) Thousands

*4.3 Results*

Estimation results on the effect of the tax credit in both 2001 and 2002 are reported in Table 2 and in Figure 4 (panel (a) describes the average effect, while panel (b) shows the interaction with education). Table entries represent marginal effects (columns with heading M.E.) and their associated t-statistics (columns with heading t-stat); columns 2 and 3 refer to the variable indicating whether workers were eligible for the subsidy in 2002; columns 4 and 5 report the interaction of the eligibility status with the schooling level; columns 6 and 7 refer to the eligibility for the tax credit in 2001 and columns 8 and 9 its interaction with schooling. Along the rows one can read the effect of the tax credit for several age groups. The numbers in the first row refer to the regression that includes in the sample only people aged 20 to 26 (with the group 20-24 acting as a control and the group 25-26 acting as eligible). The second row refers to the age group 20-27, and so on. Figure 4 contrasts these numbers for the years 2001 and 2002: in panel (a) marginal effects associated with the eligibility dummies are compared; in panel (b) their interaction with the years of schooling.

When we look at the marginal effect for people just above the cut-off point for eligibility (the row focussing on the eligible age group 25-26), we do not find any effect of the tax credit on labour market participation. Being eligible for the subsidy increased the probability of moving out of the labour force by about one percentage point in 2002 and by 1.4 percentage points in 2001; the small t-stats suggest that neither of these effects is bounded away from zero. When we include people in their late 20's we still fail to detect any particular effect of the eligibility status on the transition probabilities. Indeed the average effect for both 2001 and 2002 appears to be zero for the youngest eligible workers. In particular, compared with the years before 2000, no encouragement effect seems to emerge for people up to around 29 years of age. However the lack of an average effect hides some heterogeneity among young workers. In particular, in the year 2002 the marginal effect for the interaction between eligibility status and years of schooling is negative and statistically bounded away from zero (starting from the eligible group 25-27), suggesting that only less educated people were influenced by the subsidy. No sign of heterogeneity emerges in 2001.

One question that might arise in this type of comparisons is whether the subsidy induced firms to substitute non-eligible people (just below 25) for eligible ones (just above 24). If this were the case, the true net effect of the program on the participation rate would be smaller than that implied by the size of the coefficient $\beta_1$. We do not have a formal test to address this issue, but the small and statistically insignificant marginal effect for the group just above the critical threshold casts serious doubts on the presence of such a substitution process.

As we progressively widen the eligible group, average effects appear to grow stronger both in magnitude and statistical significance. Panel (a) of Figure 4 shows indeed that, compared with the reference years, in both 2001 and 2002 labour force entry is higher the older is the new participant at least up to 50 years of age. These results look quite stable over large age groups and the changes observed across age follow a rather smooth pattern after age 30. This regularity holds for the average effect (panel (a) of Figure 4) and for the additional effect of schooling (panel (b)) and allows us, for sake of simplicity, to concentrate our comments on a few representative groups, without much loss of generality. In particular, the columns of Table 3 report the results of the regressions referred to eight main age classes that we selected as representative: up to 29 years of age, up to 35, up to 40, and so on until the whole set of eligible persons is included in the eligible group. Along with the average effect and its interaction with schooling for the years 2001 and 2002, the rows of the Table report the marginal effects of all variables included in the regression.

Our estimates indicate that in the period 2001-2002 participation improved significantly for all people older than 29, though with relevant differences in magnitude. Indeed, labour force participation rose by about 2.8 percentage points in 2001 and a further 0.9 points in 2002 for eligible people up to 35 years of age, while the highest increases emerge when people up to 50 years of age are included in the eligible group: in this case participation rose by about 3.6 percentage points in 2001 and an additional 1.0 point in the following year. For the successive age groups, instead, labour force entry declines, though very slowly, remaining anyway positive and statistically significant even when the oldest cohort (i.e. people aged up to 64) is included in the eligible group. As far as education is concerned, labour force entry was rather homogeneous across different schooling levels in 2001 in all age groups. Conversely, in 2002 changes in participation were higher among less educated persons. As panel (b) of Figure 4 shows (but it also emerges from the analysis of Table 2), this was particularly true when people aged up to 36 were included in the eligible group. Conversely, as labour force entrants grow older this negative effect progressively fades away.

Overall, this evidence suggests that most of the action took place among adult and older people. In particular it seems that the most strongly affected persons were those aged 45-54. These results appear quite surprising since one would expect people making decisions on labour market participation in their early stages of life. The fact that only older workers seem to have been affected by the subsidy might therefore be hiding some other phenomenon. In particular, one possible story to interpret these results could be that what we are actually estimating is a decision to participate to the labour market "above the table" rather than inside the black economy. In other words, the idea to be

explored is that firms previously employing workers in the underground economy chose to take advantage of the subsidy to move these labour contracts over the table. We devote the next section to exploring this possibility. For the time being we just observe that the participation boost was stronger for adult and older male people who, before entering the labour force, were either retired or included in the residual "others" category. The vagueness of this response is at least compatible with the idea that these people wanted to be rather ambiguous about their activity before entering the market.

An additional reason behind the observed participation pattern could lie in the changes occurred in the legislation that extended the possibility to receive a while working labour incomes. In the last ten years, the pension system has undergone several modifications involving both old-age and seniority pensions as well as employees and self-employed. New rules differentiate between the type of pension (old-age versus seniority pensions), whether working as employee or self-employed, and depending from the specific year of retirement. In Table 4 we provide an overall view of the general regulation[13] along with the eligibility criteria for both old-age and seniority retirement. From 1994 up to 2002 a person retired under seniority scheme that entered employment as an employee would have to pay a tax rate of 100 per cent on the pension income exceeding a minimum[14]. This rate was reduced to 50 per cent in 1999 and then to zero per cent from 2001 for workers in payroll employment and retired under the seniority pension scheme with at least 40 years of contributions.

Further changes were made if the person retired with seniority pension went back to work as self-employed. Before 1995 the tax rate on their pensions was 0 per cent. It was changed to 50 per cent in the years 1995-2000, and to 30 per cent in the period 2001-2002 (to 0 per cent for retired people with 40 years of seniority). The most important change for people retired with seniority schemes occurred in 2003, when the tax on pensions was abolished provided that workers had retired at age 58 or more with at least 37 years of contributions. People retired under old-age retirement rules bore a tax rate of 50 per cent for most of the 1994-2000 period. Thereafter, the tax was eliminated

These frequent rule modifications do not seem to be driving our results as they mostly involved people aged at least 55 (from 1995) or with at least 40 years of seniority. For these people we do not detect any supply effect as most of the action seems to have been concentrated among people in their late 30s and 40s.

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[13] There are several exceptions to the general rules for special worker categories.
[14] Up to a ceiling. The actual rule for the take home income is *max (p + w –(p-mp)\*tx, p)* , where *tx* is the tax rate, *p* is the pension income, *mp* the minimum pension and *w* the labour income.

