

# Measuring the impact of the Italian CFL programme on the job opportunities for the youths.

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**Abstract:** The CFL programme has been introduced in 1985 to improve the youths occupational chances. It provides the employers some incentive to recruit young workers by reducing both the labour and the firing costs relative to those they would bear by recruiting older workers. Following the literature, the expected impact of the programme is to increase the eligibles chance to work *during* the eligibility period as well as to improve their chance to work *after* the eligibility period thanks to the longer work experience obtained during the eligibility period. A substitution effect might emerge since as subjects get out of eligibility employers might find convenient to replace them by younger still eligible workers. To measure the impact of the programme we exploit the variation over time and across geographical areas of the incentive to hire eligible workers induced by several reforms of the programme as well as its interaction with other incentive schemes.

**Keywords:** targeted wage subsidy, firing costs, substitution effect

**JEL:** J38, J68

## 1. Introduction

The Italian *Contratto di Formazione e Lavoro* (CFL, working and training contract) started operating in 1985 to improve the youths chance to get a job. Eligible people are workers younger than 30 (with some minor changes over the years and across areas).

The programme provides the employers willing to hire eligible workers:

- a (roughly) 30% rebate on the labour cost via a reduction on the Social Security fee
- a full exemption from firing costs

In principle, the programme should also feature an off-the-job training component. In fact, it seems that most times it has not been implemented.

Over the years several reforms of the programme took place. Since June 1988 the rebate on the SS fee has been reduced to (roughly) .15. Since January 1991 the rebate on the SS fee has been further reduced to (roughly) .07 (Centre-North of Italy) and to .12 (South of Italy). Moreover, an eligibility rule has been introduced on the employer side in that an employer is allowed to hire new CFL worker during year  $t$  only if at least 50% of the CFL workers completing their employment spell during years  $t-1$  and  $t-2$  have been kept with the firm on a permanent basis.

To properly measure the CFL programme impact one has to take into account the interaction of the programme with other incentive schemes. Among these, the main one provides firms operating in the South a ten-year long 100% rebate on the SS fee for each worker newly hired on a permanent

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basis no matter for the age of the hired worker. As a result, to hire a new worker any firm operating in the South chooses between the following options:

- A) hiring a young worker with the package {SS rebate=30%, fixed term contract}
- B) hiring a worker with the package {SS rebate=100%, permanent basis contract} no matter for the worker age.

As a matter of fact, alternative B has been chosen since there has been very few CLF workers in the South up to December 1991 when the alternative incentive scheme has been withdrawn.

In this paper we measure the marginal effect of changing the cost of hiring a young worker relative to an older one on the job opportunities of the youths *during* their eligibility period. Following Blundell, Duncan and Meghir (1998), to measure this marginal effect we exploit the variation over time and across geographical areas of the cost of hiring a young worker relative to an older one due to reforms and interactions between alternative benefit schemes.

Secondly, we check whether the possibly longer work experience got by the youths *during* their eligibility period as an impact of the CFL programme yields higher chance to work *after* the eligibility period has elapsed.

Finally, we check whether a substitution effect emerges as a result of the likely incentive on employers to replace their no longer eligible employees by younger still eligible workers.

Data we use are from the Social Security files. We track forty year-of-birth/geographical area cohorts over the time window 1986 to 1996 and over their age window 19 to 34 assessing whether the variability over time and across areas in the cost of hiring eligible workers relative to non eligible ones bears any consequence on the stock of employees.

In section 2 we present the institutional context and the main features of the CFL programme. In section 3 we formalise the analysis and develop the econometric model. In section 4 we deal with some empirical problems raised by the data set we use to obtain our estimates. In section 5 we present the result of our estimation. Final remarks follow.

## **2. The institutional context and the main features of the CFL programme**

Since the 80's several reforms have been changing the rules of the Italian labour market, bringing about effects on the "natural" labour mobility and on net job creation.

As years went by, the focus of the debate on labour market has moved from employment protection to business back-up measures: those that were once tools of labour policies (i.e. labour cost regulation and flexibility) have become the objectives to pursue, assuming their positive effect on employment.

The main result of twenty years of reforms has been that of improving possible matches between workers and firms. The "normal" open ended contract continues to be the main method of hiring but it is not any longer the only one.

The year 1984 is a remarkable one for reform process of the Italian labour market: binding obligations on hirings are reduced, diminishing the monopolistic role of employment agencies, part-time work legislation is introduced as well as the *Contratti di Formazione e Lavoro*.

The CFL is a multi-purpose tool: it defines a target group that is intended to gain from it – young people 15 to 29 years old – hiring whom firms obtain both a rebate on welfare contribution and greater flexibility. It is indeed a fixed-term contract, with a pre-determined duration that cannot be shorter than 18 months nor longer than 24. Compared to the already existing fixed-term contract, introduced in 1962, the field of action of the former has widened: in fact the latter allowed firms to hire on a fixed-term basis only to replace employees temporarily unable to work or to carry out seasonal activities.

At the lapse of the contract the firm has the right, but not the obligation, to turn the CFL contract into an open ended one, taking advantage of favourable tax treatment over a further year.

The other classical tool to hire on a fixed-term basis, the so-called apprenticeship, introduced in 1959, has a narrower target, young people being less than 19 years old, provides for a minimum of 5 years length and it is directed at getting a professional degree certificate.

The CFL, right from the start, aims higher: it cannot be used to acquire elementary professional experience and provides for a certain amount of hours devoted to off-the-job training.

As years passed by, provisions ruling CFL have gone through many changes that reduced both its advantages concerning taxation and those concerning flexibility.

