The return to recognition of prior learning:  
An analysis of the Portuguese case

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Abstract
In the first decade of this century subsequent Portuguese governments promoted two large programmes (S@ber+, 2001-2005, and Novas Oportunidades, 2006-2010) aimed at improving the educational qualifications of the adult population by means of an extended network of centres in charge of apprising prior and experiential learning. Based on the Quadros de Pessoal survey this paper assesses the wage return to the recognition of prior learning promoted by the S@ber+ and Novas Oportunidades programmes by means of DID-PSM estimates. The outcomes of the empirical analysis outline mostly significant wage effects from participation in recognition of prior learning. However, the path undertaken to improve individual qualification matters. Participants in recognition of prior learning under the S@ber+ initiative suffered on average a significant wage penalty compared to participants in formal adult education, whereas differentials became mostly non-significant under the Novas Oportunidades programme.

Keywords
Adult learning; Recognition of prior learning; Wages; DID-PSM; Quadros de Pessoal

1. Introduction
An educated labour force is increasingly perceived as a crucial resource to support knowledge-intensive and technology-intensive economic growth in industrialised countries. The growing importance attached to individual skills and competences goes along with the emphasis on continuous enlargement and deepening of the capabilities needed to meet the evolution of workplace requirements. The switch from a clear-cut separation between education and working life to an overlapping of educational and training experiences centred on the concept of lifelong learning (CEC, 2000) involves noteworthy consequences. First, formal education becomes one opportunity in a range
of multiple learning sources that also include non-formal learning and informal learning\(^1\). Second, adult education (including both formal, non-formal, and informal learning) turns into a viable an effective means to improve the skills and competences of individuals also after early schooling years (Colardyn and Bjornalvold, 2004).

Given the wider share of adult education opportunities that occur in the form of non-formal and informal learning compared to formal learning governments and institutions have been devoting increasing efforts to provide visibility to these types of learning by means of recognition, assessment, and validation processes (CEC, 2000; European Commission, 2015). Recognition of prior learning, also labelled as prior informal learning or experiential learning record, results in the accreditation of new formal qualifications that certify the accumulation of additional human capital by means of non-formal and informal learning processes (Becker, 1964) and can be conveniently signalled in the labour market (Spence, 1973).

Adult education is expected to involve significant individual and collective benefits by reducing social inequality among citizens due to lack of educational opportunities or success in youth and early adulthood, as well as by supporting the competitiveness of knowledge-based economic systems (CEC, 2000; Singh, 2005; Hällsten, 2012; European Commission, 2015). However, existing evidence is still scarce and sometimes contradictory. Formal adult education displays a positive impact on employment rates (Hällsten, 2012), on the likelihood of being in non-precarious employment, conditional on the flexibility of local labour markets (Vono de Vilhena et al., 2016), and on the probability of undertaking additional lifelong learning (Jenkins et al., 2003). When it comes to earnings, Jenkins et al. (2003) show no significant returns to late investments in formal education, whereas Hällsten (2012) reports significant but small returns and Blanden et al. (2012) find significant advantages for women only. In addition, based on Swedish data Stenberg (2011) questions the profitability of adult education targeted at primary and secondary qualifications by showing that private returns barely cover private and social costs. Evidence is even less clear in the case of returns to prior learning. With the notable exception of Lima (2012), studies that explore the benefits of the assessment of prior learning provide qualitative evidence based on case studies that does not allow for generalisation of results (Peruniak and Powell, 2007; Lima and Guimarães, 2016).

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\(^1\) Formal learning, which typically targets the achievement of a new educational or professional qualification, results from a set of structured and planned activities explicitly aimed at learning. Non-formal learning occurs within planned activities that allow for intentional learning by participants despite not being explicitly designed for education or training purposes. Informal learning, or experiential learning, results from all types of daily activities and is not driven by learner’s intentionality (Colardyn and Bjornalvold, 2004).
The Portuguese case provides a unique opportunity for a new assessment of the wage effects of recognition of prior learning. The interest of the Portuguese case descends from at least two peculiarities. First, between 2000 and 2010 subsequent Portuguese governments supported a range of initiatives aimed at improving the educational qualification of the labour force in Portugal up to secondary education by means of formal adult learning, validation and certification of individual competences, and accomplishment of education curricula interrupted by younger adults. Second, the longitudinal archive Quadros de Pessoal (QdP) collects on yearly bases data on virtually all employees and their employers in the private sector in Portugal. Since provided information includes employees’ qualifications QdP allows tracking the evolution of individual educational qualifications in connection with labour market outcomes.

Based on propensity score matching with difference-in-differences estimates (DID-PSM) on QdP linked employer-employee data between 1996 and 2010 this paper looks for systematic differences in earnings increase between employees who upgraded their educational qualification up to secondary education thanks to recognition of prior learning and a control group of employees who followed traditional paths of formal adult education. The effectiveness of the efforts enacted by Portuguese governments after 2000 is tested by comparing participants in prior learning recognition and participants in formal adult education in three distinct periods: 1) a reference period before the launch of the adult education initiative (1996-2000); 2) the first phase of the adult education program, named S@ber+ (2001-2005); and 3) the second phase of the adult education initiative, named Novas Oportunidades (2006-2010). Thanks to focus on lower education levels the proposed analysis fills up a gap in the literature on the economic returns to adult education, which focuses on mature graduates from tertiary education.