Table 2

## PROBIT ESTIMATES OF THE TAX CREDIT EFFECT ON THE PROBABILITY OF ENTERING THE LABOUR FORCE (1)

| Eligible groups | Eligible for tax credit in 2002 | | | | Eligible for tax credit in 2001 | | | |
|---|---|---|---|---|---|---|---|---|
| | Average effect: $\beta_2$ | | Interaction with schooling$^2$: $\beta_4$ | | Average effect: $\beta_1$ | | Interaction with schooling$^2$: $\beta_3$ | |
| | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| 25-26 | 0.010 | 0.88 | -0.004 | -1.21 | 0.014 | 1.22 | 0.000 | 0.06 |
| 25-27 | 0.007 | 0.69 | -0.007 | -2.62 | 0.010 | 0.99 | 0.000 | -0.07 |
| 25-28 | 0.010 | 1.03 | -0.008 | -3.66 | 0.008 | 0.90 | -0.001 | -0.46 |
| 25-29 | 0.014 | 1.61 | -0.007 | -3.68 | 0.007 | 0.80 | -0.001 | -0.36 |
| 25-30 | 0.019 | 2.27 | -0.006 | -3.77 | 0.011 | 1.35 | 0.000 | -0.18 |
| 25-31 | 0.026 | 3.03 | -0.006 | -3.72 | 0.016 | 1.88 | 0.000 | -0.21 |
| 25-32 | 0.030 | 3.67 | -0.006 | -3.83 | 0.019 | 2.33 | 0.001 | 0.47 |
| 25-33 | 0.032 | 3.93 | -0.005 | -3.67 | 0.021 | 2.68 | 0.000 | 0.19 |
| 25-34 | 0.033 | 4.13 | -0.005 | -3.78 | 0.025 | 3.11 | 0.000 | -0.11 |
| 25-35 | 0.037 | 4.65 | -0.004 | -3.33 | 0.028 | 3.56 | 0.000 | -0.01 |
| 25-36 | 0.036 | 4.64 | -0.004 | -3.02 | 0.031 | 4.00 | 0.000 | -0.11 |
| 25-37 | 0.035 | 4.58 | -0.003 | -2.52 | 0.033 | 4.40 | 0.000 | 0.09 |
| 25-38 | 0.038 | 5.02 | -0.003 | -2.52 | 0.034 | 4.56 | 0.000 | 0.26 |
| 25-39 | 0.039 | 5.22 | -0.003 | -2.44 | 0.036 | 4.95 | 0.000 | -0.09 |
| 25-40 | 0.039 | 5.35 | -0.003 | -2.47 | 0.036 | 4.97 | 0.000 | 0.14 |
| 25-41 | 0.039 | 5.37 | -0.002 | -2.11 | 0.036 | 5.03 | 0.000 | 0.14 |
| 25-42 | 0.040 | 5.55 | -0.002 | -2.14 | 0.037 | 5.23 | 0.000 | 0.12 |
| 25-43 | 0.041 | 5.84 | -0.002 | -2.46 | 0.036 | 5.15 | 0.000 | 0.23 |
| 25-44 | 0.042 | 6.02 | -0.002 | -2.46 | 0.037 | 5.40 | 0.000 | 0.36 |
| 25-45 | 0.042 | 6.06 | -0.002 | -2.20 | 0.036 | 5.29 | 0.001 | 0.68 |
| 25-46 | 0.044 | 6.42 | -0.002 | -2.26 | 0.037 | 5.44 | 0.001 | 0.82 |
| 25-47 | 0.045 | 6.70 | -0.002 | -2.13 | 0.037 | 5.53 | 0.001 | 0.79 |
| 25-48 | 0.045 | 6.83 | -0.002 | -2.25 | 0.037 | 5.70 | 0.001 | 0.63 |
| 25-49 | 0.045 | 7.00 | -0.002 | -2.14 | 0.038 | 5.89 | 0.000 | 0.56 |
| 25-50 | 0.046 | 7.25 | -0.002 | -2.47 | 0.036 | 5.76 | 0.000 | 0.58 |
| 25-51 | 0.045 | 7.28 | -0.002 | -2.13 | 0.035 | 5.77 | 0.001 | 0.76 |
| 25-52 | 0.045 | 7.49 | -0.001 | -1.99 | 0.035 | 5.94 | 0.000 | 0.51 |
| 25-53 | 0.045 | 7.60 | -0.002 | -2.32 | 0.033 | 5.86 | 0.000 | 0.60 |
| 25-54 | 0.043 | 7.62 | -0.001 | -2.02 | 0.032 | 5.88 | 0.000 | 0.58 |
| 25-55 | 0.041 | 7.53 | -0.001 | -1.96 | 0.030 | 5.75 | 0.000 | 0.67 |
| 25-56 | 0.039 | 7.56 | -0.001 | -1.69 | 0.028 | 5.60 | 0.000 | 0.71 |
| 25-57 | 0.037 | 7.43 | -0.001 | -1.55 | 0.027 | 5.58 | 0.000 | 0.64 |
| 25-58 | 0.034 | 7.36 | -0.001 | -1.48 | 0.025 | 5.55 | 0.000 | 0.47 |
| 25-59 | 0.032 | 7.31 | -0.001 | -1.52 | 0.023 | 5.51 | 0.000 | 0.34 |
| 25-60 | 0.030 | 7.31 | -0.001 | -1.23 | 0.022 | 5.47 | 0.000 | 0.19 |
| 25-61 | 0.028 | 7.39 | -0.001 | -1.43 | 0.020 | 5.40 | 0.000 | 0.30 |
| 25-62 | 0.026 | 7.40 | -0.001 | -1.45 | 0.018 | 5.25 | 0.000 | 0.37 |
| 25-63 | 0.024 | 7.30 | -0.000 | -1.40 | 0.016 | 5.15 | 0.000 | 0.39 |
| 25-64 | 0.021 | 7.14 | -0.000 | -1.39 | 0.014 | 4.96 | 0.000 | 0.49 |

Source: Own calculations on Istat data.

(1)Probit model estimation of model (8) in the text. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is in the labour force. The sample ranges from 1995 to 2002 and comprises all persons that at time t-1 were out of the labour force. The entries along the columns for a given row are marginal effects (M.E.) and t-statistics (t-stat) of the dummies that take value one if the individual is in the eligible group in the year 2002 (columns 2 and 3) or 2001 (columns 6 and 7) and their interaction with the level of schooling scaled by the mean (columns 4 and 5 for 2002 and 8 and 9 for 2001). These marginal effects are estimated in a separated regression for each of the age group listed in the rows (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The model includes other variables not shown in the Table (but shown in Table 3): a cubic in age, a quadratic in the years of education, the interaction between education and age, dummies for years, gender, marital status, regions, condition one year before the interview (such as student, housewife, retired ). . – (2) Scaled by the mean education for the eligible group

Figure 4

**PROBABILITY OF ENTERING THE LABOUR FORCE (1)**

Panel (a): Average effect on participation



■ Average effect 2002     □ Average effect 2001

Panel (b): Interaction with education



■ Interaction with education 2002     □ Interaction with education 2001
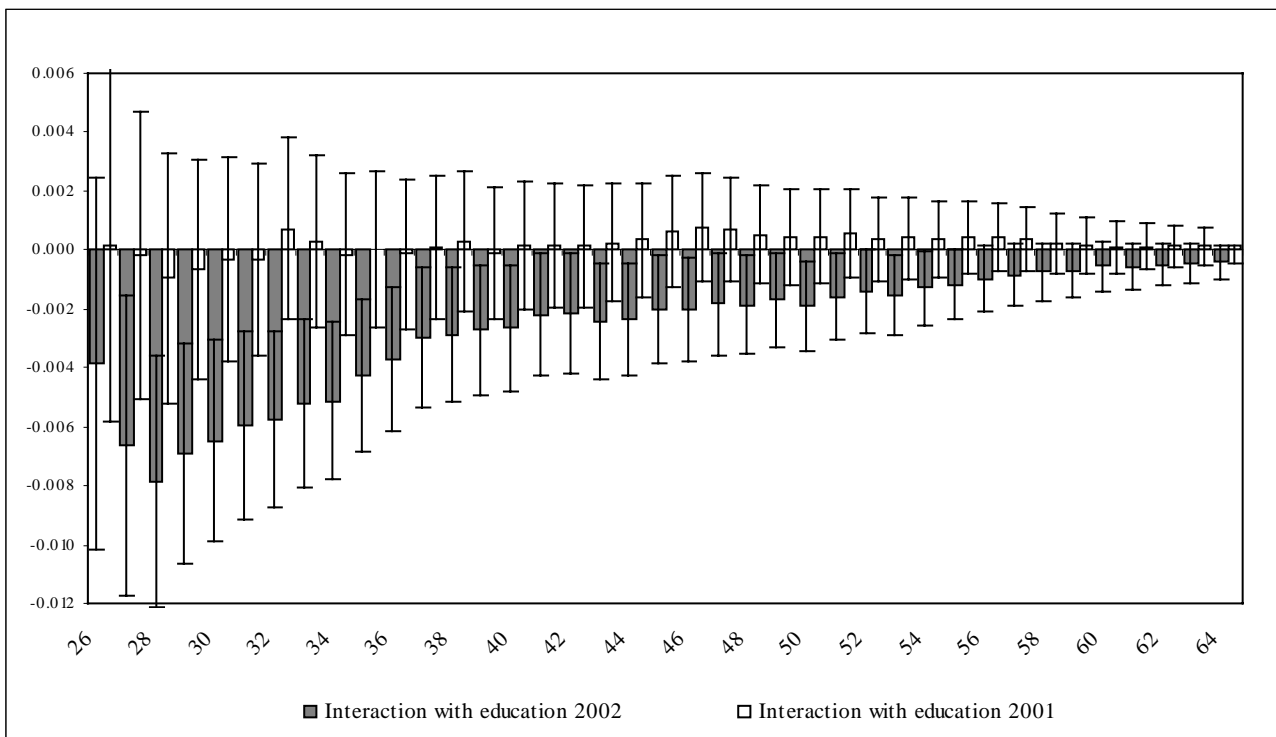
Source: See Table 2.
(1) The lines over the bars represent confidence intervals defined as plus and minus two times the standard error.