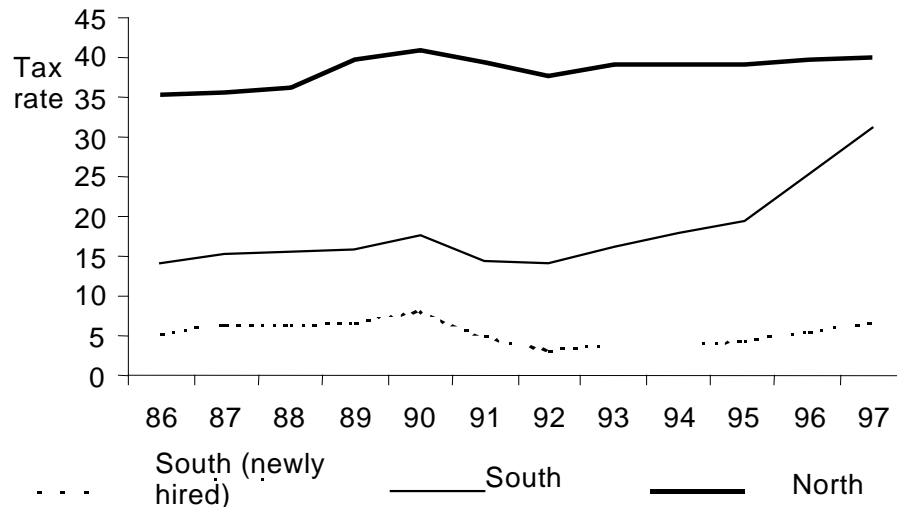
**Tab. 1. Social Security fee for CFL employees over time, across geographical areas and industries.**

Period	Main legal reference	South	Center-North, craftmen	Center-North, sales and tourism	Center-North, others
1/5/84-31/5/88	L. 19.12.84, nr.863	Social Security fee on a fix quota basis as for apprentices			
1/6/88-23/11/90	L. 26.7.88, nr.291	Social Security fee on a fix quota basis as for apprentices	Rebate on Social Security fee=50%		
24/11/90-31/12/90	DL. 22.11.90, nr.337		Rebate on Social Security fee=50%	Rebate on Social Security fee=25%	
1/1/91-31.3.95	L. 29.12.90, nr.407		Rebate on Social Security fee=40%		
1/4/95-	L 19.7.94 451				

**Tab. 2. Target population of the CFL programme and maximum duration of a CFL spell.**

Period	Target population, Center-North	Target population, South	Maximum duration of a CFL spell
1/5/84-19/11/93	15-29 years old		Maximum time length 24 months not renewable
Since 5/4/91	15-29 years old	15-32 years old	
Since 20/11/93	16-32 years old	A regional authority can extend the age limit above 32 years (only up to the end of '97)	Two types of contracts: A max 24 months – intermediate skills; B max 12 month – professional settling

**Fig. 1. The pattern of the Social Security fee rate (Manufacture) over the years and across geographical areas.**



Benefits to the firms coming with the CFL programme made this type of contract a competitive tool in comparison with other recruitment procedures – primarily, the classic open ended contract – particularly in the Centre-North of Italy. Indeed, in the Northern part of Italy significant back-up measures for business activities did not exist before either from the fiscal point of view (labour costs) or in terms of flexibility. Therefore, the CFL – jointly with the part-time introduced at the same time – was a good opportunity for employers as well as an incentive for hiring young people.

Instead, firms operating in the South of Italy as a matter of fact did not use the CFL. A straightforward explanation for this is that up to 1991 Southern employers were entitled to a ten-year tax relief on the total amount of SS contributions for each new employee hired on a permanent basis<sup>2</sup>. Whereas the share due to the national health-care system was covered by exemption from social-security taxes<sup>3</sup>.

Such a system could explain the lack of interest in CFL shown in the South, at least until 1991, when the reform of the tax break for Southern regions started. This reform entails the progressive reduction of tax relief and exemption rates as well as the reduction of the total allowance for the new employees, that goes from being on a ten-year basis to an annual one.

Fig. 1 shows the tax rates trend over time (allowing for tax cuts and tax exemptions) in the North and in the South (distinguishing between just-employed and employed workers). It should be noted that as time goes by, starting from the tax relief reform, the tax rates in the two macro regions progressively converge.

To evaluate the relative advantage from hiring an employee on the CFL scheme as compared to hiring him on a permanent basis contract we need to introduce a little of notation. Let  $w$  be the worker yearly wage and:

<sup>2</sup> In principle, to be eligible for the benefit the employer should prove that the new employee is an additional one. In practice, the eligibility rule has been enforced in a way particularly favourable to the firms

<sup>3</sup> For workers already employed, firms faced however special provisions allowing them to have the same amount of fiscal exemption and a number of tax cuts. On the whole they paid labour costs equal to  $\frac{1}{4}$  of those that comparable firms located in the North would have had to face.

$$r = f(t, \text{macro-region}, \text{industry}, \text{worker status}, \text{firm size})$$

be the Social Security (SS) fee rate varying over time, across geographical areas and industries as well as with the worker status and the firm size. In the absence of any rebate on the SS fee the per year cost from hiring a worker is  $w \cdot (1+r)$ . Exploiting the rebates made available to the employers by the existing incentive schemes results in a per year cost equal to  $w \cdot (1+r \cdot reb)$  where:

$$reb = f(t, \text{macro-region}, \text{industry})$$

is the rebate on the SS fee rate, varying over time, across geographical areas and industries available to the employer. It is the one provided by the CFL programme in the Centre-North of Italy. As for the South, as we explained up to 1991 most firms did not exploit the benefits from CFL. Rather, they exploited the alternative scheme which is not targeted to a specific age group.

