DUAL LABOUR MARKETS AND (LACK OF) ON-THE-JOB TRAINING: EVIDENCE FROM SPAIN AND OTHER EU COUNTRIES BASED ON PIAAC

Antonio Cabrales [a] **, Juan J. Dolado** [b] **& Ricardo Mora** [c]

(a) University College London, (b) European University Institute & (c) Univ. Carlos III de Madrid

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ABSTRACT

Using the Spanish micro data from the *Programme for the International Assessment of Adult Competencies* (PIAAC), we first document how the excessive gap in employment protection between indefinite and temporary workers leads to large differentials in on-the-job training (OTJ) against the latter. Next, we find that that the lower specific training received by temporary workers is correlated with lower literacy and numeracy scores achieved in the PIAAC study. Finally, we provide further cross-country evidence also based on PIAAC showing that OJT gaps are quite lower in those European labour markets where dualism is less entrenched than in those where it is more extended.

Keywords: Dual labour market, Firing costs, On-the-job training, Cognitive skills.

1. INTRODUCTION

This paper examines whether the gap between the amount of firm-provided training for permanent workers (those holding an indefinite/permanent contract) and temporary workers (those holding a fixed-term contract) tends to be larger in dual labour markets than in a less segmented ones. One plausible mechanism leading to this gap relies on the large turnover rate among temporary workers induced by the much less stringent employment protection legislation (EPL) they enjoy relative to permanent workers. Given this gap, whenever collective

bargaining prevents the neutralization of dismissal costs though wage flexibility, firms will prefer to use temporary contracts in sequence rather converting them into permanent contracts. As a result, the expected job durations of temporary workers are too short, therefore making firms more reluctant to invest in their training. By contrast, the much stronger employment protection enjoyed by permanent workers increases their expected job duration making firms more eager to invest on them.

Besides exploring this mechanism, we are interested in analyzing whether the occupational training gap may also translate into persistent differences in workers' cognitive skills. To the extent that training at the workplace helps accumulating skills dualism in the labour market would not only hinder the specific human capital of temporary workers but also their general human capital. This is a topic of considerable importance for policy in countries like Spain which traditionally has been considered as a paradigmatic case study of a highly segmented labour market. For this reason, we will focus our empirical evidence mainly on this country. Yet, in order to check whether the previous channels operate in EU other countries, we will also provide some evidence comparing the findings for Spain with those for a small group of reference EU countries as a benchmark. The chosen set of countries is such that some also have dual labour markets (France and Italy) while others have rather more unified labour markets (Denmark and UK).

Among the most salient features of the Spanish economy over the last three decades the following three stand out: (i) a strong labour-market segmentation stemming from large differences in EPL that encourage the widespread use of temporary, (ii) a rather low fraction of workers receiving on-the job training (OJT, henceforth), and (iii) a poor productivity performance with the growth rate of Total Factor Productivity (TFP henceforth) remaining low or even negative over a period where it was increasing worldwide.

The origin of the first feature dates back to 1984 when a radical labour market reform was passed to ameliorate the surge in unemployment after the restoration of democracy when the Spanish economy was hit by the second oil price crisis. This reform allowed the indiscriminate use of temporary contracts (with either reduced or no costs for dismissal) for any regular productive activity (and not just for seasonal employment, as it had been the case until then), while keeping unchanged the rigid employment protection of permanent contracts inherited from four decades of military dictatorship (see, e.g., Dolado et al., 2002 and 2008).

The rate of temporary work (i.e., the share of employees under temporary contracts) soared from 15% just before the reform to 35.4% in the mid-nineties. Since then, around 90% (94% nowadays) of newly signed contracts have been temporary ones, while the average temp-to-perm conversion rate has ranged between 10% in the nineties and first half of the 2000s and 6% nowadays (see Amuedo-Dorante, 2001 and Güell and Petrongolo, 2007). Later on, as a result of a long sequence of partial labour market reforms, the r ate of temporary work leveled off at around 30%. More recently, even after the mass destruction of temporary jobs in Spain during the Great Recession, it has only dropped to 24% since 2009, which still remains as one of the highest rates in the OECD.