Table 3

## PROBIT ESTIMATES OF THE PROBABILITY OF ENTERING THE LABOUR FORCE
## FOR SOME SPECIFIC AGE GROUPS: ALL COVARIATES (1)

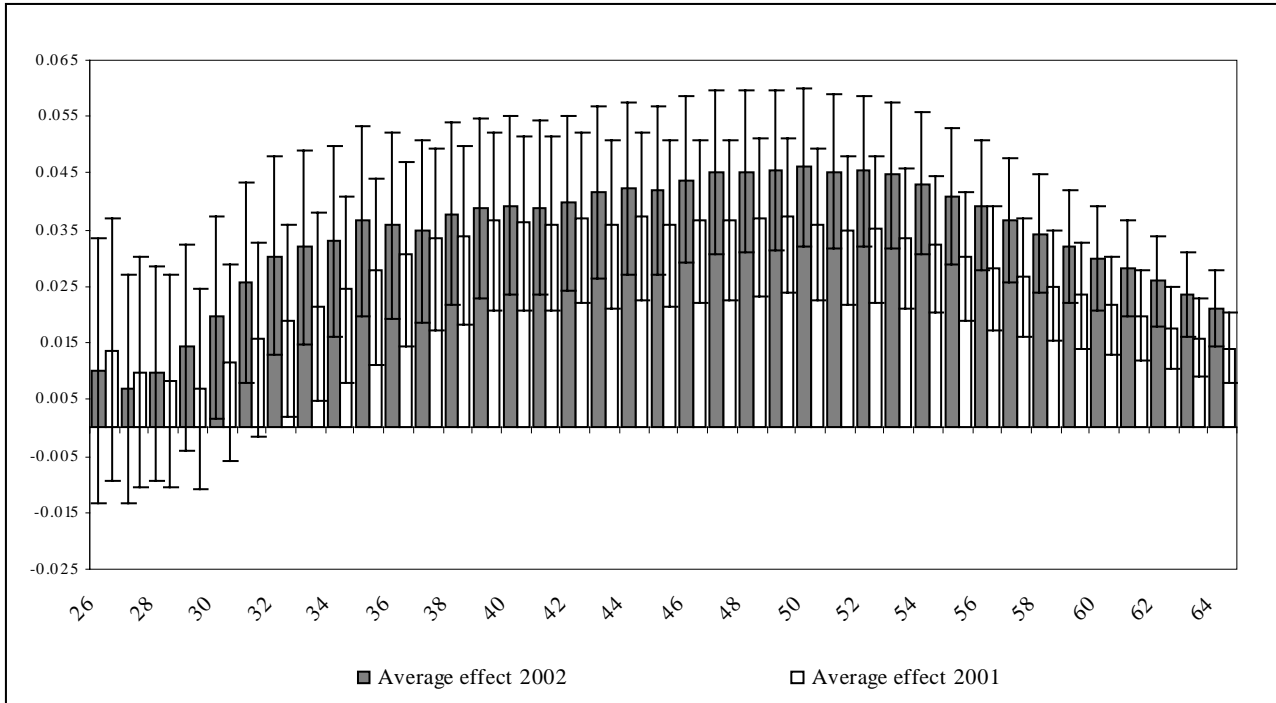| | Up to 29 | | Up to 35 | | Up to 40 | | Up to 45 | | Up to 50 | | Up to 55 | | Up to 60 | | Up to 64 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| **Eligible in 2002:** | | | | | | | | | | | | | | | | |
| Average effect ($\beta_2$) | .014 | 1.61 | .037 | 4.65 | .039 | 5.35 | .042 | 6.06 | .046 | 7.25 | .041 | 7.53 | .030 | 7.31 | .021 | 7.14 |
| Interaction with education$^2$ ($\beta_4$) | -.007 | -3.68 | -.004 | -3.33 | -.003 | -2.47 | -.002 | -2.2 | -.002 | -2.47 | -.001 | -1.96 | -.001 | -1.23 | .000 | -1.39 |
| **Eligible in 2001** | | | | | | | | | | | | | | | | |
| Average effect ($\beta_1$) | .007 | .80 | .028 | 3.56 | .036 | 4.97 | .036 | 5.29 | .036 | 5.76 | .030 | 5.75 | .022 | 5.47 | .014 | 4.96 |
| Interaction with education$^2$ ($\beta_3$) | -.001 | -.36 | .000 | -.01 | .000 | .14 | .001 | .68 | .000 | .58 | .000 | .67 | .000 | .19 | .000 | .49 |
| **Age** | | | | | | | | | | | | | | | | |
| Linear term | -.992 | -7.18 | -.263 | -7.65 | -.072 | -4.58 | -.029 | -3.44 | -.019 | -3.77 | -.014 | -4.35 | -.003 | -1.38 | .002 | 1.64 |
| Quadratic term | .039 | 6.86 | .010 | 7.59 | .003 | 4.85 | .001 | 4.19 | .001 | 5.39 | .001 | 7.05 | .000 | 4.8 | .000 | 2 |
| Cubic term | -.001 | -6.65 | .000 | -7.59 | .000 | -5.1 | .000 | -4.93 | .000 | -7.11 | .000 | -1.2 | .000 | -9.24 | .000 | -7.16 |
| **Education** | | | | | | | | | | | | | | | | |
| Linear term | -.039 | -9.06 | -.012 | -4.08 | -.004 | -1.73 | -.001 | -.6 | .001 | .67 | .001 | .95 | .001 | 1.35 | .001 | 1.58 |
| Quadratic term | .001 | 14.47 | .001 | 15.52 | .001 | 15.22 | .001 | 14.64 | .001 | 14.79 | .001 | 15.48 | .000 | 15.67 | .000 | 15.65 |
| Interaction with age | .001 | 6.93 | .000 | 1.71 | .000 | -.86 | .000 | -2.07 | .000 | -4.19 | .000 | -5.28 | .000 | -6.19 | .000 | -6.65 |
| Female | .028 | 9.21 | .018 | 6.11 | .010 | 3.66 | .001 | .32 | -.009 | -3.55 | -.011 | -5.55 | -.010 | -6.85 | -.008 | -7.75 |
| Male | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| Future activity. | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| Housewife | -.173 | -2.2 | -.233 | -28.7 | -.271 | -34.4 | -.295 | -38.9 | -.304 | -42.1 | -.283 | -44.8 | -.221 | -46.4 | -.156 | -46.8 |
| Student | -.439 | -32.3 | -.347 | -38.1 | -.303 | -42.2 | -.269 | -45 | -.230 | -47.4 | -.178 | -49.4 | -.117 | -5.4 | -.074 | -5.8 |
| Retired | -.117 | -14.4 | -.108 | -15.3 | -.107 | -17.8 | -.110 | -22.3 | -.111 | -29.2 | -.106 | -36.3 | -.095 | -4.4 | -.081 | -42 |
| Other | -.090 | -8.81 | -.089 | -1.9 | -.092 | -13.3 | -.093 | -15.4 | -.088 | -17.5 | -.075 | -19.6 | -.054 | -21.1 | -.037 | -21.9 |
| 1995 | -.005 | -1 | -.005 | -1.21 | -.006 | -1.52 | -.009 | -2.53 | -.011 | -3.43 | -.009 | -3.62 | -.007 | -3.51 | -.004 | -3.27 |
| 1996 | -.010 | -1.88 | -.009 | -1.91 | -.008 | -1.86 | -.009 | -2.51 | -.009 | -2.88 | -.007 | -2.74 | -.005 | -2.63 | -.003 | -2.21 |
| 1997 | -.010 | -1.92 | -.006 | -1.39 | -.003 | -.78 | -.004 | -1.17 | -.004 | -1.24 | -.001 | -.44 | -.001 | -.57 | .000 | -.26 |
| 1998 | -.004 | -.77 | -.002 | -.49 | .000 | -.12 | -.001 | -.23 | .000 | .13 | .001 | .36 | .001 | .5 | .001 | .56 |
| 1999 | -.001 | -.19 | -.002 | -.48 | .001 | .16 | .001 | .34 | .001 | .39 | .001 | .5 | .002 | .87 | .001 | .99 |
| 2000 | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| 2001 | -.024 | -3.74 | -.027 | -4.34 | -.027 | -4.52 | -.027 | -4.76 | -.024 | -4.74 | -.019 | -4.52 | -.014 | -4.28 | -.009 | -4.01 |
| 2002 | -.016 | -2.48 | -.019 | -3.03 | -.019 | -3.17 | -.019 | -3.35 | -.017 | -3.26 | -.013 | -2.97 | -.009 | -2.69 | -.006 | -2.41 |
| *Memorandum* | | | | | | | | | | | | | | | | |
| Mean education 01 | 11.08 | | 10.38 | | 10.02 | | 9.68 | | 9.32 | | 8.84 | | 8.37 | | 7.95 | |
| Mean education 02 | 11.51 | | 10.63 | | 10.21 | | 9.86 | | 9.48 | | 9.00 | | 8.57 | | 8.15 | |
| Number of observations | 79947 | | 110869 | | 136062 | | 161077 | | 190945 | | 231368 | | 289736 | | 349886 | |

Source: Own calculations on Istat data.

(1) Probit model estimation of model (8) in the text. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is in the labour force. The sample ranges from 1995 to 2002 and comprises all persons who, at time t-1, were out of the labour force. The entries along the columns are marginal effects (M.E.) and t-statistics (t-stat) associated with indicated variables. These marginal effects are estimated in a separated regression for each of the age group listed in the top row (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The last three rows report average years of education of the eligible group in both 2001 and 2002, as well as the size of the sample used. **.** – (2) Scaled by the mean education for each eligible group.