The empirical analysis developed in this paper shows that government initiatives consistently rose participation in programs to upgrade educational titles in absolute terms and, even if to a lesser extent, also in the share of participants among all employees with the same initial education. DID-PSM estimates outline mostly significant wage effects from participation in recognition of prior learning. However, the path undertaken to improve individual qualification matters. Participants in recognition of prior learning under the S@ber+ initiative suffered on average a significant wage penalty compared to participants in formal adult education, whereas

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2 See, e.g., Jepsen and Montgomery 2012 for the US; Hällsten 2012 for Sweden; Kilpi-Jakonen et al., 2012 for a comparison between the UK, Spain, Sweden, and Russia. For an exception focused on primary and secondary education, see Jenkins et al. (2003).
differentials became mostly non-significant under the Novas Oportunidades programme.

The rest of the paper is organised as follows. The next section presents the Portuguese initiatives in support of adult education and recognition of prior learning and discusses the available evidence on their outcomes. Section 3 provides information on Quadros de Pessoal, the dataset used in the empirical analysis, and describes the evolution of educational qualifications in the Portuguese labour market between 1996 and 2012. Section 4 details the empirical strategy to assess earnings increase for participants in recognition of prior learning, whose results are presented in section 5. The final section discusses the paper outcomes and outlines some concluding remarks.

2. Recognition of prior learning: The Portuguese experience

Recent research suggests that the evolution of the Portuguese public policies in support of adult education mirrors the parallel developments in the approach towards lifelong learning in Western countries in general and in EU countries in particular (Fragoso and Guimaraães, 2010; Guimaraães, 2012; Lima and Guimaraães, 2016). UNESCO first developed the concept of lifelong learning in the 1970s as a tool in support of democracy. Adult education and lifelong learning were meant to complement inclusive educational systems in promoting a social, political, and civic emancipation based on adult participation and rooted in problems and needs directly experienced by learners. However, the diffusion of neoliberalism and globalisation progressively switched the perception of lifelong learning from a means of social inclusion to a means in support of economic sustainability. By increasing the flexibility of citizens and workers adult education and lifelong learning could reinforce economic growth and improve the probability of individual survival in a mutable and increasingly competitive labour market. This change in the perception of lifelong learning involved a shift from a collective to a private focus also in the role played by adult education actors. On the one hand learners had to take the risk of designing their own educational and training trajectory, which may not fit with market demand. On the other hand, private profit-seeking partners could complement public organisations in providing and assessing educational contents. The interplay between market-driven demand for skills and participation of both public and private actors in the provision of adult education services involved significant consequences also for the organisation of recognition, assessment, and validation of prior learning. A growing emphasis on the efficiency of prior learning recognition processes progressively shifted the attention from learning processes to certification processes, with an increasing emphasis on standards, routines, and performance indicators. For instance, CEC (2000) reported that “The rising demand
for qualified labour by employers and increased competition between individuals to gain and keep employment is leading to much higher demand for recognised learning than ever before” (p. 15). The adoption of proper benchmarks and indicators was consequently regarded as necessary to develop high quality systems for the accreditation of prior and experiential learning.

The above described shift from an emancipation-oriented to a market-oriented approach to lifelong learning and adult education clearly reflects in the evolution of adult education policies in Portugal after the 1974 revolution (Guimaraës, 2012; Lima and Guimaraës, 2016), when the new democracy had to face an illiteracy rate among adult population that still rounded 25%. If the early years were marked by bottom-up adult education policies focused on social and political emancipation, entry in the former European Community (EC) in 1986 soon turned the attention to the opportunity of leveraging on adult education to promote the modernisation of the country. The consequent emphasis on formal education programs was strongly encouraged by EC-funded adult education initiatives.

High dependence on EU funds also justifies compliance with the further evolution of adult education policies centred on market-driven lifelong learning adopted by the EU at the turn of the century (CEC, 2000; European Commission, 2015). It is within this framework that in 1999 the Portuguese government launched the “Projeto de Sociedade S@ber+” (Know+ Project) in support of adult education and established a new public agency, ANEFA (National Agency for Adult Education and Training), to coordinate and implement a new set of adult education policy programmes revolving around two main tools3. These included a network of national centres for the recognition, validation, and certification of competences (RVCC centres) and the promotion of formal education initiatives for individuals at risk of social exclusion, the EFA courses (Adult Education and Training courses). Recognition of prior learning, targeted at individuals over the age of 18, focused on basic education levels and the corresponding qualifications (either four, six, or nine years of formal education) and possibly included up to 25 hours of further education for applicants who displayed significant gaps in any of the four key competence areas considered in the assessment process (Citizenship and employability, Information and communication technologies, Language and communication, and Maths for life). After the opening of the first six centres in 2001 the network of RVCC centres rapidly expanded, despite the suppression of ANEFA in 2002, substituted by a General Directorate of Vocational Training. By the

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end of 2005 the number of RVCC centres amounted to 98. This fast enlargement leveraged on the integration of certification competences by already existing civil society organisations focused on adult education and social intervention.

At the end of 2005 a political change brought in a revival of adult education initiatives with the launch of a new, more ambitious programme called “Novas Oportunidades” (New Opportunities), which also involved the creation of a new agency in charge of qualification processes (Agência Nacional para a Qualificação, ANQ). The New Opportunities initiative focused on the certification of competences corresponding to both basic and secondary education (up to the 12th grade of Portuguese curricula) as well as on encouraging young school leavers to complete interrupted education programmes. Certification of prior learning processes could include up to 50 hours of formal education to fill up gaps in key competence areas, with possible direction to formal programs of adult education for applicants displaying more severe gaps. The network of the national centres called to manage adult education and recognition of prior learning further grew from 270 units in 2006 to 454 in 2010, thanks to collaboration with regular secondary schools. In addition, a media campaign was launched to raise citizens’ awareness about new education and certification opportunities.