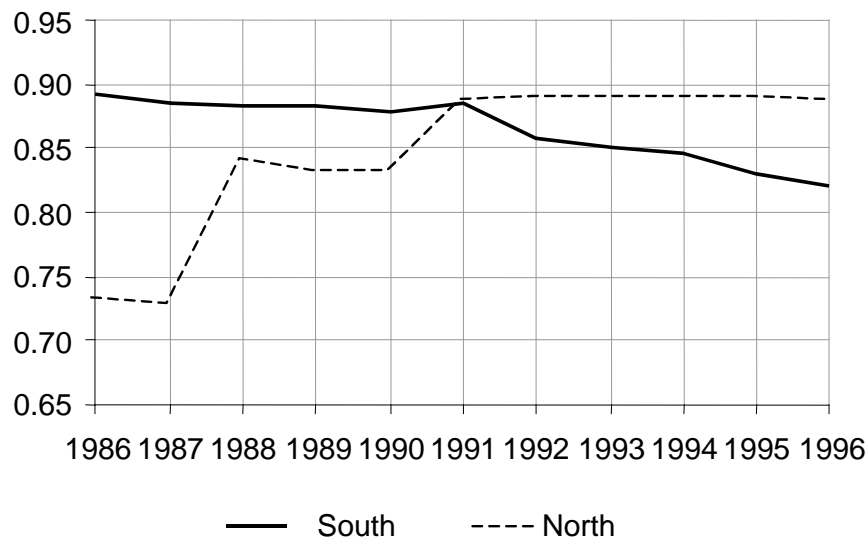
As a result, in the Centre-North the relative labour cost from hiring a young employee becomes:

$$rlc = (1 + r \cdot reb) / (1 + r)$$

a function of time, geographical area, firm industry and size and worker status. Instead, in the South it is basically equal to 1 up to 1991 just because both young and older workers are eligible for the rebate provided by the alternative scheme.

We evaluated a weighted mean of  $rlc$  by geographical area and over time using as weights the proportion of employees by firm industry and size and worker status in each year and geographical area. Fig. 2 shows the pattern of  $rlc$  over time for the two macro-regions.

**Fig. 2. Labour cost for an eligible worker as a proportion of the labour cost for a non eligible worker.**



As for the duration of a CFL employment spell, up to 1994 it cannot last more than 24 months. In 1994 a reform introduced two types of CFL contracts:

- type A, with an off-the-job training component aimed at acquiring “intermediate skills” and with a maximum duration of 24 months;
- type B, with a limited training component, aimed at fostering the settling in of new young employees by means of a work experience, with a maximum duration of 12 months. This is mainly intended as a tool to adapt professional skills to the production environment and organisational structure.

As for the conversion of a CFL contract into an open ended one, the turning point is January 1991. Up to then firms did not face restrictive clauses regarding the replacement of expiring CFL contracts with new young employees. Employers were allowed to freely hire new CFL employees no matter for the proportion of CFL employees kept with the firm on a permanent basis as the CFL contract expired.

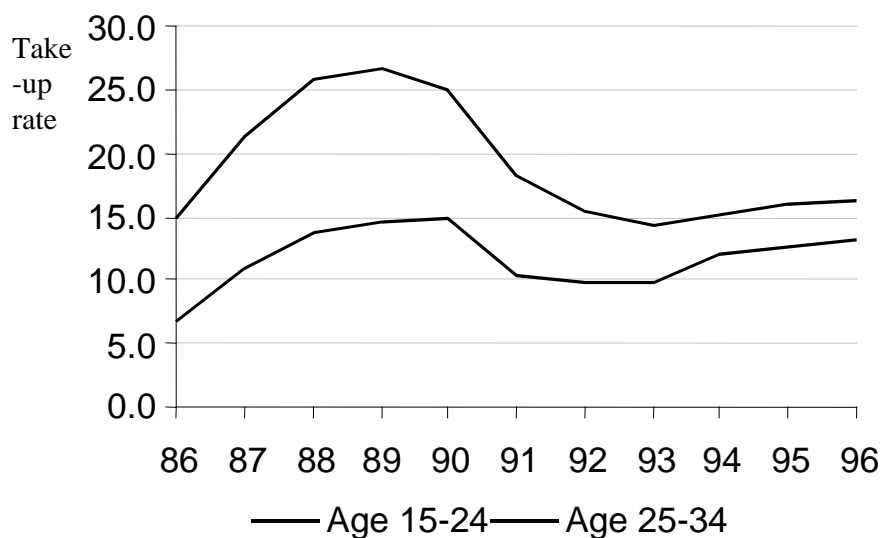
On January 1991 things changed. The new rule stipulates the following:

Starting from Jan. 1, 1991 the right to hire by means of CFL cannot be asserted by employers that, while calling for new CFL hiring, are not proved to have hired at least 50% of those workers whose CFL contract has expired in the previous 12 months. Starting from Nov. 19, 1993 this percentage is raised to 60%. Discarded workers, fair dismissed ones and those who refused at the end of the CFL spell to be hired on an open ended contract are not included in the percentage.

The reason for the change seems to be that of discouraging the use of CFL by firms that were mainly interested in tax cut and convenience in firing, rewarding instead those employers that by means of selecting and training young people use this tool to have in the up-coming future more skilled labour.

Fig. 3 shows the pattern of CFL hiring over the total hiring for the period 1986-1996.

**Fig. 3. Take-up rate for the CFL programme by age (nr. of newly hired CFL workers in the specified age window/total nr. of newly hired workers).**



### 3. Model specification

#### 3.1. Formalising the benefit scheme

In this section we go through the details of the CFL programme as reviewed in section 2 to formalise them in a way suitable for the econometric analysis. The main step we take here is to convert the degree of flexibility allowed by the various type of labour contracts into expected firing costs as seen from the time period in which an hiring takes place.