As regards the second feature, although the participation of workers in OJT has increased from 10% in the early nineties to 24% in 20010 (see European Commission, 2014) this rate, together with the Italian one, remains one of the lowest in the EU-27 being 8 pp. below the EU average rate and between 20-30 pp. lower than in the Scandinavian countries or the UK.

Finally, regarding the third feature, there has been a sharp decline in the growth rate of TFP, which went down from an average of 1.5% in 1980-1994 to -0.35% in 1995-2007. Although a substantial part of this decline has been due to the heavy dependence of the Spanish economy on several low value-added sectors (e.g., construction, tourism, personal services, etc.), there is ample evidence documenting that TFP growth has also performed rather poorly in manufacturing and other several tradable sectors (see, e.g., Escribá and Murgui, 2009). This poor performance of the TFP growth rate in Spain is rather puzzling since it took place during a period of large technological improvements worldwide.

Our aim in this paper is to analyze the relationship between features (i) and (ii) focusing on a mechanism which so far has received scarce attention in the literature. Specifically, to analyze the two mechanisms pointed out before, use will be made of the cross-sectional database available for Spain and the other reference countries in the recently released first wave of the *Programme for the International Assessment of Adult Competencies* (PIAAC, 2013).

The basic insight of our approach is that, whenever a large EPL gap operates in a context of wage rigidity, firms are less inclined to turn unstable contracts into stable ones. This implies that temporary contracts no longer play the role of being "probationary contracts" (*stepping stones*) and become "terminal contracts" (*dead-ends*) leading to a very high worker turnover between employment and unemployment. Insofar as the EPL gap cannot be neutralized through enough wage flexibility, firms have little incentive to invest in the training their employees. By the same token, workers lack the right incentives to improve on their job performance by accumulating better productive capabilities. Further, since these skills and OJT are important components of multifactor productivity, this mechanism may have played a relevant role in explaining the relation between labour market duality and the unsatisfactory development of productivity growth (see Bassanini et al., 2008).

This type of mechanism has been recently explored by Dolado et al. (2013) when analyzing the relationship between features (i) and (iii). To do so, they use a theoretical model where the decisions of employers and workers interact in a dual labour market. Inspired by the working of the Spanish labour market, the setup is one in which firms find it optimal to initially hire workers under fixed-term contracts. When such contracts expire (typically after one year), the employers face the decision to upgrade the worker to a permanent contract (subject to much larger firing costs) or to dismiss the worker and hire another one again in sequence on a temporary basis. Their main result is that an increase in the EPL gap leads to lower TFP growth via less firm-provided training and a lower level of effort exerted by temporary workers in their jobs. The basic insight for this result is that a higher EPL gap reduces the temp-to-perm conversion rate. Therefore, employers do not find it profitable to invest in the OJT of temporary workers who are very unlikely to continue in the firm. This gives rise to a discouragement effect among these workers, who respond to the lower and more uncertain promotion prospects by exerting less effort. Hence, this setup leads to a self-fulfilling

prophecies equilibrium where employers do not invest in workers, expecting that they will not exert enough effort, and workers fulfill these expectations by rationally anticipating firms' low promotion strategies.

To test the main predictions of their model, Dolado et al. (2013) use a database (*Survey of Business Strategies*, SBS) which provides firm-level longitudinal information on a representative sample of manufacturing firms in Spain during 1991-2005. This database enables the author to compute TFP growth rate and the conversion rate of temporary workers into permanent ones for each year and firm in this survey. By means of panel regression methods (controlling for a wide range of socio-economic and demographic variables for both workers and firms), their main empirical finding is that changes in the EPL gap are inversely related to conversion rates which in turn are positively correlated with their TFP growth rates.