The large efforts devoted to adult education by programs S@ber+ and Novas Oportunidades produced significant involvement by citizens. Between 2001 and 2005 153,719 people enrolled in a certification or education programme at a RVCC centre and 44,192 new certifications occurred. In the following five years, between 2006 and 2010, the same figures multiplied to 934,597 and 328,263, respectively. In addition, 15,305 candidates obtained a certification after completing an EFA course between 2001 and 2005 and 45,452 additional certifications were released between 2006 and 2010 (ANQ, 2010). Overall, over one million of people enrolled in a qualification program between 2006 and 2010 and over 400,000 participants obtained a new educational qualification in a population that in the same period counted slightly more than 7 million residents in the 18-64 age group.

Nevertheless, despite the incontrovertible numerical success, judgement of the program outcomes is still controversial. Most empirical analyses agree that participation in S@ber+ and Novas Oportunidades involved more than a mere certification process and led to significant skills improvement, especially in the areas of literacy, ICT use, A new political change and the severe economic crisis undergone by Portugal in 2011 reduced the resources available for the Novas Oportunidades initiative after 2010. Novas Oportunidades Centres definitively closed at the end of March 2013, substituted by new Centres for Qualification and Vocational Training. In Spring 2016 the Portuguese government announced the launch of a new program targeted at adult education and training.
“learning to learn” skills and soft skills (Valente et al., 2009). Participation in a self-assessment process increased applicants’ self-esteem and self-confidence and fuelled their motivation to join in further education and training activities (Valente et al., 2009; CEPCEP, 2010; Lima and Guimaraës, 2016). In addition, higher educational certifications allowed participants to join vocational training opportunities previously forbidden due to insufficient formal qualifications and significantly rose unemployed participants’ hope in better future work opportunities by increasing their employability awareness (Lima and Guimaraës, 2016). However, despite 32% of participants in a sample of certified individuals reported a positive impact of enrolment in the Novas Oportunidades initiative on their working life (CEPCEP, 2010), these benefits remained mainly restricted to the personal sphere and involved limited improvement in the professional situation of participants. Participants reported no substantial change in their professional status due to the acquisition of a new qualification, whereas employers of newly certified workers related at most limited improvement in their employees’ performance (Valente et al., 2009; Lima and Guimaraës, 2016).

Based on double-robust estimators Lima (2012) develops a quantitative analysis of the impact of the Novas Oportunidades initiative on the probability to be in employment and on the returns to improved qualifications. This study depicts substantially negative outcomes for participation in recognition of prior learning. According to Lima (2012), a higher qualification improves the probability to switch from unemployment to employment only in the case of vocational qualifications or when formal educational qualifications are accompanied by vocational training. In addition, the estimate of the economic return to recognition of prior learning shows non-significant change or even a small penalisation of wage for participants who received a new qualification thanks to recognition of prior learning compared to non-participants. However, it has to be underlined that these estimates suffer from lack of information on the initial educational qualification of both participants and non-participants, which originates at least three problems. First, missing information on initial education levels does not allow to discriminate between the labour market outcomes of participants who achieved the same certificate starting from different qualifications, hence different educational and experiential paths. Second, the labour market outcomes of participants are gauged against the average outcomes on non-participants irrespective of the educational achievements of the latter. Since non-participants comprise individuals in active population within the full range of educational qualifications, including higher diplomas, comparison with the achievers of lower and middle educational certificates risks to bias downwards the outcomes registered for the latter. Third, estimated differentials miss a clear benchmark because controls include both individuals who did
not change their qualification in the observed period and upgraders who achieved a new education title by following a traditional formal adult education path. Accordingly, despite the interesting insights provided by the analysis, the outcomes proposed by Lima (2012) suggest that better-grounded evidence could be achieved by means of a clearer identification of treated and control groups.

3. Data
An opportunity to assess the return to investment in recognition of prior learning in Portugal is provided by Quadros de Pessoal (QdP), a longitudinal dataset that includes the population of Portuguese firms with at least one wage earner and their employees in private sectors. Thanks to unique employer and employee codes, QdP allows employer and employee information to be matched and employees’ careers to be followed across subsequent employers. Data are collected annually by the Portuguese Ministry of Employment in the month of October (Cardoso and Portela, 2009) and participation is compulsory for manufacturing and services firms, whereas participation by employers in the primary sector is optional. Compared to other administrative datasets QdP offers the important advantage of reporting employees’ educational qualification, besides standard information on employees, their occupation, and their employers. QdP therefore allows assessing the evolution of educational qualifications and educational upgrades in private sector working population in Portugal.

Give the focus of the S@ber+ and the Novas Oportunidades initiatives the empirical analysis accounts for upgrades to basic education titles (including the 4th grade, the 6th grade, and the 9th grade certificates) and to secondary education certificates (corresponding to 12 years of formal education). Figure 1 reports the absolute number of educational upgrades by year and by initial level of education for employees registered in QdP in two subsequent years between 1996 and 2010, whereas Figure 2 reports the share of educational upgrades in the same period.