As before,  $w$  is the worker yearly wage and  $r$  the Social Security (SS) fee rate. The per year cost to an employer from hiring a worker non eligible for the CFL programme is  $w(1+r)$ . Let  $p$  be the probability that the employer eventually fires that worker,  $fc$  the firing costs and  $d$  the number of years the matching to that particular employee is expected to hold before firing as perceived at the time of hiring. Then the *expected per year total labour cost* of a non eligible worker is:

$$tlc_{ne} = w(1+r) + p*fc/d. \quad (1)$$

As at the time the CFL programme has been introduced, an employer hiring an eligible worker enjoys a rebate on the SS fee as well as a full exemption from firing costs at the end of the CFL spell. As a result, the per year total labour cost of an eligible worker is:

$$tlc_e = w(1+ r*reb_1) \quad (2)$$

where  $(1-reb_1)$  is the rebate on the SS fee at that time.

The reform in operation since June 1988 reduces the rebate on SS fee. Let  $(1-r_2) < (1-r_1)$  be the new rebate. Then, the per year total labour cost of an eligible worker is straightforwardly obtained by modifying (2).

A further reform is in operation since January 1991. It introduces both a new rebate on the SS fee lower than the previous one,  $(1-r_3) < (1-r_2)$  say, and an eligibility rule on the employer side. According to this eligibility rule, an employer is allowed to hire new workers on the CFL scheme only if at least 50% of his CFL employees concluding their CFL spell over the previous two years have been kept on a permanent basis.

Let  $t_0$  be the current calendar year. The employer decides whether or not to hire a CFL worker;  $t_0+2$  is the calendar year in which the CFL employment spell would end<sup>4</sup>. As seen from  $t_0$  the eligibility rule on the employer side induces a firing cost. To see this note that on hiring a CFL worker in  $t_0$  the employer exposes himself to the risk of bearing a higher per year total labour cost on the employees to be (possibly) hired in  $t_0+2$ . For this risk to materialise in  $t_0+2$  three events need to take place:

- i) as the CFL employment spell ends the employer is unwilling to keep the CFL employee with him on a permanent basis,
- ii) the decision to fire the CFL employee gets the employer out of eligibility,
- iii) the employer needs to hire a new employee which because of ii) cannot be a CFL one.

Let  $q$  be the joint probability of these events. As seen from  $t_0$  the expected cost of firing the CFL employee is  $(tlc_{ne} - tlc_e) q$ , namely the additional cost of hiring in  $t_0+2$  a non eligible employee instead of an eligible one times the joint probability of the events i)-iii). Hence, from 1991 onward the per year expected total labour cost of a CFL employee becomes:

$$tlc_e = w(1+r*reb_3) + (tlc_{ne} - tlc_e) q/2.$$

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<sup>4</sup> The typical length of a CFL employment spell is two years.

where we divide by 2 the expected firing costs to account for the typical length of a CFL employment spell<sup>5</sup>. Solving for  $tlc_e$  one gets:

$$tlc_e = w(1+r*reb_3) (1 - \theta) + tlc_{ne} \theta \quad (3.1)$$

$$\theta = q / (2 + q). \quad (3.2)$$

Apparently, as a result of the 1991 reform  $tlc_e$  becomes a weighted mean of what it would be in the absence of the newly introduced eligibility rule on the employer side, namely the worker wage plus the reduced SS fee, and of the expected per year total labour cost of a non eligible worker. In particular, note that the employer starts bearing a fraction of  $tlc_{ne}$  even during the two CFL years of his eligible employee.

The weight  $\theta$  increases with  $q$ , rising from 0 to 1/3 as  $q$  rises from 0 to 1 meaning that the fraction of  $tlc_{ne}$  the employer incurs in by hiring a CFL worker increases with the joint probability of the events i)-iii).

Note that before January 1991  $q$  (hence  $\theta$ ) is zero because the probability of the event ii) is zero.

Finally, as explained in section 2 we need to account for an alternative targeted wage subsidy programme operating in the South of Italy up to 1991 whose benefits cannot be cumulated to the CFL ones. According to this scheme firms operating in the South enjoy a ten-year long full exemption from SS fees on each new employee hired on a permanent basis no matter for the employee's age<sup>6</sup>. As an implication, on hiring a new employee a firm operating in the South chooses among hiring an employee whose expected per year labour cost is:

$$tlc = w + p*fc/d. \quad (4)$$

no matter for his age - ten-year full exemption from SS fees - and hiring an employee eligible for the CFL programme whose per year labour cost is:

$$tlc_e = w(1+ r reb) \quad (5)$$

- full exemption from firing costs - with  $reb=reb_1$  up to May 1988 ,  $reb=reb_2$  from June 1988 to December 1990 and  $reb=reb_3$  from January 1991 onward.

As a matter of fact, firms in the South did very little use of the CFL programme up to December 1991 suggesting that even for a worker eligible for CFL the labour cost in (5) is larger than the one in (4). Otherwise stated, up to 1991 in the South of Italy there has been no actual incentive to hire youths since the benefits to the employers coming with the CFL programme are outperformed by the benefits coming with the alternative scheme which is not targeted to a specific sub-population.

In the econometric model we shall work with the ratio  $tlc_e/tlc_{ne}$ , the expected per year total labour cost from hiring an eligible worker as a fraction of the corresponding cost from hiring a non eligible worker. Let:

$$\psi = w(1+r) / [w(1+r) + p fc/d], \quad (6)$$

<sup>5</sup> Also note that  $q$  slightly increases by the end of 1993 since to remain eligible for further CFL hirings the percentage of CFL employees an employer need to keep on a permanent basis as they conclude their CFL spell switches from 50% to 60% inducing an increase of the probability of the event ii). To simplify the discussion in the following we disregard this (likely) negligible variation over time.