Table 4

## RETIREMENT RULES IN ITALY: ELIGIBILITY CRITERIA FOR RETIREMENT AND TAX RATE APPLIED TO PENSION INCOME OF RETIRED WORKERS WITH A NEW JOB

| | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Seniority pensions** | | | | | | | | | | |
| A) Eligibility rules for retirement (years) | | | | | | | | | | |
| *Private sector employees* | | | | | | | | | | |
| Age | | | 52 | 54 | 55 | 55 | 56 | 56 | 57 | 57 |
| Contributions | | | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Only Contributions | 35 | 35 | 36 | 36 | 36 | 37 | 37 | 37 | 37 | 37 |
| *Public sector employees* | | | | | | | | | | |
| Age | | | 52 | 52 | 53 | 53 | 54 | 55 | 55 | 56 |
| Contributions | | | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Only Contributions | 35 | 35 | 36 | 36 | 36 | 37 | 37 | 37 | 37 | 37 |
| *Self- employed* | | | | | | | | | | |
| Age | | | 56 | 56 | 56 | 57 | 57 | 57 | 58 | 58 |
| Contributions | | | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Only Contributions | 35 | 35 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| B) Share of pension (above the minimum) withdrawn if working [1] | | | | | | | | | | |
| As employee | 100% | 100% [2] [3] | 100% | 100% | 100% | 100%/ 50% [6] | 100%/ 50% [6] | 100%/ 0% [6] | 100%/ 0% [6] | 0% [7] |
| As self-employed | 0% | 50% [3] | 100% [4]/ 50% [5] | 100% [4]/ 50% [5] | 50% | 50% | 50% | 30%/0% [6] | 30%/0% [6] | 0% [7] |
| **Old-age pensions** | | | | | | | | | | |
| A) Eligibility rules for retirement (years) | | | | | | | | | | |
| *Old-age retirement* | | | | | | | | | | |
| Age male | 61 | 61/62 | 62 | 63 | 63/64 | 64 | 65 | 65 | 65 | 65 |
| Age female | 56 | 56/57 | 57 | 58 | 58/59 | 59 | 60 | 60 | 60 | 60 |
| Contributions | 16 | 17 | 17 | 18 | 18 | 19 | 19 | 20 | 20 | 20 |
| B) Share of pension (above the minimum) withdrawn if working [1] | | | | | | | | | | |
| As employee | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 0% [8] | 0% [8] |
| As self-employed | 0% | 50% | 50% | 50% | 50% | 50% | 50% | 50% | 0% [8] | 0% [8] |

(1) Numbers indicate the tax rate to be applied to the pension income, net of the minimum, if retired workers go back to work; in symbols let $tx$ be the tax rate reported in the Table, $p$ be the pension income, $mp$ the minimum pension and $w$ the labour income: the take home ($th$) income is $th=p + w -(p-mp)*tx$ if $w>(p-mp)*tx$, $th=p$ if $w=(p-mp)*tx$. These rules apply to people who become eligible for pension in the indicated period . – (2) Until 30.9.1996 . – (3) People retired in this period and already eligible for seniority pensions by 31.12.1994 follow the rules in force at 31.12.1994. – (4) It applies to the pension of people who worked as employees. – (5) It applies to the pension of people who previously worked as self-employed. – (6) For people who retired after working 40 years. – (7) It applies to people 58 years old with 37 years of contributions. – (8) Regardless of the requirements fulfilled to gain the eligibility for old-age pensions.

*4.3 Some robustness checks*

This section is devoted to checking the robustness of our results. In particular, we chose to run two different types of tests. On the one hand, we want to be sure that our results do not depend on the particular functional form we used to carry out our estimation. On the other hand, in order to attribute the registered increase in labour force participation to the newly issued tax credit we need to exclude the possibility that an increasing trend was already in the data before the year 2001, that is before the subsidy was operating.

*4.3.1 Check on the functional form*

Do our results depend on the way we specified the functional form of our controls? In order to check the robustness of the evidence of Table 3 we estimated the models for the same age groups after substituting the (three) age and the (two) schooling variables with a full set of dummies for age (one dummy for each age), and for education (three dummies: up to 8 years of schooling, high-school diploma, college degree) and the interaction among these two sets of dummies. Results are presented in Table 5. Each pair of columns represents marginal effects and t-statistics that refer to the eligible group reported in the heading. The usual eight age groups are reported. In the rows of the Table we reported for both years 2001 and 2002 the effect of the eligibility status for the least educated among participants and the additional effect for those holding a high-school or a university degree. We did not report the effect of the age dummies and their interaction with the three schooling dummies.

Overall the evidence confirms that the impact of the tax credit on the transition probabilities was small or null for young workers and stronger for more mature people. The Table clarifies that the impact of the tax credit rises with age because the negative impact of education fades away with age. For example, in 2002 the impact of the tax credit on the transition probabilities of the least educated was positive for all age groups and higher for those up to 29 years old (5.4 percentage points), and declined with age. However the additional effect for those holding a high-school or a college degree was strongly negative among the youngest and declined toward zero with age. In the aggregate this second effect dominates the first and generates the rising pattern shown by Figure 4.

Thus, this analysis confirms our previous finding that the tax credit appears to have mostly encouraged the entry of people belonging to the central and older age cohorts. In particular, it confirms that people aged 45-54 experienced a significant rise in labour market participation.

*4.3.2 Check on the identification strategies*

The second check we ran is devoted to evaluating whether the positive trend in labour force participation for older workers was in the data even before the year 2001, that is before the subsidy was operating. If this were the case then we could not attribute the observed increase in labour supply to government intervention. To run such a control we included in our model a dummy for all people at least 25 years old in every year comprised in our sample. We also included for every considered year an interaction with education.

Thus, the determinants of the probability of entering the labour force are

$$(9) \quad x_{it}^{'}\beta = \beta_{o} + \sum_{t=1995}^{2002} \beta_{1t} eligible_{it} * t_{i} + \sum_{t=1995}^{2002} \beta_{2t} eligible_{it} * t_{i} * (educ_{it} - mean(educ_{t}))$$
$$+ g(educ_{it}, age_{it}) + other\ demographic\ characteristics_{it} + year\ dummies$$

If the marginal effects associated with the coefficients $\beta_{1t}$ and $\beta_{2t}$ turn out to be equal over time, then we say that the rising trend in labour force participation was a feature of the Italian economy even before the introduction of the subsidy at the end of the year 2000. If instead the effect shows up only in 2001 and 2002, we can be confident in our results. Once more we estimated the model with the usual "robust against choosiness" technique that starts with the comparison of people very close to the eligibility threshold (25-26 versus 20-24 years old) and progressively expands the sample until it includes everybody aged 20 to 64, i.e. the entire potentially eligible cohort. Table 6 reports the results only for the usual representative groups. Overall our findings seem to be supportive of the claim that something actually happened in the biennium 2001-2002 and it was somewhat unprecedented at least in the magnitude.

In its upper part, Table 6 presents the $\beta_{1t}$'s (average effects), which measure the difference in the probability of being in the labour force between people younger and older than 25. For all age groups, these coefficients are larger in 2001 and especially in 2002 compared with any other previous years. The only exception is represented by the year 1998, when the so-called "Treu package" – i.e. a series of active policy measures named after the Labour Minister Tiziano Treu– was put forward by the Italian Government. One should notice that this Treu package was mostly oriented toward young workers and that data fully reflect this feature since the coefficients for the year 1998 are comparable in size to those of 2001 and 2002 only for people up to 35 years of age. Apart from this exception, before 2001 there was no advantage in being older than 25 with respect to labour force entry. In fact in most cases it seemed conversely to be a disadvantage since the coefficients are negative. Then in 2001 and 2002, instead, there emerged a clear premium, which rose with age and reached a maximum for individuals of 45-55 year of age, while it declined thereafter.

Table 5

**PROBIT ESTIMATES OF THE PROBABILITY OF ENTERING THE LABOUR FORCE: NON-PARAMETRIC SPECIFICATION (1)**

| | Up to 29 | | Up to 35 | | Up to 40 | | Up to 45 | | Up to 50 | | Up to 55 | | Up to 60 | | Up to 64 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| Eligible in 2002 Effect for people with less than high-school | .054 | 3.66 | .050 | 4.92 | .042 | 4.9 | .043 | 5.53 | .047 | 6.7 | .040 | 6.74 | .029 | 6.51 | .021 | 6.48 |
| Additional effect for people with: | | | | | | | | | | | | | | | | |
| High-School | -.042 | -3.2 | -.027 | -3 | -.020 | -2.6 | -.019 | -2.8 | -.018 | -3.2 | -.012 | -2.6 | -.007 | -1.9 | -.005 | -1.9 |
| College | -.060 | -3.7 | -.049 | -3.8 | -.039 | -3.4 | -.035 | -3.3 | -.031 | -3.2 | -.023 | -2.9 | -.015 | -2.6 | -.010 | -2.6 |
| Eligible in 2001 Effect for people with less than high school | .001 | .07 | .022 | 2.24 | .030 | 3.59 | .029 | 3.73 | .030 | 4.41 | .025 | 4.36 | .019 | 4.37 | .012 | 4.07 |
| Additional effect for people with: | | | | | | | | | | | | | | | | |
| High-School | .009 | .64 | .002 | .22 | -.004 | -.4 | .001 | .21 | -.001 | -.2 | .002 | .44 | .001 | .23 | .001 | .53 |
| College | -.010 | -.5 | -.024 | -1.7 | -.026 | -2.1 | -.025 | -2.2 | -.022 | -2.2 | -.021 | -2.6 | -.016 | -2.9 | -.011 | -2.8 |
| Less than high-school | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| High-school | .088 | 11.3 | .085 | 1.4 | .083 | 1.1 | .080 | 9.92 | .075 | 9.84 | .065 | 9.8 | .051 | 9.73 | .038 | 9.75 |
| College | -.204 | -24 | -.211 | -35 | -.203 | -35 | -.190 | -35 | -.168 | -35 | -.133 | -32 | -.093 | -24 | -.062 | -24 |
| Male | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| Female | .028 | 9.14 | .018 | 6.29 | .011 | 3.92 | .002 | .6 | -.008 | -3.3 | -.010 | -5.2 | -.010 | -6.5 | -.008 | -7.5 |
| 1995 | -.006 | -1.3 | -.006 | -1.4 | -.007 | -1.7 | -.010 | -2.8 | -.011 | -3.7 | -.010 | -3.9 | -.007 | -3.8 | -.005 | -3.6 |
| 1996 | -.011 | -2.1 | -.009 | -2 | -.008 | -2.01 | -.010 | -2.7 | -.010 | -3.1 | -.008 | -2.9 | -.005 | -2.8 | -.003 | -2.5 |
| 1997 | -.010 | -1.9 | -.006 | -1.3 | -.003 | -.7 | -.004 | -1.1 | -.004 | -1.2 | -.001 | -.4 | -.001 | -.5 | .000 | -.3 |
| 1998 | -.004 | -.9 | -.002 | -.4 | .000 | -.1 | -.001 | -.2 | .001 | .19 | .001 | .41 | .001 | .55 | .001 | .58 |
| 1999 | -.001 | -.2 | -.002 | -.5 | .001 | .2 | .001 | .36 | .001 | .41 | .001 | .54 | .002 | .9 | .001 | 1 |
| 2000 | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| 2001 | -.023 | -3.6 | -.022 | -3.6 | -.021 | -3.5 | -.021 | -3.7 | -.019 | -3.7 | -.015 | -3.5 | -.011 | -3.4 | -.008 | -3.3 |
| 2002 | -.015 | -2.2 | -.014 | -2.2 | -.013 | -2 | -.013 | -2.2 | -.011 | -2.1 | -.008 | -1.8 | -.006 | -1.7 | -.004 | -1.6 |