(Figure 1 about here)

(Figure 2 about here)

Data in Figure 1 display a positive trend of participation in formal adult education between 1996 and 2010. A non-negligible average of 66,000 educational upgrades per year already took place in Portugal between 1996 and 2000. The launch of both

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5 Information on educational upgrades between 2000 and 2001 and between 2001 and 2002 is missing because the QdP survey was not run in 2001.
S@ber+, in 2001, and Novas Oportunidades, in 2006, generated an upsurge in new qualifications for adults in employment, which nevertheless tended to fade away in the following years. An estimate of the quantitative impact of the two programmes on educational upgrades among employed adults is possible bearing in mind the number of total certificates released within the two programmes reported in the above section and considering that both ANQ (2010) and Lima and Guimaraes (2016) estimate at about 67% the employment rate among participants in the Novas Oportunidades initiative. A comparison between the estimated number of education certificates released to employed participants and the total number of educational upgrades registered by QdP in the same years suggests that S@ber+ accounts for 16% of basic educational qualifications between 2001 and 2005, whereas participation in Novas Oportunidades explains a sizable 50% of overall upgrades in basic and secondary education between 2006 and 2010.

While the adult education initiatives pursued by Portuguese governments managed to increase absolute participation in formal adult education and recognition of prior learning, they had a much more limited impact on the share of education upgraders on total workforce, non-qualified employees achieving a 4th grade certificate excepted (Figure 2). Nevertheless, it has to be noticed that in all the examined periods the share of upgraders to primary and secondary education per year rounds a sizable 5% of total workforce, the same level calculated by Blanden et al. (2012) for the UK.

4. Empirical strategy

Thanks to the availability of information on employees’ educational qualification and to the longitudinal nature of data QdP allows measuring the increase in earnings due to participation in a specific support initiative, such as a programme to encourage the upgrade of educational qualification, compared to a suitable control group of non-participants. In a standard difference-in-differences (DID) setting the relationship between participation in a treatment, denoted by an indicator $d_i$ that takes value one for involved individuals and zero otherwise, and an outcome variable of interest $y_{it}$, measured before and after possible participation in treatment, is usually described by the following relationship:

$$ y_{it} = \beta + \alpha_id_itt + u_{it} = \beta + \alpha_id_itt + n_t + m_t $$

(1)

where $t$ is a time indicator that takes values zero and one in pre-treatment and post-treatment observation periods, respectively, whereas $\alpha_i$ is the impact of the treatment on treated individuals. Under the hypothesis that selection on unobservables does not

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6 However, non-qualified employees represent a minor share of the Portuguese workforce in the private sector, which steadily declined from 3.1% in 1995 to 0.7% in 2012.
depend on transitory individual-specific effects\(^7\) the error term \(u_{it}\) can be rewritten as the sum of an unobservable individual-fixed effect \(n_i\) and an aggregate time-dependent macro-shock \(m_t\). Conditional on \(d_i\) and \(t\), the expected outcome \(y_{it}\) can be written as

\[
E[y_{it}|d_i, t] = (\beta + E[\alpha_i|d_i = 1] + E[n_i|d_i = 1] + (m_t|t = 1) \text{ if } d_i=1 \text{ and } t=1)
\] (2)

and the average value of the treatment effect for treated individuals (the so-called average treatment on the treated, ATT) can be calculated by double differentiating the outcome variable of interest across treated and untreated individuals and across time, thus sterilising the effect of non-time variant unobservables and time trends unrelated with the treatment (Blundell and Costa Dias, 2009):

\[
E[\alpha_i|d_i = 1, t = 1] = \hat{\alpha}^{DID} = [E(y_{it}|d_i = 1, t = 1) - E(y_{it}|d_i = 1, t = 0)] + [E(y_{it}|d_i = 0, t = 1) - E(y_{it}|d_i = 0, t = 0)]
\] (3)

Unfortunately, a standard DID approach is not suitable to appraise the return to participation in recognition of prior learning, because QdP provides no information on the origin of educational upgrades, which also in the years covered by the S@aber\(^+\) and the Novas Oportunidades initiatives could result from traditional formal adult education as well as from participation in prior learning appraisal programmes. A possible solution to identify the impact of the examined programmes on participants’ earnings is provided by Blundell and Costa Dias (2009), who focus on education upgraders and exploit variation in supportive policies across different time windows\(^8\). Treatment \(z\) is thus identified by participation in adult education in a period when a support policy is enforced and a relevant outcome variable \(y_{it}\) is observed before (\(t=0\)) and after (\(t=1\)) change in educational qualification for all upgraders, both in the treatment period (\(z=1\)) and in the baseline period when no incentives are available (\(z=0\)).

If upgraders in the treatment period include both employees who completed a standard formal adult education path and participants in recognition of prior learning, the measured \(\hat{\alpha}^{DID}\) effect averages the null gains achieved by participants in formal adult education in the treatment period compared to participants in formal adult education in the baseline period and the gains of additional participants attracted by new policies enforced in the treatment period. To disentangle the above effects Blundell and Costa Dias (2009) suggest considering the growth in the share of participants in adult

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\(^7\) This hypothesis implies that the expected value of the error term does not depend on treatment:

\[
E[(\alpha_i|d_i = 1, t = 1) - (\alpha_i|d_i = 1, t = 0)] = E[(\alpha_i|d_i = 0, t = 1) - (\alpha_i|d_i = 0, t = 0)] = E[(\alpha_i|t = 1) - (\alpha_i|t = 0)]
\]