<sup>6</sup> Strictly speaking, there are some firms operating in the South which are not eligible for this scheme but their relative weight in terms of employees is rather small. See the details in section 2.



be the reduction in the labour cost resulting from the exemption from firing costs as a proportion of the *expected per year total labour cost* of a non eligible worker. Let:

$$rlc = w(1 + r*reb)/w(1+r) = (1 + r*reb)/(1+r), \quad (7)$$

be the further reduction in the labour cost resulting from the rebate on the SS fee. Then, the following identity holds:

$$tlc_e/tlc_{ne} = \psi^*rlc. \quad (8)$$

This identity highlights how the two components of the programme – exemption from firing costs and rebate on SS fee - cumulate to yield the total reduction in the labour cost the firm obtain from hiring an eligible worker as compared to hiring a non eligible one.

In the Centre-North the ratio  $tlc_e/tlc_{ne}$  is as in (8) up to Dec. 1990, then it switches to

$$(1 - \theta) \psi^*rlc + \theta, \quad (9)$$

(see equations (3.1)-(3.2)) with  $reb = reb_1$  up to May 1998,  $reb = reb_2$  from June 1998 to December 1990 and  $reb = reb_3$  from January 1991 onward.

As for the South, the ratio  $tlc_e/tlc_{ne}$  is slightly less than 1<sup>7</sup> up to December 1991. Then, it becomes the same as in (9) but with  $reb$  very close to  $reb_2$  in 1992 and then slightly decreasing over time.

### 3.2. The econometric model

To measure the impact of the CFL programme on the job opportunities of youths we elaborate on the standard binary-outcome fixed-effect model:

$$y_{it}^* = \alpha x_{it} + u_i + \varepsilon_{it} \quad (10)$$

with the observable  $y_{it}=1/0$  – meaning that the i-th subject is at work/not at work in period  $t$ – depending on the sign of the latent variable  $y_{it}^*$ ;  $x_{it}$  are the explanatory variables relevant to the chance of being at work and  $u_i$  represents the time-invariant unobserved heterogeneity.

Specifically, we want to measure the marginal effect of changing the cost of hiring a young worker relative to an older one. Following Blundell, Duncan and Meghir (1998), to measure this marginal effect we exploit the variation over time and across geographical areas of the cost of hiring a young worker relative to an older one due to reforms and interactions between alternative benefit schemes.

To keep things simple, in the following we develop the analysis maintaining that both  $\psi$  as defined in (6) and  $\theta$  as defined in (3.2) are constant across subjects and over time. That is we treat them as parameters to be estimated.

The main explanatory variable entering the rhs of (10) is the ratio  $tlc_e/tlc_{ne}$ . Given the assumption we just made about  $\psi$  and  $\theta$ , the variability of  $tlc_e/tlc_{ne}$  is due to  $rlc$ , the relative labour cost as defined in section 2. Since conditional on the geographical area and on the time period both  $r$  and  $reb$  vary across firms and across workers we evaluate the mean value of  $(1 + r reb)/(1+r)$  as explained in section 2. Let  $rlc_{it}$  be the resulting mean ratio. It varies over time – due to the reforms illustrated above - and across areas – due to the interaction with the alternative targeted wage

<sup>7</sup> It is not just 1 because of the presence of the firms we mentioned in the previous footnote which did use the CFL programme (more on this below).

subsidy scheme, but it is common to all subjects living in a specific geographical area in a given time period.

As explained in sec. 3.1  $tlc_e/tlc_{ne}$  is a function of the unknown parameters  $\psi$  and  $\theta$  and of the observable variable  $rlc_{it}$ . Let  $g(rlc_{it}, \psi, \theta)$  be this function which as a result of (8) and (9) is linear with respect to  $rlc_{it}$ . Inserting it as an explanatory variable in (10) yields:

$$y_{it}^* = \alpha_1 g(rlc_{it}, \psi, \theta) + u_i + \varepsilon_{it} \quad (11)$$

where  $\alpha_1$  is the marginal effect of  $tlc_e/tlc_{ne}$  we are looking for whose expected sign is negative.

We modify this model:

1. to identify the lasting effects of the programme
2. to identify substitution effects

As for the *lasting effects* of the programme, following Bell, Blundell and Van Reenen (1999), we design the analysis to identify the programme impact on the eligibles during their eligibility period as well as the lasting effect of the programme led by the role played by work experience.

By including among the explanatory variable the work experience  $exp_{it} = \sum_{j=t_0}^{t-1} y_{ij}$  - namely, the number of years at work before period  $t$  - we can test whether the possibly longer work experience got by the youths *during* their eligibility period as an impact of the CFL programme yields higher chance to work *after* the eligibility period. If it were not the case, then it is not clear whether the programme is worthwhile even in the presence of an impact during the eligibility period.

By including work experience, model (11) becomes:

$$y_{it}^* = \alpha_1 g(rlc_{it}, \psi, \theta) + \alpha_2 exp_{it} + u_i + \varepsilon_{it}. \quad (12)$$

Note that being affected by the entire previous history of the disturbance  $\varepsilon_{is}$ ,  $s < t$ ,  $exp_{it}$  is predetermined in the model which we need to account for in the estimation of the parameters.

To identify the parameter associated to the experience we need to take into account that during the age window in which individuals are eligible for CFL they might get post-compulsory education. To keep things easy let the schooling choice takes place the following way.  $t0_i$  is the time period in which the  $i$ -th unit completes compulsory schooling and chooses about further schooling. Let  $E_i$  be the chosen years of further schooling which we assume is not revised after  $t0_i$ . Then, from  $t0_i$  to  $t0_i + E_i$  the  $i$ -th individual is (mainly) studying (with possible minor employment spells). From  $t0_i + E_i + 1$  onward the individual participates in the labour market<sup>8</sup>.