Source: Own calculations on Istat data.

(1) Probit model estimation of model (8) in the text, with a non-parametric specification for the effect of age and schooling. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is in the labour force. The sample ranges from 1995 to 2002 and comprises all persons who, at time t-1, were out of the labour force. Entries along the columns are marginal effects (M.E.) and t-statistics (t-stats) associated with indicated variables. These marginal effects are estimated in a separated regression for each of the age groups listed in the top row (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The effect of age (not shown) is taken care of by including in the regression a dummy for each age. The variable "years of schooling" is split into three categorical variables: less than high-school (reference in the Table), high-school and college. The interaction between years of schooling and age are accounted for by a full interaction between age and school dummies. The regression also includes labour market conditions one year before the interview (not shown).

The results of Table 3 are also confirmed as far as the interaction with schooling is concerned, even though the differences between pre- and post-2000 periods are less clear-cut. For every year preceding 2001, better educated people tended to participate relatively more. For people up to 50 years of age, the size of this larger propensity ranged between 1.0 and 1.2 percentage points for every additional year of education above the mean. It was smaller for older people. This pattern was present in both 2001 and 2002, but the higher participation propensity of more educated people, though still present, was however much smaller than before. For example, for the age group up to 35 years of age in the year 2000, one more year of education increased the (differential) propensity to participate (of the eligible compared to the control group) by 1.6 percentage points. This additional effect declines to 1.2 in 2001 and to 0.8 in 2002. However, these differences in the pre- and post-2000 periods disappear as we widen the eligible group, which is consistent with the evidence of Table 3.

Table 6

## PROBIT ESTIMATES OF THE PROBABILITY OF ENTERING THE LABOUR FORCE: CONTROLS FOR THE EXISTENCE OF A TREND BEFORE THE TAX CREDIT (1)

| | | Up to 29 | | Up to 35 | | Up to 40 | | Up to 45 | | Up to 50 | | Up to 55 | | Up to 60 | | Up to 64 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| Average effect $(\beta_{1t})$ | | | | | | | | | | | | | | | | | |
| | 2002 | .018 | 1.63 | .039 | 4.14 | .045 | 5.03 | .045 | 5.32 | .043 | 5.5 | .033 | 4.97 | .018 | 3.66 | .009 | 2.48 |
| | 2001 | .007 | .64 | .027 | 2.95 | .040 | 4.52 | .038 | 4.52 | .032 | 4.19 | .022 | 3.45 | .010 | 2.06 | .002 | .65 |
| | 2000 | .003 | .29 | .005 | .56 | .008 | 1.02 | .008 | 1.09 | .003 | .4 | -.003 | -.47 | -.008 | -1.77 | -.009 | -2.97 |
| | 1999 | -.002 | -.19 | .000 | -.04 | .008 | 1.02 | .009 | 1.19 | .003 | .43 | -.002 | -.39 | -.007 | -1.53 | -.008 | -2.76 |
| | 1998 | .019 | 1.71 | .019 | 2.12 | .024 | 2.89 | .021 | 2.72 | .015 | 2.11 | .008 | 1.33 | -.001 | -.11 | -.004 | -1.44 |
| | 1997 | -.009 | -.88 | .001 | .07 | .009 | 1.16 | .007 | .96 | .001 | .16 | .000 | -.08 | -.007 | -1.65 | -.008 | -2.73 |
| | 1996 | -.006 | -.52 | -.003 | -.3 | .002 | .25 | .000 | -.02 | -.007 | -1.01 | -.010 | -1.65 | -.013 | -3.02 | -.012 | -4.03 |
| | 1995 | -.025 | -2.47 | -.021 | -2.51 | -.017 | -2.15 | -.019 | -2.65 | -.025 | -3.73 | -.024 | -4.39 | -.022 | -5.51 | -.018 | -6.5 |
| Interaction with school[2] $(\beta_{2t})$ | | | | | | | | | | | | | | | | | |
| | 2002 | .002 | .77 | .008 | 4.5 | .009 | 5.66 | .008 | 5.89 | .007 | 6.13 | .006 | 6.56 | .005 | 7.24 | .003 | 7.24 |
| | 2001 | .008 | 3.12 | .012 | 6.72 | .011 | 7.36 | .010 | 7.73 | .009 | 8.04 | .008 | 8.12 | .005 | 7.98 | .004 | 8.26 |
| | 2000 | .011 | 4.54 | .016 | 8.49 | .014 | 8.96 | .012 | 8.64 | .010 | 8.52 | .008 | 8.36 | .005 | 8.07 | .004 | 8.06 |
| | 1999 | .011 | 4.34 | .014 | 7.8 | .013 | 8.19 | .011 | 7.98 | .010 | 8.5 | .008 | 8.56 | .006 | 8.48 | .004 | 8.59 |
| | 1998 | .007 | 2.96 | .012 | 6.84 | .011 | 7.48 | .011 | 8.07 | .010 | 8.48 | .008 | 8.48 | .006 | 8.78 | .004 | 9.08 |
| | 1997 | .011 | 4.24 | .014 | 7.67 | .013 | 8.45 | .011 | 8.47 | .010 | 8.69 | .008 | 8.28 | .006 | 8.79 | .004 | 8.77 |
| | 1996 | .011 | 4.18 | .015 | 8.18 | .014 | 9.17 | .013 | 9.11 | .012 | 9.89 | .010 | 1.28 | .007 | 1.56 | .005 | 1.32 |
| | 1995 | .008 | 3.32 | .015 | 7.9 | .014 | 8.78 | .012 | 8.92 | .011 | 9.27 | .009 | 9.01 | .006 | 8.81 | .004 | 8.75 |
| Year effect | | | | | | | | | | | | | | | | | |
| | 2002 | -.013 | -1.85 | -.014 | -1.88 | -.013 | -1.86 | -.012 | -1.8 | -.011 | -1.7 | -.009 | -1.59 | -.006 | -1.51 | -.004 | -1.48 |
| | 2001 | -.021 | -3.04 | -.022 | -3.08 | -.021 | -3.07 | -.020 | -3.04 | -.019 | -2.99 | -.015 | -2.94 | -.011 | -2.9 | -.008 | -2.88 |
| | 2000 | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | | Reference | |
| | 1999 | .001 | .11 | .001 | .12 | .001 | .11 | .001 | .1 | .001 | .08 | .000 | .08 | .000 | .08 | .000 | .08 |
| | 1998 | -.011 | -1.53 | -.010 | -1.47 | -.010 | -1.45 | -.010 | -1.45 | -.009 | -1.46 | -.008 | -1.47 | -.006 | -1.48 | -.004 | -1.48 |
| | 1997 | -.006 | -.94 | -.006 | -.82 | -.005 | -.8 | -.005 | -.79 | -.005 | -.81 | -.004 | -.84 | -.003 | -.83 | -.002 | -.81 |
| | 1996 | -.008 | -1.22 | -.008 | -1.11 | -.007 | -1.08 | -.007 | -1.07 | -.007 | -1.11 | -.006 | -1.14 | -.004 | -1.12 | -.003 | -1.09 |
| | 1995 | .004 | .64 | .005 | .73 | .005 | .74 | .005 | .73 | .004 | .69 | .003 | .65 | .003 | .65 | .002 | .66 |

Source: Own calculations on Istat data.

(1) Probit model estimation of model (9) in the text. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is in the labor force. The sample ranges from 1995 to 2002 and comprises all persons who, at time t-1, were out of the labour force. Entries along the columns are marginal effects (M.E.) and t-statistics (t-stat) associated with indicated variables. The first block of rows under the heading "Average effect $(\beta_{1t})$" are the marginal effects associate with a set of dummy variables (one for each year) that take value one if the observation $i$ in year $t$ is at least 25 years old. We interact these variables with the years of schooling of the observation $i$ at time $t$ (scaled by the mean education of the group) to obtain a new set of variables whose marginal effects are reported in the second block of rows under the heading "Interaction with school $(\beta_{2t})$". The third block reports standard year dummies. These marginal effects are estimated in a separated regression for each of the age groups listed in the top row (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The model includes other variables not shown in the Table: a cubic in age, a quadratic in the years of education, the interaction between education and age, dummies for gender, marital status, regions, condition one year before the interview (such as student, housewife, retired ) . – (2) Scaled by the mean education for each eligible group.