However, an important shortcoming of their database is that it lacks information on the two key outcome variables of the model, namely firm-provided training and the level of effort exerted by employees, forcing these authors to use TFP as a proxy for these variables once they control for other components of TFP. The availability in PIAAC of different measures of OJT activities for workers as well as on their scores in the literacy and numeracy tests allows us to overlook, at least in part, this deficiency.

In order to derive testable hypotheses in our empirical approach, we start by laying out a simple two-period model of OJT provision in a dual labour market. At the beginning of the first period, individuals with different innate abilities are randomly assigned to firms with identical technologies. Workers are hired either under permanent contracts (with high dismissal costs) or under temporary contracts (with low or even no dismissal costs and shorter expected job duration). During the first period, firms decide whether to train workers in order to improve their productivity. Firms face a cost of providing OJT that is decreasing in the individual's innate ability. The return to training, in terms of higher productivity, only accrues to the firm in the second period. However, due to aggregate productivity shocks and the sudden termination of fixed-term contracts, some of these jobs get destroyed during the second period. In the absence of total wage flexibility, having to pay firing costs implies that, when hit by a shock, firms offering permanent contracts will find it optimal to dismiss less workers than those offering temporary contracts (see Cahuc and Postel-Vinay, 2002, and Bentolila et al., 2012). Hence, firms offering permanent contracts will face a trade-off between paying dismissal costs and having longer job duration. We show that, under some plausible conditions regarding the fixity of wages, higher labour market duality s (i.e., higher gap in firing costs) leads to a higher provision of OJT to workers under permanent contracts than to workers under temporary contracts.

In general, our empirical results support this prediction. First, using a large array of controls on individual and job characteristics (including worker's motivation), we find a substantially negative and statistically significant relationship between holding a temporary contract and the amount of OJT received at the workplace. Secondly, we find that the less OJT individuals receive, the worse their literacy and numeracy skills. These results turn out to be consistent with the growing empirical evidence about the negative effects of persistent labour market dualism in Spain on productivity growth and unemployment (see Bentolila et al., 2012).

Moreover, we find similar evidence for other EU countries with dual labour markets while the evidence is much weaker or non-existent for countries with more unified labour markets.

The rest of the paper is structured as follows. Section 2 provides a brief overview of the related literature in Spain on this topic. Section 3 develops a simple theoretical model that guides our empirical approach. Section 4 describes the PIAAC database and provides descriptive statistics of the outcome and treatment variables used in the empirical analysis for Spain. Section 5 presents the main empirical results for this county. Section 6 reports the evidence for the reference EU countries. Finally, Section 7 offers some brief conclusions.

2. RELATED LITERATURE

In addition to the previously discussed paper by Dolado et al. (2013), there are some other related works, focusing on the Spanish case, that examine the effects of segmentation in the labour market on productivity growth. We next summarize their main conclusions.

Possibly the first paper addressing this issue is Sánchez and Toharia (2000) who, on the basis of the main implications of a standard efficiency wage model, use data from the SBS for the period 1991-1994 to estimate the relationship between the rate of temporary work and labour productivity growth. Specifically, they regress average labour productivity on the rate of temporary work at the firm level, plus other controls, finding a negative relationship between both variables. Similar results been obtained by Alonso-Borrego (2010) and Gonzalez and Miles (2012) using more updated samples drawn from the Firms' Balance Sheets of the Bank of Spain (CBBE) and the SBS, respectively. Like Dolado et al. (2013), these authors focus on documenting the negative effect of contractual instability on TFP growth. Yet, they do not deal with the mechanism linking conversion rates and TFP which is stressed by the latter authors.

Regarding the relationship between dualism and the incidence of occupational training in Spain, it is worth highlighting the work of Alba-Ramirez (1994) and De la Rica et al. (2008). In both cases, they document that firms invest less in training temporary workers given their high turnover rates, although they do not examine how the amount of training has varied with the changes observed in the EPL gap.