We model this process by including a dummy  $S_{it}$  equal to 1 if the  $i$ -th subject is still attending school at time  $t$  and equal to 0 otherwise. Moreover, to control for the level of education of people participating at work we include the variable  $(1 - S_{it}) E_i$  where  $E_i$  is the final level of formal education attained by the  $i$ -th subject. The overall model becomes:

$$y_{it}^* = \alpha_1 g(rlc_{it}, \psi, \theta) + \alpha_2 exp_{it} + \alpha_4 S_{it} + \alpha_5 (1 - S_{it}) E_i + u_i + \varepsilon_{it}. \quad (13)$$

with an expected negative and positive sign, respectively, for  $\alpha_4$  and  $\alpha_5$ . Given the way we are assuming subjects choose their level of formal education both  $S_{it}$  and  $E_i$  might be correlated to  $u_i$  but they are uncorrelated with  $\varepsilon_{it}$ . Also, since they are very likely to be correlated to  $exp_{it}$  omitting them would result in an inconsistent estimate of  $\alpha_2$ .

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<sup>8</sup> Potentially, there might be an impact of the programme on the schooling choices in that due to the availability of better occupational chances there might be subjects revising their schooling plans and leaving school to enter the labour market. We do not deal with this further problem here and leave it for future research.

As for the *substitution effects* of the programme, consider an eligible worker born in the calendar year  $c$ . As s/he completes the eligibility period s/he becomes at risk of being substituted out by the workers born in the calendar year  $c+1$  which are still eligible for CFL. This is because presumably the composition of the cohort  $c$  with respect to all the characteristics relevant for being hired is very close to the corresponding composition of the cohort  $c+1$  except for how much they cost to a potential employer: hiring a worker from the still eligible cohort  $c+1$  is cheaper than hiring one from the no longer eligible cohort  $c$ .

To account for this potential substitution effect we interact the ratio  $tlc_e/tlc_{ne}$  with a dummy variable,  $I_{it}$ , indexing whether the  $i$ -th subject at time  $t$  is eligible for CFL. Model (12) becomes:

$$y_{it}^* = \alpha_1 g(rlc_{it}, \psi, \theta) I_{it} + \alpha_2 exp_{it} + \alpha_3 g(rlc_{it}, \psi, \theta) (1 - I_{it}) + \alpha_4 S_{it} + \alpha_5 (1 - S_{it}) E_i + u_i + \varepsilon_{it} \quad (14)$$

with a positive expected sign for  $\alpha_3$ .

Note that the substitution effect we are dealing with is a peculiar one. In the common usage of the word, a programme is said to have a substitution effect when the intended effect on the eligible subjects comes at the price of hurting subjects which are not eligible for the programme itself. In the CFL case more rigorously we should say that the programme impact on subject  $i$  is two-fold. As the subject enters the labour market s/he benefits from the programme because of the higher chance to be hired during the eligibility period. As the subject gets out of eligibility s/he is hurt by the very same programme s/he got benefits from because there are other subjects around still eligible for CFL. The overall impact depends on the relative size of the two parameters  $\alpha_1$  and  $\alpha_3$ .

#### 4. Inference

Preliminarily, a major problem we need to solve is that information on education and school attendance is not available in the Social Security archive we draw our data from. As a result we miss both  $S_{it}$  and  $E_i$ .

The solution to the problem rests on grouping subjects according to their year of birth and to the geographical area they live in. The aggregated counterpart of equation (14) is as follows:

$$y_{(c)t} = \alpha_1 g(rlc_{(c)t}, \psi, \theta) I_{(c)t} + \alpha_2 exp_{(c)t} + \alpha_3 g(rlc_{(c)t}, \psi, \theta) (1 - I_{(c)t}) + \alpha_4 S_{(c)t} + \alpha_5 [(1 - S) E]_{(c)t} + u_{(c)} + \varepsilon_{(c)t}. \quad (15)$$

where  $y_{(c)t}$  is the number of subjects belonging to the cohort  $c$  at work at time  $t$ ;  $I_{(c)t}$  is a dummy variable defined the same way as  $I_{it}$ ;  $exp_{(c)t}$  is the total number of years at work at the beginning of time  $t$  for the subjects belonging to the cohort  $c$ ;  $S_{(c)t}$  is the number of subjects still at school and  $[(1 - S) E]_{(c)t}$  is the aggregate level of education for those who have already completed their schooling.

Note that the aggregation leaves unmodified the variable  $rlc_{it}$  since it is common to all subjects living in a specific geographical area (we rewrite it as  $rlc_{(c)t}$  for convenience).

Also, note that there is an abuse of notation in (15) since because of the non linearity of the micro model (14) the parameters in (15) cannot be equal to those in (14). To avoid introducing a new set of symbols we go on with the old ones.

The missing data problem disappears at the cohort level since both  $S_{(c)t}$  and  $[(1 - S) E]_{(c)t}$  can be recovered from other data sources.

There is an apparent analogy between what we do with our data and the literature on pseudo-panel modelling (see Deaton, 1985, and Verbeek, 1996). In fact, in both cases the analysis is eventually based on data aggregated by cohort. The difference between our case and the standard pseudo-panel problem is that in the latter truly longitudinal data are not available and the longitudinal dimension is recovered by resorting to a time series of cross-sectional data while in the

former the raw data are truly longitudinal and the aggregation by cohort is introduced only to solve a missing-regressor problem.

As one switches from the micro model (14) to its aggregated counterpart (15) the unobserved heterogeneity is integrated out so that one might wonder why leaving the cohort-specific time-invariant component  $u_{(c)}$  in the model. The main reason to leave it is that the size of the year-of-birth cohorts we are considering is rather heterogeneous increasing over time up to the year-of-birth 1965 and then sharply decreasing. As a consequence, members of the cohorts born around the mid-60's might find *coeteris paribus* more difficult than members of the older and younger cohorts to find a job when they enter the labour market because of the number of peers they have to compete with. Since the size of the cohorts - which *prima facie* approximates the number of peers competing for a given stock of available jobs - is time invariant it is suitably accounted for by a cohort-specific time-invariant component.