*4.4 Modes of participation: working or searching for a job?*

In this section we investigate what people do upon entering the labour force. This question is important because it allows us to purge the estimates of the previous section from possible confounding effects arising because the boundaries between unemployment and inactivity are often weak, especially for marginal groups. As suggested by the Referee of this paper, part of the effect we estimated is a pure demand effect if new participants were already searching for jobs in the previous period even if the intensity was below that required to be classified as unemployed. Indeed, this would be the case if new entrants were people belonging to the "marginally attached" group. In our setting we would see a move from out of the labour force to participation while the true transition is from searching to employment. On the contrary, transitions from out of the labour force to unemployment would not suffer from this confounding effect and would reflect a pure increase in labour supply. However we cannot assume that all direct transitions from out of the labour force to employment are due to measurement errors. We look at transitions after one year; therefore there might be people who, in this interval, have transited first into unemployment and then into employment. There might also be people who entered the labour force because they found a job. In these cases, we should count these transitions as a labour supply effect.

Nevertheless, looking only at transitions into unemployment is still informative as it provides a lower bound to the effects of the tax credit on labour supply.

In Table 7 we present the estimates of the tax credit effect on the probability of participating either as unemployed or as an employee (we also include the estimates for the overall probability of participation[15]). The statistical model is that presented in equation (8) and the corresponding estimates are reported for the usual eight age groups.

Restricting the analysis to the transition probabilities into unemployment does not alter qualitatively the message of the preceding section. The supply effect is nil or very small for younger workers; it increases considerably for older workers reaching a maximum for those up to 50 years of age (2.6 and 1.9 percentage points in 2001 and 2002, respectively) and declines thereafter. For the whole 25-64 age range, the effect is around 1 percentage point in both 2001 and 2002, about two thirds of the total effect (including transition into employment). Those who enter unemployment from out of the labour force are the least educated among younger workers.

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[15] In a linear setting, the overall effect would exactly be the sum of "participating as unemployed" and "as a job holder".

Overall, this check confirms the qualitative pattern of our results and sets the lower bound to the tax credit effect to a one percentage point increase in the labour supply of the age group 25-64.


## 5. New participants' characteristics: moving out of the black economy?

The characteristics of the people who took advantage of the subsidy to enter the labour market in 2001 and 2002 were rather surprising to us. We did not anticipate that the effects would have been stronger for adult and older males. In fact our guess was that the subsidy could further encourage groups whose participation rate was on the rise. Therefore we wondered whether these results could have been driven by the reduction of workers in the underground economy. The idea is that the strong labour cost reduction granted by the new subsidy could have made more convenient for some workers and firms operating in the shadow economy to emerge and join the regular sector.

Some assumption on people's behaviour is needed in order to set up a statistical framework which allows us to check for the credibility of this idea. In particular we assume that people working in the black economy would answer the questions of the Labour Force Survey as if they were out of the labour force. If they are instead either self-employed or working with a regular contract, or if they are active job searchers, we assume all of them to report correctly their labour market status. This is not a completely unrealistic assumption since it seems to be supported by the results of some researchers on the field[16]. If our identification assumption is correct and the effects of the subsidy were mostly due to the emergence of previously irregular workers, then stronger subsidy effects should be found in those areas and sectors characterised by larger shares of irregular work. Moreover, our story implies that the impact should be concentrated on new open-end employment rather than on other forms of labour force participation (i.e. temporary work, self-employment, job search).

A way to implement this idea is to augment our basic specification with a variable representing the share of employees in the underground economy on total payroll employment in the region/sector where the individual is currently working and the interaction of this new variable with the dummy for the eligible group. Formally, one could add to the basic equation (8) the following term:

$$\beta_5 eligible\ 2001_i * (black_{it} - mean\ (black_t)) +$$
$$\beta_6 eligible\ 2002_i * (black_{it} - mean\ (black_t)) + \beta_7 * black_{it}$$

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[16] See Busetta-Giovannini (1998).

where the variable *black* is the incidence of the shadow economy, measured by the number of irregular employees over total payroll employment (regular + irregular) in the region/sector where individual $i$ is working at time $t$.

Table 7

## PROBIT ESTIMATES OF THE PROBABILITY OF ENTERING THE LABOUR FORCE AS UNEMPLOYED OR EMPLOYEE (1)

| | Up to 29 | | Up to 35 | | Up to 40 | | Up to 45 | | Up to 50 | | Up to 55 | | Up to 60 | | Up to 64 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M.E. | t-stat | M.E. | t-stat | .E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| **Panel (a): Probability of being unemployed** | | | | | | | | | | | | | | | | |
| Eligible in 2002: Average effect ($\beta_2$) | .0031 | .44 | .012 | 2.02 | .017 | 2.86 | .018 | 3.35 | .019 | 3.99 | .017 | 4.25 | .012 | 4.29 | .009 | 4.53 |
| Interaction with education$^2$ ($\beta_4$) | -.005 | -3.44 | -.004 | -3.49 | -.003 | -3.48 | -.003 | -3.66 | -.003 | -4.56 | -.002 | -4.35 | -.001 | -4.34 | -.001 | -4.71 |
| Eligible in 2001 Average effect ($\beta_1$) | .0085 | 1.18 | .020 | 3.09 | .026 | 4.26 | .027 | 4.72 | .026 | 5.19 | .022 | 5.34 | .016 | 5.43 | .011 | 5.38 |
| Interaction with education$^2$ ($\beta_3$) | -.003 | -1.67 | -.002 | -1.50 | -.001 | -1.29 | -.001 | -1.24 | -.001 | -1.42 | -.001 | -1.71 | -.0006 | -2.01 | -.0004 | -1.81 |
| **Panel (b): Probability of holding a job** | | | | | | | | | | | | | | | | |
| Eligible in 2002: Average effect ($\beta_2$) | .010 | 1.93 | .023 | 4.41 | .025 | 5.03 | .026 | 5.45 | .027 | 6.09 | .022 | 5.81 | .015 | 4.90 | .009 | 3.92 |
| Interaction with education$^2$ ($\beta_4$) | -.002 | -2.20 | -.002 | -2.97 | -.002 | -2.39 | -.001 | -1.86 | -.001 | -.073 | -.0002 | -.049 | .0000 | 0.12 | .0001 | .61 |
| Eligible in 2001 Average effect ($\beta_1$) | -.004 | -.82 | .0046 | .97 | .009 | 1.97 | .008 | 1.86 | .008 | 2.03 | .0039 | 1.14 | .0005 | 0.20 | -.002 | -.78 |
| Interaction with education$^2$ ($\beta_3$) | .002 | 2.20 | .0007 | 0.97 | .0001 | 0.15 | .0005 | 0.78 | .0005 | 0.99 | .0006 | 1.62 | .0004 | 1.34 | .0004 | 1.83 |
| *Memorarandum* | | | | | | | | | | | | | | | | |
| **Panel (c): Probability of participation** | | | | | | | | | | | | | | | | |
| Eligible in 2002: Average effect ($\beta_2$) | .014 | 1.61 | .036 | 4.65 | .039 | 5.35 | .042 | 6.06 | .046 | 7.25 | .041 | 7.53 | .030 | 7.31 | .021 | 7.14 |
| Interaction with education$^2$ ($\beta_4$) | -.007 | -3.68 | -.004 | -3.33 | -.003 | -2.47 | -.002 | -2.20 | -.002 | -2.47 | -.001 | -1.96 | -.0005 | -1.23 | -.0004 | -1.39 |
| Eligible in 2001 Average effect ($\beta_1$) | .007 | .80 | .027 | 3.56 | .036 | 4.97 | .036 | 5.29 | .036 | 5.76 | .030 | 5.75 | .022 | 5.47 | .014 | 4.96 |
| Interaction with education$^2$ ($\beta_3$) | -.001 | -.36 | -.0 | -.01 | .0001 | 0.14 | .0006 | 0.68 | .0004 | 0.58 | .0004 | 0.67 | .0001 | 0.19 | .0002 | 0.49 |

Source: Own calculations on Istat data.
(1) Probit model estimation of model (8) in the text. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is unemployed (panel (a)) or is holding a job (panel (b)) or is in the labour force (panel (c)). The sample ranges from 1995 to 2002 and comprises all persons who, at time t-1, were out of the labour force. Entries along the columns are marginal effects (M.E.) and t-statistics (t-stat) associated with indicated variables. These marginal effects are estimated in a separated regression for each of the age groups listed in the top row (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The model includes other variables not shown in the Table: a cubic in age, a quadratic in the years of education, the interaction between education and age, dummies for the years, gender, marital status, regions, condition one year before the interview (such as student, housewife, retired ) . – (2) Scaled by the mean education for each eligible group.

We scaled this variable by its mean computed over those individuals who belong to the specific eligible group[17]. The marginal effect associated with the coefficient $\beta_7$ measures the average impact of the black economy on the participation rate while those related to the two slopes $\beta_5$ and $\beta_6$ indicate its additional effect for an eligible person in 2001 and 2002.