Recently, Garda (2013) has analyzed the size of wage losses experienced by those workers who have been displaced to other firms as a result of having been subject to a collective dismissal (ERE) in their previous firm. If firms provide a higher level of specific training to workers with permanent contracts than to those with temporary contracts, the loss of this type of human capital will be more significant for the first type of workers than for the second. Therefore, we would expect to find higher wage losses among workers with permanent contracts. Using the Social Security records from the Continuous Sample of Working Lives (MCVL) and controlling by job tenure, sector of activity and other covariates, the results confirm that permanent workers subject to EREs suffer higher and more permanent wage cuts than those with temporary contracts.

3. A MODEL OF OJT IN A DUAL LABOUR MARKET

3.1 Preliminaries

In our stylized model, workers and firms live for two periods and, for simplicity, there is no time discounting. At the beginning of the first period, individuals get hired by firms in a framework where each firm hires one worker. By normalizing hiring costs to zero, hiring takes place whenever the expected values of such a decision for the firm, *W*, and for the worker, *V*, are non-negative. Firms have a simple linear production technology where output equals the workers´ s level of human capital, which coincides with their productivity. Human capital is taken to be a composite of the individual´s innate ability and firm-specific OJT, whose role is to raise workers' productivity. The initial ability of the worker, θ, is assumed to be uniformly distributed over the support $[\underline{\theta}, \overline{\theta}]$. For simplicity, we assume that there are only two levels of OJT, i.e., one involving no training and another one where some fixed amount of training is provided. Thus, under these simplifying assumptions, human capital/ productivity of untrained (superscript *u*) and trained (superscript *t*) workers are given by $H^u(\theta) = \theta$ and $H^t(\theta) = h\theta$, with *h> 1*, respectively.

OJT takes place in the first period while its return for the firm only accrues in the second period. While untrained workers produce θ in each of the two periods, trained workers bear a loss of productivity in the first period (due to their enrolment in OJT activities) in exchange for a higher productivity in the second period. Thus, the initial productivity of a trained worker is given by $\theta - C(\theta)$, where $C(\theta)$ is the cost in terms of output loss entailed by undertaking OJT. This cost is assumed to be decreasing in ability, i.e., $C'(\theta) < 0$. For illustrative purposes, in the sequel we choose the simple functional form $C(\theta) = k(\overline{\theta} - \theta)$, with $k > 0$ implying that the output loss is null for a worker with the highest ability type $\overline{\theta}$. As a result, the initial productivity of a trained worker becomes $\theta - k(\overline{\theta} - \theta)$, while it raises to $h\theta$ $(> \theta)$ in the second period. Notice that our simple formulation of the OJT costs paid by the firm implies that the net productivity of a trained worker is negative for values of θ low enough, namely when $\theta < (k/1+k)\overline{\theta}$, meaning that these workers will not be trained.

Although all firms have the same technology, some of them hire workers under temporary (T) or while others do under permanent contracts (P). For simplicity, it is assumed that workers are offered either type of contract with the same probability. The difference between the two types of contracts is that dismissing a worker with a permanent contract involves a firing cost $F > 0$ whereas destroying a temporary job does not involve any dismissal cost. Thus, F could be interpreted in the sequel as the gap in firing-costs between permanent and temporary workers. Furthermore, to capture in a simple way the unstable nature of temporary contracts-- because of their short-term duration or low rate of conversion into indefinite contracts-- a key assumption is that temporary workers quit their jobs during the second period at rate q, with $0 < q < 1$, while permanent workers will never quit. Following the arguments by Dolado et al. (2013) about how an increase in the firing-cost gap is likely to reduce the transformation rate

of temporary into permanent contracts (a decision which is not modeled here) we take the shortcut of assuming that q is increasing in F, i.e., $q'(F) > 0$.