\(^8\) Blundell and Costa Dias (2009) exploit inter-regional variation in incentives to participate in adult education. However, their reasoning can be easily transferred to comparison among time periods when different support policies are enforced.
education in the treatment period, reasonably positive because enforced measures are expected to reduce the costs of education and attract larger numbers of applicants to higher qualifications. If we denote by \( p_{zt} \) the probability of education in treatment period \( z \) at time \( t \), and under the hypothesis that the overall increase in participation rate in the treatment period is due to upgraders who take advantage of the new policy measure, the average gain of upgraders in the treatment period can be decomposed in two components:

\[
E(y_{it}|d_i = 1, t = 1) - E(y_{it}|d_i = 1, t = 0) =
\]

\[
= \frac{(p_{11} - p_{10})}{p_{11}} [E(y_{it}|d_i = 1, t = 1) - E(y_{it}|d_i = 1, t = 0)] + \]

\[
+ \frac{p_{10}}{p_{11}} [E(y_{it}|d_i = 1, t = 1) - E(y_{it}|d_i = 1, t = 0)] +
\]

(4)

If no systematic differences exist between upgraders in the treatment period and in the baseline period, no difference is expected in the average outcome increase enjoyed by participants in formal adult education, and the second term the left side of equation (4) is equal to the second term of the left side of equation (3). Consequently, by substituting equation (4) in equation (3) and re-arranging terms we obtain:

\[
E(y_{it}|d_i = 1, t = 1) - E(y_{it}|d_i = 1, t = 0) = \frac{\hat{\alpha}^{DID}}{(p_{11} - p_{10})} \]

(5)

The average treatment on individuals that change their educational decision in response to the enforcement of an education policy can be calculated by dividing the estimated DID effect by the relative change in the share of participants in adult education caused by the examined policy. This effect corresponds to the so-called local average treatment effect (LATE).

A strong hypothesis underlying the proposed identification strategy is that, in the absence of a policy change, upgraders in the treatment period would experience the same average outcome increase as educational upgraders in the baseline period. This condition required to complement the DID approach with propensity score matching (PSM). In the DID-PSM approach the use of a matching algorithm to compare treated and untreated individuals rules out non-random differences in the distribution of initial characteristics that affect the probability of selection into treatment, whereas DID accounts for time-invariant unobserved heterogeneity and time trends unrelated with the treatment (Blundell and Costa Dias, 2009; Imbens and Wooldridge, 2009). Using the propensity scores derived from a logit estimate of the probability to participate in treatment (Rosenbaum and Rubin, 1983), the chosen PSM algorithm calculates individual weights based on an epanechnikov kernel density function that increase the impact of untreated observations similar to treated observations along the covariates
profile (i.e., untreated observations with high propensity scores) and weights down the outcome gain displayed by untreated observations with low propensity scores (Villa, 2016).

5. Estimate of wage differentials
The DID-PSM strategy outlined in the above section was applied to test the effectiveness of the efforts enacted by Portuguese governments after 2000 by means of two separate analyses. In the first analysis treated individuals include upgraders during the development of the S@ber+ programme and the initial development of the RVCC centres network focused on basic education, whereas the second analysis focuses on the Novas Oportunidades programme and the further expansion of the centres network. In both cases the outcome variable of interest is the natural logarithm of the gross hourly wage observed before and after an education upgrade and the control group includes employees who upgraded their educational qualification in a baseline period that preceded the launch of the initiatives in favour of recognition of prior learning.

The literature suggests that an upgrade in the education title of individuals in employment or self-employment has no immediate effect on earnings, whereas both the meta-analysis by Card et al. (2010) and the empirical study by Blanden et al. (2012) show positive returns two or more years after the achievement of a new qualification. To allow enough time for full unfolding of the returns to investment in adult education, the earnings of employees in QdP are observed in a three-year window from t-1 to t+2. Pre-upgrade wage is measured in year t-1, possible occurrence of change in educational qualification is recorded in t⁹, and post-treatment outcome is measured at least two years later, in t+2. The dependent variable of the empirical analysis is therefore the 3-year change in the natural logarithm of gross hourly wage¹⁰ before and after an upgrade in education.

Due to the strategy chosen to assess differentials in wage growth between treated and untreated upgraders of education titles the QdP observations used in the empirical analysis are limited to individuals in employment in years t-1, t, and t+2 of observation windows starting between 1996 and 2007. Limits in data availability and exogenous factors that might significantly affect the education decisions of eligible employees drove the selection of time windows in both the baseline period and the two treatment periods. First, due to missing data for 2001 in QdP time windows starting in 1998, 2000, 2001.

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⁹ QdP data refer to the month of October of each year. Consequently, an educational upgrade observed between year t-1 and year t will take place between November of year t-1 and October of year t.

¹⁰ Gross monthly wage is deflated by the 2012 Consumer Price Index and includes base wage plus additional regular payments, but exclude non-regular payments and overtime pay. Monthly hours include regular time but exclude overtime.
and 2001 were excluded because employees could not be observed in all relevant years. Second, the increase of compulsory education to the achievement of the 9th grade certificate from school year 1995-96 suggested to start the observation of occupational upgrades in the baseline period from 1997, hence setting the observation of pre-upgrade characteristics in 1996. In a similar way, the 2009 reform announcing that the 12th year certificate (or 18 years of age) was to become the minimum schooling level from 2012 suggested to limit the observation of educational transitions not beyond 2008. Time windows included in the second treatment period were further limited by the desire to exclude possible biases due to the Great Recession, whose effects on wages and employment levels became particularly visible in Portugal from 2010. Accordingly, the second treatment period, which concerns education upgrades under the Novas Oportunidades programme, includes employees who completed an adult education path in 2006 and 2007, whose initial wage is observed in 2005 and 2006 and whose final wage is observed in 2008 and 2009, respectively. The first treatment period includes individuals who improved their educational qualification under the S@ber+ initiative in years 2003, 2004, and 2005. The baseline period includes employees who completed a formal adult education programme either in 1997, 1998, or 2000.