Despite its simplicity, several problems emerge when implementing this statistical model. First of all, we only have limited information on the incidence of the black economy, namely either a regional or a sector breakdown from 1995 to 2000[18]. To deal with this shortcoming we used the last available observed value for the years for which data are not yet available. This approximation should not deeply influence the results since the share of the underground economy changes only slowly over time. The second problem concerns instead the nature of the dependent variable to look at. According to the black economy story, the interaction coefficient should be positive when looking at the number of people who were hired under a permanent contract. Therefore we changed the dependent variable and estimated the probability of entering the market as a permanent worker in contrast to section 4, where we looked at the chances of participating tout-court. We estimated this equation on the usual sample described in paragraph 4.2, which includes all people interviewed in the April wave of the LFS who, one year earlier, were out of the labour force (for reasons other than disability and mandatory military service). However, when using this sample we might misinterpret the results whenever the participation rate as a whole (i.e. not only the share of people hired with an open-end contracts) of a given group rises in a region which happens to have a large incidence of irregular work. To control for this scale effect, we also estimated our model after restricting the sample only to people who actually entered the labour force, thus eliminating everybody who chose to remain inactive.

[17] For example the mean that we use in the interaction with the eligible group in 2002 is computed only among the observations belonging to the eligible group in 2002.
[18] Up to 1999 as far as the regional breakdown is concerned.

Table 8

# PROBIT ESTIMATES OF THE PROBABILITY OF ENTERING THE LABOUR FORCE AS A PERMANENT WORKER: THE IMPACT OF THE UNDERGROUND ECONOMY (1)

| | | Up to 29 | | Up to 35 | | Up to 40 | | Up to 45 | | Up to 50 | | Up to 55 | | Up to 60 | | Up to 64 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| Average effect $(\beta_{1t})$ | | | | | | | | | | | | | | | | | |
| | 2002 | .009 | 2.05 | .017 | 4.02 | .021 | 4.87 | .021 | 5.15 | .022 | 5.60 | .022 | 6.17 | .013 | 5.37 | .007 | 4.63 |
| | 2001 | .004 | .88 | .006 | 1.53 | .010 | 2.67 | .010 | 2.83 | .010 | 2.79 | .008 | 2.86 | .004 | 1.85 | .001 | .91 |
| | 2000 | .002 | .35 | .001 | 0.19 | .002 | .50 | .002 | .50 | .001 | 0.43 | .001 | .50 | -.000 | -.26 | -.001 | -.99 |
| | 1999 | .008 | 1.77 | .005 | 1.41 | .006 | 1.59 | .007 | 1.83 | .006 | 1.70 | .006 | 1.88 | .003 | 1.22 | .001 | .54 |
| | 1998 | .017 | 3.16 | .014 | 3.23 | .018 | 4.2 | .021 | 4.85 | .019 | 4.82 | .017 | 4.96 | .011 | 4.26 | .005 | 3.53 |
| | 1997 | .003 | .68 | .005 | 1.34 | .012 | 3.12 | .014 | 3.73 | .014 | 3.75 | .013 | 4.16 | .008 | 3.67 | .004 | 2.96 |
| | 1996 | .009 | 1.85 | .011 | 2.54 | .017 | 3.81 | .016 | 3.86 | .016 | 4.09 | .015 | 4.26 | .009 | 3.72 | .005 | 3.10 |
| | 1995 | -.004 | -1.01 | .001 | 0.26 | .006 | 1.59 | .007 | 1.93 | .006 | 1.73 | .005 | 1.81 | .003 | 1.22 | .001 | .46 |
| Interaction with black economy[2] $(\beta_{2t})$ | | | | | | | | | | | | | | | | | |
| | 2002 | .041 | 1.08 | .063 | 2.04 | .072 | 2.58 | .087 | 3.30 | .086 | 3.62 | .097 | 4.76 | .084 | 5.59 | .060 | 6.09 |
| | 2001 | .022 | .54 | .048 | 1.37 | .051 | 1.65 | .056 | 1.91 | .059 | 2.27 | .068 | 3.08 | .062 | 3.75 | .044 | 4.07 |
| | 2000 | -.006 | -.13 | -.034 | -.93 | -.029 | -.85 | -.021 | -.66 | .009 | .32 | .038 | 1.55 | .035 | 1.96 | .027 | 2.29 |
| | 1999 | .029 | .69 | .067 | 1.96 | .058 | 1.82 | .057 | 1.90 | .051 | 1.83 | .064 | 2.70 | .056 | 3.20 | .039 | 3.47 |
| | 1998 | .059 | 1.49 | .097 | 3.03 | .136 | 4.54 | .158 | 5.70 | .164 | 4.63 | .169 | 7.86 | .135 | 8.48 | .094 | 8.93 |
| | 1997 | .013 | .24 | .031 | 0.81 | .084 | 2.55 | .105 | 3.49 | .127 | 4.63 | .126 | 5.47 | .106 | 6.29 | .071 | 6.40 |
| | 1996 | .062 | 1.14 | .079 | 1.92 | .146 | 4.06 | .161 | 4.82 | .191 | 6.47 | .175 | 6.98 | .155 | 8.35 | .107 | 8.86 |
| | 1995 | -.003 | -.04 | .057 | 1.25 | .125 | 3.25 | .183 | 5.24 | .214 | 6.88 | .204 | 7.3 | .173 | 8.99 | .114 | 9.01 |
| Black economy own effect $(\beta_3)$ | | .031 | 0.29 | -.066 | -.64 | -.030 | -.31 | -.105 | -1.19 | -.140 | -1.78 | -.169 | -2.56 | -.117 | -2.41 | -.087 | -2.77 |

Source: Own calculations on Istat data.

(1) Probit model estimation of model (10) in the text. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is employed as a permanent worker. The sample ranges from 1995 to 2002 and comprises all persons who, at time t-1, were out of the labour force. Entries along the columns are marginal effects (M.E.) and t-statistics (t-stat) associated with indicated variables. The first block of rows under the heading "Average effect $(\beta_{1t})$" are the marginal effects associated with a set of dummy variables (one for each year) that take value one if the observation $i$ in year $t$ is at least 25 years old. We interact these variables with the share of the black economy in the region of residence of the observation $i$ at time $t$ (scaled by the mean) to obtain a new set of variables whose marginal effects are reported in the second block of rows under the heading "Interaction with black economy $(\beta_{2t})$". The third variable is the share of the black economy in the region of residence of observation $i$ at time $t$. These marginal effects are estimated in a separated regression for each of the age groups listed in the top row (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The model includes other variables not shown in the Table: a cubic in age, a quadratic in the years of education, the interaction between education and age, dummies for years, gender, marital status, regions, condition one year before the interview (such as student, housewife, retired ) . – (2) Scaled by the mean education for each eligible group.

Table 9

**PROBIT ESTIMATES OF THE PROBABILITY OF FINDING A PERMANENT JOB: THE IMPACT OF THE UNDERGROUND ECONOMY; SAMPLE RESTRICTED TO LABOUR FORCE PARTICIPANTS (1)**

| | | Up to 29 | | Up to 35 | | Up to 40 | | Up to 45 | | Up to 50 | | Up to 55 | | Up to 60 | | Up to 64 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat | M.E. | t-stat |
| Average effect ($\beta_{1t}$) | | | | | | | | | | | | | | | | | |
| | 2002 | .055 | 1.65 | .058 | 2.06 | .051 | 1.83 | .048 | 1.70 | .049 | 1.72 | .055 | 1.93 | .063 | 2.24 | .059 | 2.11 |
| | 2001 | .020 | .61 | -.004 | -.16 | -.013 | -.47 | -.016 | -.61 | -.024 | -.90 | -.024 | -.86 | -.020 | -.74 | -.024 | -.88 |
| | 2000 | .006 | .17 | -.016 | -.60 | -.025 | -.95 | -.032 | -1.20 | -.039 | -1.48 | -.038 | -1.40 | -.032 | -1.21 | -.031 | -1.20 |
| | 1999 | .061 | 1.75 | .023 | .83 | .001 | .04 | -.003 | -.11 | -.006 | -.25 | -.001 | -.05 | .004 | .17 | .004 | .15 |
| | 1998 | .089 | 2.51 | .045 | 1.58 | .050 | 1.78 | .058 | 2.01 | .052 | 1.79 | .053 | 1.81 | .054 | 1.89 | .052 | 1.85 |
| | 1997 | .026 | 0.76 | .011 | 0.40 | .028 | 1.00 | .039 | 1.39 | .042 | 1.45 | .046 | 1.60 | .058 | 2.04 | .057 | 2.03 |
| | 1996 | .058 | 1.64 | .051 | 1.75 | .058 | 2.00 | .063 | 2.13 | .062 | 2.08 | .065 | 2.16 | .071 | 2.40 | .071 | 2.42 |
| | 1995 | -.011 | -.31 | .004 | .13 | .022 | .79 | .031 | 1.11 | .031 | 1.10 | .037 | 1.28 | .042 | 1.46 | .038 | 1.33 |
| Interaction with black economy[2] ($\beta_{2t}$) | | | | | | | | | | | | | | | | | |
| | 2002 | .327 | 1.07 | .638 | 2.72 | .608 | 2.74 | .723 | 3.35 | .761 | 3.58 | .794 | 3.75 | .829 | 3.95 | .868 | 4.14 |
| | 2001 | .027 | 0.08 | .239 | .91 | .131 | .55 | .193 | .83 | .241 | 1.05 | .383 | 1.67 | .424 | 1.87 | .453 | 2.00 |
| | 2000 | -.155 | -.47 | -.264 | -.97 | -.271 | -1.05 | -.212 | -.84 | -.103 | -.42 | .082 | .34 | .109 | .45 | .114 | .47 |
| | 1999 | .341 | 1.06 | .687 | 2.69 | .594 | 2.44 | .618 | 2.58 | .562 | 2.35 | .655 | 2.78 | .685 | 2.93 | .685 | 2.95 |
| | 1998 | .217 | .72 | .465 | 1.88 | .931 | 3.58 | .983 | 4.37 | 1.06 | 4.80 | 1.22 | 5.57 | 1.26 | 5.79 | 1.30 | 5.98 |
| | 1997 | .214 | .58 | .249 | .88 | .608 | 2.39 | .644 | 2.63 | .828 | 3.43 | .851 | 3.57 | .883 | 3.74 | .901 | 3.84 |
| | 1996 | .412 | 1.03 | .561 | 1.85 | .871 | 3.19 | .984 | 3.71 | 1.16 | 4.50 | 1.15 | 4.48 | 1.36 | 5.39 | 1.42 | 5.68 |
| | 1995 | .006 | .01 | .245 | .72 | .587 | 1.96 | .996 | 3.56 | 1.19 | 4.39 | 1.29 | 4.79 | 1.46 | 5.53 | 1.48 | 5.63 |
| Black economy own effect ($\beta_3$) | | -.321 | -.38 | -1.00 | -1.28 | -.761 | -1.03 | -1.21 | -1.70 | -1.34 | -1.92 | -1.54 | -2.24 | -1.59 | -2.35 | -1.71 | -2.55 |