To account for endogenous job destruction we follow the standard Mortensen-Pissarides modeling device by assuming that productivity diverges during the second period due to an aggregate shock. In particular, during this period, productivity for untrained workers is perceived by firms to be uniformly distributed $U\left[\bar{\theta}(1-\varepsilon),\bar{\theta}\right]$, where $\varepsilon \in ([0,1])$ is a parameter of the distribution, for which it holds that $\underline{\theta} = \bar{\theta}(1-\varepsilon)$. As a result, during the second period, the p.d.f. and c.d.f. of productivity for this type of worker become $g_\theta(\varepsilon) = \frac{1}{\varepsilon\bar{\theta}}$ and $G_\theta(\varepsilon) = 1 + \frac{\theta - \bar{\theta}}{\varepsilon\bar{\theta}}$, respectively. As for trained workers, the corresponding distribution is $U\left[\bar{\zeta}(1-\varepsilon),\bar{\zeta}\right]$, where $\bar{\zeta} = h\bar{\theta}$, so that $g_\zeta(\varepsilon) = \frac{1}{\varepsilon\bar{\zeta}}$ and $G_\zeta(\varepsilon) = 1 + \frac{\zeta - \bar{\zeta}}{\varepsilon\bar{\zeta}}$. Notice that in both cases a higher (lower) value of ε should be interpreted as capturing a recessionary (expansionary) period in the business cycle during where the average productivity of workers in both types of firms drops (increases).

The wage paid in P and T jobs is assumed to be the same and is denoted as w. We take a partial equilibrium approach by assuming that the wage is determined exogenously and that it is rigid. Specifically, the exogenous wage is posted by the firms at the beginning of the first period but that it is only paid in the second period to those workers who have not been dismissed. Further, it is assumed that the value of the exogenous wage verifies the inequality $F < w < \bar{\theta}$. As will be shown below, this restricted range ensures that workers always prefer working to not working. Therefore, the participation constraints are satisfied.

3.2 Asset values

(I) Firms

As discussed earlier, firms hire workers whenever the expected value of their contribution to the firm's profits is greater to be zero for both types of jobs.

Denote by W_i^t and $W_i^u\,(i = P,\ T)$ the asset values for firms of having trained and untrained workers, respectively, in either type of job. Then, using integration by parts (see Annex 1), the asset values for firms with P jobs are given by,

$$W_P^t(\varepsilon,\zeta) = \theta - k(\bar{\theta} - \theta) + \left[\int_{\bar{\zeta}(1-\varepsilon)}^{\bar{\zeta}} \max\left(\zeta - w,\ -F\right)\, dG_\zeta(\varepsilon)\right] =$$

$$= \theta - k(\bar{\theta} - \theta) + \left[\left(\bar{\zeta} - w\right) - \int_{w-F}^{\bar{\zeta}} G_\zeta(\varepsilon)\ d\zeta\right], \qquad (1)$$

$$W_P^u(\varepsilon,\theta)=\theta+\left[\int_{\bar{\theta}(1-\varepsilon)}^{\bar{\theta}}\max\left(\theta-w,\ -F\right)\,dG_\theta(\varepsilon)\right]=$$

$$=\theta+\left[\left(\bar{\theta}-w\right)-\int_{w-F}^{\bar{\theta}}G_\theta(\varepsilon)\ d\zeta\right] \tag{2}$$

By the same reasoning, the asset values for firms offering temporary jobs become,

$$W_T^{\,t}(\varepsilon,\zeta)=\theta-k(\bar{\theta}-\theta)+(1-q)\left[\int_{\bar{\zeta}(1-\varepsilon)}^{\bar{\zeta}}\max\left(\zeta-w,\ 0\right)\,dG_{\zeta}(\varepsilon)\right]=$$

$$=\theta-k(\bar{\theta}-\theta)+(1-q)\left[\left(\bar{\zeta}-w\right)-\int_{w}^{\bar{\zeta}}G_{\zeta}(\varepsilon)\ d\zeta\right] \tag{3}$$

$$W_T^{\,u}(\varepsilon,\theta)=\theta+(1-q)\left[\int_{\bar{\theta}(1-\varepsilon)}^{\bar{\theta}}\max\left(\theta-w,\ 0\right)\,dG_{\theta}(\varepsilon)\right]=$$

$$=\theta+(1-q)\left[\left(\bar{\theta}-w\right)-\int_{w}^{\bar{\theta}}G_\theta(\varepsilon)\ d\theta\right]. \tag{4}$$