Available observations further shrink due to additional limits imposed on data. The analysis is restricted to individuals aged between 18 (the minimum age for eligibility in S@ber+ and Novas Oportunidades programmes) and 65 (the typical age of retirement) and to employees, excluding individuals in self-employment and unpaid jobs. Observation from employers in the agricultural sector, where participation in the QdP survey is not mandatory, and in public administration, not explicitly addressed by the QdP survey, were removed. Given the focus of S@ber+ and Novas Oportunidades programmes on basic and secondary education, observations on employees in post-secondary and tertiary education were discarded, as well as observations reporting hourly gross wages 80% lower of the minimum hourly wage prescribed in each year by the Portuguese legislation and 50% higher than the 99th percentile of the hourly wage distribution. Eventually, to increase the homogeneity among individuals who achieve the same educational qualification the analysis considers only upgrades involving no more than one step along the ladder of educational titles and excludes employees who report more than one education upgrade in the same time window.

Despite all the above restrictions, and after controlling for missing information or conflicting information on the same individual in different instants of a time window, the final dataset includes 108,090 observations on unique individuals in the baseline.

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11 The Portuguese legislation allows wages to be as low as 80% of the official minimum wage in the case of apprentices and trainees.
period, 152,138 in the S@ber+ period, and 153,902 in the Novas Oportunidades period\textsuperscript{12}.

Table 1 reports the differences observed between treated and controls in some descriptive variables by gender and final education level. The first three variables (initial wage, age, and hours worked per month) concern characteristics of individuals in employment. In line with standard expectations, across all periods the achievers of lower educational titles display lower pre-upgrade hourly wages, are older and work longer hours compared to employees who, starting from already higher initial qualifications, obtain the 9\textsuperscript{th} or the 12\textsuperscript{th} grade certificate. For each qualification level initial hourly wages are stable in time across the observed periods, but in the case of applicants to the 12\textsuperscript{th} grade certificate, for whom the steady decline in pre-qualification hourly earnings may signal a progressive exclusion from more lucrative positions that increasingly require secondary and tertiary qualifications. The growing age of upgraders observed across periods signals that the proposed support policies were successful in attracting candidates whose characteristics may hamper participation in traditional formal adult education programmes, possibly more demanding in terms of personal effort and time compared to recognition of prior learning.

(Table 1 about here)

The following variable in Table 1, average initial sales per employee by cell, aims at capturing the impact of employers’ characteristics on participation. Across both genders and all periods displayed data suggest a uniform pattern. Applicants to lower education certificates come from less profitable companies whereas the employers of applicants to the 9\textsuperscript{th} grade certificate and, above all, to secondary educational qualifications display higher turnovers per employee. As in the case of upgraders’ age, the declining values of sales per employee across periods suggest the progressive enlargement of participation in adult education to candidates employed in less dynamic workplaces. The last variable in Table 1 accounts for the geographical dispersion of treated and untreated employees. The proposed index, which scores 100 for the whole country on yearly bases, assesses differences in gross domestic product per inhabitant at the regional (NUTS 2) level. Provided data outline a pattern across genders and periods also in this case. Applicants to lower and higher qualifications concentrate in richer areas, whereas upgraders to the 6\textsuperscript{th} and the 9\textsuperscript{th} grade certificate cluster in poorer districts. However, differences tend to smooth down in time.

\textsuperscript{12} The overall share of upgraders to primary and secondary educational titles is 7.3\% in the baseline period, 7.4\% in the S@ber+ period, and 9.9\% in the Novas Oportunidades period, respectively.
Overall, data in Table 1 suggest that variables expected to affect the propensity to participate in adult education initiatives not always vary monotonically with education levels. In addition, the significant differences between female and male employees stress the opportunity to perform separate analysis by gender, in line with most existing studies (Jenkins et al., 2003; Hällsten, 2012; Blanden et al., 2012; Stenberg, 2011; Lima, 2012). Thus, the estimate of earnings differentials between participants in recognition of prior learning and formal adult education is performed separately according to the gender and the initial qualification of observed employees.

Cross-period differences in Table 1 also confirm the existence of structural differences between treated and controls that justify the adoption of a DID-PSM approach to account for both observable and non-time variant unobservable differences. For each cell identified by employees’ gender and initial education level the propensity scores to participate in treatment (i.e., the propensity to educational upgrade under a support policy programme compared to educational upgrade in the baseline period) fed to the epanechnikov kernel matching algorithm is calculated by means of logit regressions with robust standard errors that take advantage of the rich pre-upgrade information provided by QdP. Employee-specific and job-specific regressors include age and squared age, binary controls for 2-digit occupation, a variable indicating the modal education in the same 3-digit occupation, two binary variables flagging overeducation and undereducation compared to modal education, and two variables that signal pre-upgrade part-timing and fixed-term employment. Firm-specific variables include controls for employer size, measured as the natural logarithm of employees, and fixed industry effects. Local and institutional effects are captured by employee’s district fixed effects and the above mentioned annual index of gross domestic product per inhabitant at the NUTS 2 level. The explanatory power of estimated logit models (R-squared between 14% and 32% when comparing the S@ber+ initiatives to the baseline period and between 25% and 46% when comparing the Novas Oportunidades programme to the baseline period) is higher than the values obtained in other studies (Jenkins et al., 2003). However, the still comparably low values signal the important role played by unobserved individual heterogeneity, which the DID estimates accounts for at least as far as it concerns time-invariant effects.