Source: Own calculations on Istat data.

(1) Probit model estimation of model (10) in the text. The dependent variable is a dummy that takes value one if the person $i$ at time $t$ is employed as a permanent worker. The sample ranges from 1995 to 2002 and comprises all persons who, at time t-1, were out of the labour force and in year $t$ are in the labour force . Entries along the columns are marginal effects (M.E.) and t-statistics (t-stat) associated with indicated variables. The first block of rows under the heading "Average effect ($\beta_{1t}$)" are the marginal effects associated to a set of dummy variables (one for each year) that take value one if the observation $i$ in year $t$ is at least 25 years old. We interact these variables with the share of the black economy in the region of residence of the observation $i$ at time $t$ (scaled by the mean) to obtain a new set of variables whose marginal effects are reported in the second block of rows under the heading "Interaction with black economy ($\beta_{2t}$)". The third variable is the share of the black economy in the region of residence of observation $i$ at time $t$. These marginal effects are estimated in a separated regression for each of the age groups listed in the top row (each regression also includes the control group, which consists of people aged 20-24 who, at time t-1, were out of the labour force). The model includes other variables not shown in the Table: a cubic in age, a quadratic in the years of education, the interaction between education and age, dummies for years, gender, marital status, regions, condition one year before the interview (such as student, housewife, retired ) . – (2) Scaled by the mean education for each eligible group.

An additional problem arises if we want to use sector information; in this case we need to restrict the analysis only to employed people (job searchers and inactive persons do not have any sector affiliation). For the time being, we confine ourselves to regional information on irregular work.

Finally, the above statistical model does not allow us to evaluate whether the black economy also had an additional effect also before 2001. This would be evidence contradicting our black economy story.

To take all these problems into account, we ended up specifying an equation in which the probability of entering the labour force as a permanent worker is related to the usual set of variables, a black economy indicator that varies at the regional level, a set of dummies for the eligible group interacted with the year dummies and a set of interactions between eligible group, year dummies and the black economy indicator:

$$(10) \quad x_{it}' \beta = \beta_o + \sum_{t=1995}^{2002} \beta_{1t} eligible_{it} * t_i + \sum_{t=1995}^{2002} \beta_{2t} eligible_{it} * t_i * (black_{it} - mean(black_t)) + \beta_3 * black_{it}$$
$$+ g(educ_{it}, age_{it}) + other\ demographic\ characteristics_{it} + year\ dummies$$

Ideal evidence in favour of our shadow economy story would call for a $\beta_{2t}$ (statistically) positive only for the years 2001 and 2002; otherwise the story could not hold since it would imply that workers older than 24, living in regions characterised by larger shares of irregular work enjoyed a higher probability of being hired with an open-end contract even before the introduction of the subsidy. A less strong but still valid evidence would be one in which $\beta_{2t}$ for $t < 2001$ is positive but (statistically) smaller than $\beta_{2t}$ for $t > 2000$[19]. We again adopted the "robust against choosiness" strategy to avoid the issue of selecting a unreasonable eligible group and estimated the above model recursively adding every time one additional year of age.

Table 8 reports the marginal effects associated to $\beta_{1t}$ and $\beta_{2t}$. In the last row we present the marginal effect (and its t-stat) associated with the coefficient $\beta_3$ that represents the effect of the black economy *per se* on the probability of entering the labour force as an open-end worker.

Results show that for the whole sample (20-64 years old) the probability of being hired on a permanent basis is reduced by the share of the underground economy (a 10 percentage point of underground economy decreases the probability by about 1 percentage points); this effect looks concentrated on people older than 45.

For the years 2001 and 2002, both coefficients $\beta_1$ and $\beta_2$ accord in sign and magnitude with the underground economy interpretation of our previous results, with some variation across different age groups. In 2002, the average effect shows a pattern similar to that observed for the probability of participating discussed in paragraph 4.3: it is small and barely different from zero for people 25-29

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[19] This is the same argument we used to check for the existence of an average effect.

years of age (about 1 percentage point increase in the probability of entering the market as an open-end worker in 2002); it grows steadily in size as the eligible group becomes larger until it includes all people up to 50 years of age, and declines thereafter. In 2001, the pattern shown by the average effect looks very similar, though smaller in size.

Interaction coefficients in 2002 are positive and statistically different from zero (except for people aged 25-29) and become stronger for older people (up to the age group 25-55); the magnitude of this effect is not trivial: for people aged 25 to 55, a 10 percentage point increase in the share of the underground economy above the average reduces its negative impact on participation by about 1 percentage point. For other age groups the impact is smaller but still relevant. The same pattern can be observed in 2001, though less pronounced.

Can we conclude that we have enough evidence in favour of the underground economy story? Before answering this question we need to exclude the possibility that a similar pattern was present in the pre-2001 period, i.e. before the subsidy was introduced. When we examine the $\beta_2$ coefficients in the period 1995-2000 we find a U-shaped pattern. For the whole sample we find a very large effect in 1995 (about 1.1 percentage points for a 10 per cent increase of the black economy above the mean), which steadily declines in the following years (except for the year 1998) until its minimum in 2000 (0.27) and rises afterwards to a level which is significantly different from zero (about 0.6 points in 2002). This U-shaped pattern can be interpreted as mild evidence in favour of the fact that the subsidy revitalised a tendency to move out from the black economy, which was strong in the second half of the 1990s.

Table 9 presents our last set of results, which refer to the estimation we carried out using the more restricted sample, i.e. the one only covering people who actually entered the labour force. These estimates are therefore purged by the scale effect due to the increases in labour force participation as a whole. The basic message does not change: the additional effect brought about by the existence of a shadow economy is positive, statistically different from zero, increasing in age, and stronger in 2002 than in 2001. However, the U-shaped pattern does not disappear.

## 6. Conclusions

In this paper we investigate how labour supply reacts to subsidies which reduce firms' labour costs. In particular we examine a recent program introduced in Italy at the end of the year 2000, which provided a large subsidy to firms hiring workers with open-end contracts. The question we ask is whether the subsidy encouraged more people to participate because of the improvement in labour

market conditions. To address this question we look at how transitions from inactivity to participation were affected by the subsidy. We use the April waves of the Italian Labour Force Survey micro-data for the period 1995-2002, within a difference-in-differences framework.

Our results suggest the subsidy did exert a non-trivial effect on the participation rate. The tax credit increased labour force participation of eligible inactive people by about 1.4% in 2001 and 2.1% in 2002 relative to non-eligible individuals. This increase was rather heterogeneous across people. It seems indeed to have been mostly concentrated among individuals aged 35-54, with a low or at most a secondary schooling level, who, before entering the labour market, were either retired or housewives. These demographic characteristics look quite surprising since they do not really match with the composition by age and schooling level of the group of people who sustained the expansion of the Italian labour supply in the pre-2000 period.

The fact that only adult and older workers seem to have been affected by the subsidy might therefore be hiding some other phenomenon. In particular, one possible story could be that what we are actually estimating is a decision to participate to the regular labour market rather than remaining in the black economy. The idea is that some of the firms employing workers in the underground economy took advantage of the subsidy to move these labour contracts "above the table". Our evidence seems indeed to confirm this intuition. However, the phenomenon is not specific to the biennium 2001-2002 but was quite evident also in the preceding years, especially between 1995 and 1998. We can therefore conclude that the new subsidy revitalised a tendency to move out of the black economy, which was strong in the second half of the 1990s.

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