A further problem with model (15) is that due to the time window our data refer to - 1986 to 1996 - the work experience is not observable for the cohorts entering the labour market before 1986. To avoid losing all the observations on the older cohorts - which are exactly those cohorts allowing us to identify possible substitution effects - we work with the first-differenced model:

$$\Delta y_{(c)t} = \alpha_1 \Delta g(\text{rlc}_{(c)b}, \psi, \theta) I_{(c)t} + \alpha_2 y_{(c)t-1} + \alpha_3 \Delta g(\text{rlc}_{(c)b}, \psi, \theta) (1 - I_{(c)t}) + \alpha_4 \Delta S_{(c)t} + \alpha_5 \Delta [(1 - S) E]_{(c)t} + \Delta \varepsilon_{(c)t}. \quad (16)$$

exploiting the identity  $\Delta \exp_{(c)t} = y_{(c)t-1}$ . This way we only lose one degree of freedom for each cohort. In this equation the dependent variable is the yearly variation of the stock of employees belonging to the  $c$ -th cohort.

Note that differencing as in (16) also sweeps the unobserved heterogeneity  $u_{(c)}$  away but as a result the explanatory variable  $y_{(c)t-1}$  turns out correlated to the disturbance  $(\varepsilon_{(c)t} - \varepsilon_{(c)t-1})$ . To solve the endogeneity problem we use  $y_{(c)t-2}$  as an IV for  $y_{(c)t-1}$ .

## 5. Empirical results

### 5.1. Data

The estimates we obtain exploit a 1:90 random sample from the Social Security files over the time window 1986-1996. The reference population of the SS archive is slightly reduced with respect to the programme one since it does not include agriculture and civil service employees (ISTAT codes 0 and 911, respectively). Unfortunately, due to the unreliability of the information from the archive previous than 1986 it is not possible to exploit in the analysis the 1985 break introduced by the CFL programme.

The dependent variable at the micro level is  $y_{it}=1$  if the  $i$ -th subject is at work during May of year  $t$  and  $y_{it}=0$  otherwise. We chose May since it is a 'normal' month with respect to the pattern of seasonality.

Aggregation by year-of-birth and geographical area (Centre-North and South) cohorts took place the way we explained in section 4. The cohorts we include were born over the time window 1958-1977 (see tab. 3). We track them over the age window 19-34. The lower age limit has been set at 19 because there is nearly no CFL hiring below this age (most people younger than 19 are hired on an apprenticeship contract). On the other hand the upper age limit has been set at 34 to have some evidence on the post-eligibility work history of youths.

Note that the time window over which we could obtain data is such that only few cohorts (year of births 1958 to 1963) are observed after their eligibility period.

Finally, note that as a result of the time window and of the age window we set the number of available observations varies across cohorts (total number of observations is 310).

**Tab. 3. Cohorts included in the analysis**

Year of birth	Calendar years of observation	Age window of observation	Calendar years in which the cohort is eligible for CFL
1958	1986-1992	28-34	1986-1987
1959	1986-1993	27-34	1986-1988
1960	1986-1994	26-34	1986-1989
1961	1986-1995	25-34	1986-1990
1962	1986-1996	24-34	1986-1991, 1994
1963	1986-1996	23-33	1986-1991, 1993-1994
1964	1986-1996	22-32	1986-1996
1965	1986-1996	21-31	1986-1996
1966	1986-1996	20-30	1986-1996
1967	1986-1996	19-29	1986-1996
1968	1987-1996	19-28	1987-1996
1969	1988-1996	19-27	1988-1996
1970	1989-1996	19-26	1989-1996
1971	1990-1996	19-25	1990-1996
1972	1991-1996	19-24	1991-1996
1973	1992-1996	19-23	1992-1996
1974	1993-1996	19-22	1993-1996
1975	1994-1996	19-21	1994-1996
1976	1995-1996	19-20	1995-1996
1977	1996-1996	19-19	1996-1996

### 5.3. Estimation

The model we estimate is a simplified version of (16). The simplification we introduce is to overcome the lack of precision in the estimation of the structural parameters  $\alpha_1$ ,  $\alpha_3$ ,  $\psi$  and  $\theta$  we found in some preliminary estimation exercise.

We did some experimentation setting  $\psi$  and  $\theta$  to alternative likely values and found that at the selected values and as a result of its actual variability over time and across areas  $tlc_{\theta}/tlc_{ne} = g(rlc_{(c)b}, \psi, \theta)$  displays a fairly large positive correlation to  $rlc_{(c)t}$ . Table 3 reports a sample of our results. Otherwise stated,  $rlc_{(c)t}$  is a fairly good proxy for  $tlc_{\theta}/tlc_{ne}$ .

**Tab. 3. Correlation between  $rlc$  and  $tlc_{\theta}/tlc_{ne}$  at selected values for  $\theta$  and  $\psi$  (values of  $q$  implied by  $\theta$  are reported; see equations (3.1)-(3.2), (6)-(9))**

$\psi$	$\theta$	<b>.05</b>	<b>.1</b>	<b>.2</b>
	$q$	<b>.11</b>	<b>.22</b>	<b>.5</b>
<b>.5</b>		.76	.69	.58
<b>.7</b>		.79	.76	.69
<b>.9</b>		.80	.79	.76

Then, instead of dealing with equation (16) we use the much simpler model:

$$\Delta y_{(c)t} = \alpha_1^* \Delta rlc_{(c)t} I_{(c)t} + \alpha_2 y_{(c)t-1} + \alpha_3^* \Delta rlc_{(c)t} (1 - I_{(c)t}) + \alpha_4 \Delta S_{(c)t} + \alpha_5 \Delta [(1 - S) E]_{(c)t} + \Delta \varepsilon_{(c)t}. \quad (17)$$

where  $\alpha_1^*$  and  $\alpha_3^*$  measure the combined marginal effect of the rebate on the SS fee and of introducing/withdrawing a firing costs component into the programme. Otherwise stated, we do not identify the separate marginal impacts of reducing the SS fee and of reducing the firing costs. Instead, we identify an overall marginal programme impact.