Table 2 reports the average 3-year change in the logarithm of gross hourly wage for participants in recognition of prior learning versus participants in formal adult education. For comparative purposes the first panel of Table 2 shows the gains estimated by means of difference-in-differences equations that do not account for non-random distribution of pre-treatment characteristics between treated and non-treated observations. In contrast, the second panel reports the estimates based on DID-PSM
with epanechnikov kernel matching. In both cases the outcomes of DID-PSM estimates are corrected to account for the simultaneous presence of participants in both recognition of prior learning and formal adult education in the treatment periods according to equation (5) in section 4.

The effectiveness of the matching algorithm adopted in the DID-PSM estimates is confirmed by post-matching tests of covariate balance between treated and control group\textsuperscript{13}. While high percent bias between treated and non-treated are recorded for a large share of explanatory variables in unmatched samples, after matching percent biases are always well below the usually accepted hurdle of 10\% (Austin, 2011). In addition, the negligible number of observations lost to perform the DID-PSM estimate on the common support of the propensity score, i.e., to ensure that for each given value of the covariates both treated and controls can be observed (overlap assumption), allows to exclude biases in outcomes due to this restriction.

(Table 2 about here)

Outcomes in Table 2 suggest two main considerations. First, comparison between the first and second panel of Table 2 shows that estimated coefficients are lower (and less significant, when treatment is participation in the Novas Oportunidades programme) when accounting for non-random differences between treated and controls. Overlooking the different distribution of pre-treatment characteristics that significantly affect the probability of participation in adult education biases downwards the estimate of relative wage gains due to the higher concentration of observable and unobservable characteristics associated with successful participation in adult education among individuals in the control group. This finding suggests that both S@ber\textsuperscript{+} and Novas Oportunidades were successful in attracting candidates whose individual characteristics would otherwise prevent participation in adult education.

Second, the return to participation in recognition of prior learning differs between the two examined policy initiatives. Estimated differentials are always negative and significant for participants in the S@ber\textsuperscript{+} programme, but coefficients become lower (and mostly non-significant, when accounting for systematic differences between treated and controls) for upgraders under the umbrella of the Novas Oportunidades programme. The stronger investment in communication that accompanied Novas Oportunidades compared to S@ber\textsuperscript{+} may have contributed to create a different, more

\textsuperscript{13} The standardised percent bias of a pre-treatment covariate is calculated as the percent ratio between i) the percent difference of the sample means in the treated and untreated sub-samples and ii) the square root of the average of the sample variances in the treated and the control groups (Rosenbaum and Rubin, 1985).
positive awareness among both employers and employees about the contents and targets of recognition of prior learning that eventually contributed to eliminate or at least significantly downsize differentials in wage growth between those who achieve a further qualification by means of traditional educational paths and those who benefit from appraisal of past experience and learning.

In general terms absolute wage differentials associated with participation in recognition of prior learning follow different patterns for women and men but in the case of upgraders to the 9th grade certificate. In the case of lower qualifications women suffer from higher penalisations, statistically significant under both the S@ber+ and the Novas Oportunidades initiatives also in DID-PSM estimates. Among upgraders to the 12th grade certificate the picture reverses, with a wage penalisation that is non-significant among female employees and negative and significant for male ones.

Since change in the logarithm of earning approximates percent change (McGuinness, 2006), Table 3 reports the compound annual growth rate of average wages due to education upgrades under the examined support programmes based upon DID-PSM estimates. Once again, wage annual growth rates confirm the higher success of Novas Oportunidades compared to S@ber+ and the strong penalisation that affected participants in recognition of prior learning during the first round of dedicated policy measures.

(Table 3 about here)

6. Discussion and concluding remarks
The achievement of additional educational qualifications by adult workers prospects advantages for employers and employees both when a new diploma results from participation in formal education programme and when education upgrade follows from appraisal and recognition of prior learning. Potential benefits include better matching between labour demand and supply, availability of a more qualified workforce in support of modernisation and growth processes, increased motivation to learning, and improvement of professional and career perspectives. In the first decade of this century Portuguese policy makers promoted a massive effort to improve the educational qualification of the Portuguese workforce also by implementing an extended network of centres in charge of apprising prior and experiential learning and delivering primary and secondary education certificates.

Based on the Portuguese QdP survey this paper has assessed the economic return to recognition of prior learning under the umbrellas of the S@ber+ and the Novas Oportunidades initiatives by means of DID-PSM estimates. The adopted identification
strategy allowed to disentangle the average wage differential enjoyed by participants in recognition of prior learning promoted by the enforced policy programmes from the wage benefits enjoyed by participants in traditional formal adult education.

The outcomes of the empirical analysis show that the enforced adult education-oriented policies managed to increase both the absolute number of education upgraders and, even if to a lesser extent, their share on employees with the same initial qualification. However, the S@ber+ and the Novas Oportunidades programmes exerted very different effects on participants’ wages. Possibly due to a still inadequate diffusion of appraisal centres on the national territory and to insufficient investment in communication with candidates and employers, participants in recognition of prior learning suffered on average significant and sizeable wage penalisations. The situation reversed during the following Novas Oportunidades initiative, when wage differentials with participants in traditional formal adult education became mostly non-significant but in the case of women achieving a 4th or a 6th grade certificate and men acquiring a 12th grade certificate. The wage penalty considerably reduced compared to the corresponding values in the S@ber+ programme also in those cases. Based on estimated outcomes, the proposed analysis provides an overall positive evaluation of the Novas Oportunidades initiative, contrary to past findings of the literature (Lima, 2012).

Further research may throw additional light on the preliminary findings proposed in this paper by exploring two promising research lines. First, the assessment of the extent of the time interval during which upgraders enjoy increasing wage benefits compared to stayers would help to quantify the overall wage return to investment in recognition of prior learning. Second, QdP allows for additional measures of the impact of investment in adult education on individual professional situation. By exploring the frequency and the direction of job and employer switches after an education upgrade future analyses may help to qualify the consequences of recognition of prior learning beyond the sole monetary dimension.

References
ANQ, Agência Nacional para a Qualificação (2010), New Opportunities Initiative, Lisboa: ANQ.


Figure 1. Number of education upgraders on total workforce in Portugal by year of transition and initial qualification


Figure 2. Percentage of education upgraders on total workforce in Portugal by year of transition and initial qualification

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Females</th>
<th></th>
<th></th>
<th></th>
<th>Males</th>
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<th></th>
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<td><strong>Baseline period</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>3.4</td>
<td>3.2</td>
<td>3.6</td>
<td>4.7</td>
<td>3.9</td>
<td>4.0</td>
<td>4.5</td>
<td>6.0</td>
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<td>Age [years]</td>
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<td>32.6</td>
<td>31.0</td>
<td>31.3</td>
<td>42.2</td>
<td>33.5</td>
<td>31.3</td>
<td>32.9</td>
</tr>
<tr>
<td>Hours worked per month (b)</td>
<td>173.1</td>
<td>172.0</td>
<td>169.6</td>
<td>165.7</td>
<td>172.0</td>
<td>172.1</td>
<td>171.9</td>
<td>169.1</td>
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<tr>
<td>Firm sales per employee [000€ 2012]</td>
<td>48.4</td>
<td>54.5</td>
<td>68.9</td>
<td>96.2</td>
<td>43.7</td>
<td>35.1</td>
<td>48.2</td>
<td>72.3</td>
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<td>92.2</td>
<td>99.3</td>
<td>105.4</td>
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<td>94.6</td>
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<td>3.6</td>
<td>4.6</td>
<td>4.3</td>
<td>4.1</td>
<td>4.4</td>
<td>5.6</td>
</tr>
<tr>
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<td>32.3</td>
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<td>168.4</td>
<td>167.4</td>
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<td>Firm sales per employee [000€ 2012]</td>
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<td>Index of GDP per inhabitant (c)</td>
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<td><strong>Novas Oportunidades period</strong></td>
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<td>3.5</td>
<td>4.3</td>
<td>3.9</td>
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<td>4.3</td>
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<td>44.0</td>
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<td>33.1</td>
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<td>165.9</td>
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<td>166.3</td>
<td>166.0</td>
<td>167.0</td>
<td>165.9</td>
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<td>45.0</td>
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<td>28.5</td>
<td>26.9</td>
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<td>93.2</td>
<td>102.2</td>
<td>98.3</td>
<td>92.2</td>
<td>94.3</td>
<td>102.4</td>
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(a) Gross hourly wage calculated as the ratio of base monthly wage and additional regular monthly payments to regular working hours, € 2012
(b) Hours worked per month include regular time and overtime
(c) Annual index of Gross Domestic Product per inhabitant by NUTS 2 (Portugal=100); source: Portuguese Institute of Statistics
Table 2. Estimates of 3-year increase in ln hourly wage for participants in recognition of prior learning

<table>
<thead>
<tr>
<th>Final qualification</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
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<tr>
<td>Treatment</td>
<td>DID estimation results</td>
<td>DID estimation results</td>
</tr>
<tr>
<td></td>
<td>S@ber+ vs. Baseline</td>
<td>S@ber+ vs. Baseline</td>
</tr>
<tr>
<td>4th grade certificate</td>
<td>-0.315 ***</td>
<td>-0.108 ***</td>
</tr>
<tr>
<td>6th grade certificate</td>
<td>-0.444 ***</td>
<td>-0.113 ***</td>
</tr>
<tr>
<td>9th grade certificate</td>
<td>-0.130 ***</td>
<td>-0.056 ***</td>
</tr>
<tr>
<td>12th grade certificate</td>
<td>-0.210 ***</td>
<td>-0.067 ***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Final qualification</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>DID with Kernel PSM estimation results</td>
<td>DID with Kernel PSM estimation results</td>
</tr>
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<td></td>
<td>S@ber+ vs. Baseline</td>
<td>S@ber+ vs. Baseline</td>
</tr>
<tr>
<td>4th grade certificate</td>
<td>-0.382 ***</td>
<td>-0.095 **</td>
</tr>
<tr>
<td>6th grade certificate</td>
<td>-0.266 ***</td>
<td>-0.029 **</td>
</tr>
<tr>
<td>9th grade certificate</td>
<td>-0.073 ***</td>
<td>-0.003 **</td>
</tr>
<tr>
<td>12th grade certificate</td>
<td>-0.116 ***</td>
<td>-0.001 **</td>
</tr>
</tbody>
</table>

*** p< 0.01 ** p< 0.05 * p< 0.10.

Table 3. Wage CAGR due recognition of prior learning

<table>
<thead>
<tr>
<th>Final qualification</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
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<td>S@ber+ vs. Baseline</td>
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<tr>
<td>4th grade certificate</td>
<td>-14.8%</td>
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<td>6th grade certificate</td>
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<td>-1.0%</td>
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<tr>
<td>9th grade certificate</td>
<td>-2.5%</td>
<td>-0.1%</td>
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<tr>
<td>12th grade certificate</td>
<td>-4.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Based on DID with Kernel PSM estimates
Statistically significant values in bold