Finally, the results presented here do not exploit information on schooling attendance nor on education from the auxiliary data source. The approximate solution we propose also exploits the aggregation by cohort.

### Specification 1

We approximate  $\alpha_4 \Delta S_{(c)t} + \alpha_5 \Delta [(1 - S) E]_{(c)t}$  in (17) by a polynomial in the cohort age. After some experimentation we chose a second degree polynomial.

In this specification we account for the business cycle by including the *GDP* yearly growth rate,  $(GDP - GDP_{-1})/GDP_{-1}$ , separately evaluated for the Centre-North and the South.

Tab. 4 reports the result of the IV estimation of equation (17) using  $y_{(c),t-2}$  as the instrument for  $y_{(c),t-1}$ . The estimation procedure properly accounts for the non invertible MA(1) structure of the disturbance.

The main result emerging is that the programme does not have any impact on the youths chance to obtain a job during the eligibility period. The estimated marginal effect is both very small in absolute value<sup>9</sup> and statistically zero. Consistently, it does not hurt them as they get out of eligibility. Work experience turns out statistically significant: an additional year at work in the past implies a three percentage points higher probability to be at work.

**Tab. 4. IV estimates of Specification 1 (accounting for the *non invertible* MA(1) disturbance).**

	Estimate	t-stat.
Intercept	3628.6	14.4
Age	-249.0	-13.2
Age <sup>2</sup>	4.167	12.1
rlc <sub>ct</sub> I <sub>ct</sub>	-194.6	1.07
rlc <sub>ct</sub> (1-I <sub>ct</sub> )	-198.9	1.08
Exp <sub>ct</sub>	.02960	7.17
GDP	641.5	1.36

### Specification 2

In the second specification instead of approximating the missing variables by a polynomial we get rid of them by taking the *across-cohorts* first difference  $\Delta y_{(c)t} - \Delta y_{(c-1)t-1}$ . The rationale of this differencing is that adjacent cohorts are presumably alike with respect to their schooling decision. As a consequence  $\Delta S_{(c)t} = \Delta S_{(c-1)t-1}$  and  $\Delta [(1 - S) E]_{(c)t} = \Delta [(1 - S) E]_{(c-1)t-1}$ . In words, by comparing two adjacent cohorts at the same age we expect to observe the same proportion of

<sup>9</sup> The reported figure means that a ten percentage points reduction of the relative labour cost yields an increase of the number of employees in a specific cohort as large as 1.746 (19.4 times 90, the sampling rate). Since the cohorts size is approximately 300.000 in the South and 500.000 in the Centre-North the marginal effect we estimate is apparently negligible.

subjects still attending school as well as the same mean level of education for subjects who already completed their schooling.

By applying this differencing to model (17) we get:

$$\Delta y_{(c)t} - \Delta y_{(c-1)t-1} = \alpha_1^* (\Delta rlc_{(c)t} I_{(c)t} - \Delta rlc_{(c-1)t-1} I_{(c-1)t-1}) + \alpha_2 (y_{(c)t-1} - y_{(c-1)t-2}) + \alpha_3^* (\Delta rlc_{(c)t} (I - I_{(c)t}) - \Delta rlc_{(c-1)t-1} (I - I_{(c-1)t-1})) + (\Delta \varepsilon_{(c)t} - \Delta \varepsilon_{(c-1)t-1}). \quad (18)$$

Finally, note that double-differencing as in (18) also sweeps out the business cycle provided it evolves over time along a quadratic local polynomial. Which allows us to avoid including the *GDP* yearly growth rate in the regression.

Tab. 5 reports the result of the IV estimation of model (18) using  $(y_{(c),t-2} - y_{(c-1),t-3})$  as the instrument for  $(y_{(c),t-1} - y_{(c-1),t-2})$ . The estimation procedure properly accounts for the autocorrelation structure of the disturbance resulting from the double-differencing.

Results are very much the same as in tab. 4. No programme impact emerges while the effect of work experience turns out statistically significant albeit somewhat larger than in the previous specification.

**Tab. 5. IV estimates of Specification 2 (accounting for the autocorrelation structure of the disturbance)**

	Estimate	t-stat.
Intercept	-9.316	-9.27
Reb <sub>ct</sub> I <sub>ct</sub>	-118.4	1.24
Reb <sub>ct</sub> (1-I <sub>ct</sub> )	-87.30	.90
Exp <sub>ct</sub>	.03855	3.98

## 6. Final remarks

The CFL programme has been introduced in 1985 to improve the youths occupational chances. It provides the employers some incentive to recruit young workers by reducing both the labour and the firing costs relative to those they would bear by recruiting older workers.

Following the literature, we argue that the expected impact of the programme is two-fold: it should increase the eligibles chance to work *during* the eligibility period thanks to the reduction in the labour and firing costs as well as their chance to work *after* the eligibility period thanks to the longer work experience obtained during the eligibility period.

There is also some room for a substitution effect since as subjects get out of eligibility employers might find convenient to replace them by younger still eligible workers.

To measure the impact of the programme we exploit the variation over time and across geographical areas of the labour and firing costs for an eligible worker relative to a non eligible one induced by several reforms of the programme as well as its interaction with other incentive schemes.

In fact, our main result is that during the eligibility period youths chance to work does not react to variation of the relative labour and firing costs. Consistently, no substitution effect emerges. We identify a positive statistically significant effect of work experience which in the presence of an impact during the eligibility period would yield also an impact on the long-run work history of formerly eligible subjects.

## References

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