Note that the terms $w-F$ and w in (1) to (4) turn out to be the reservation productivity cutoffs in P and T jobs, respectively, so that workers with productivities below these cutoffs will see their contracts terminated in the second period. Notice that a higher value of F reduces the productivity cutoff for P workers since, having to pay dismissal costs, firms will may prefer not to sack lower workers with lower productivity. In particular, using the uniform distributions $\zeta\sim U\left[h\bar{\theta}(1-\varepsilon),h\bar{\theta}\right]$ and $\theta\sim U\left[\bar{\theta}(1-\varepsilon),\bar{\theta}\right]$ with $\varepsilon\in[(0,1]$, yields,

$$W_P^t(\varepsilon,\zeta)=\theta-k(\bar{\theta}-\theta)+\left[\frac{\left(h\bar{\theta}-w+F\right)^2}{2\varepsilon h\bar{\theta}}-F\right] \tag{5}$$

$$W_P^u(\varepsilon,\theta)=\theta+\left[\frac{\left(\bar{\theta}-w+F\right)^2}{2\varepsilon\bar{\theta}}-F\right], \tag{6}$$

$$W_T^t(\varepsilon,\zeta)=\theta-k(\bar{\theta}-\theta)+(1-q)\left[\frac{\left(h\bar{\theta}-w\right)^2}{2\varepsilon h\bar{\theta}}\right]. \tag{7}$$

$$W_T^u(\varepsilon,\theta)=\theta+(1-q)\left[\frac{\left(\bar{\theta}-w\right)^2}{2\varepsilon\bar{\theta}}\right]. \tag{8}$$

(II) Workers

Normalizing the value of being unemployed to zero, we next derive the asset values of workers, denoted by V_i, in P and T contracts. We start with those pertaining to trained workers, which yield,

$$V_P^t(\varepsilon,\varsigma)=\left[\int_{w-F}^{\bar{\varsigma}} w\, dG_{\varsigma'}(\varepsilon)+\int_{\bar{\varsigma}(1-\varepsilon)}^{w-F} F dG_{\varsigma'}(\varepsilon)\right]=$$
$$=\frac{(w-F)\left[h\bar{\theta}-(w-F)\right]}{\varepsilon h\bar{\theta}}+F \qquad (9)$$

$$V_T^t(\varepsilon,\varsigma)=(1-q)\int_{w}^{\bar{\varsigma}} w\, dG_{\varsigma}(\varepsilon)=$$
$$=(1-q)\left[\frac{w\,(h\bar{\theta}-w)}{\varepsilon h\bar{\theta}}\right] \qquad (10)$$

The asset values for untrained workers in P and T jobs, $V_P^u(\varepsilon,\theta)$ and $V_T^u(\varepsilon,\theta)$, are similar to (9) and (10) but with $\bar{\theta}$ replacing $\bar{\varsigma}$ in the expression above. Thus, given that h>1, the assumed inequality for wages, namely $F<w<\bar{\theta}$ (and hence $h\bar{\theta}-(w-F)>0$) imply that the asset values of workers are all positive and therefore that their participation constraints are satisfied.

3.3 Decisions on OJT

Using the previous asset values of firms in (5) to (9) we can now compute the ability threshold values, denoted by θ^*, determining whether firms provide OJT to their workers. This is the key decision variable taken by firms take in our model. As regards workers hired under permanent contract, firms would find it profitable to offer them training whenever,

$$W_P^t(\varepsilon,\varsigma)\geq W_P^u(\varepsilon,\theta)$$
$$\Leftrightarrow\quad \theta-k(\bar{\theta}-\theta)+\left[\frac{(h\bar{\theta}-w+F)^2}{2\varepsilon h\bar{\theta}}-F\right]\geq\theta+\left[\frac{(\bar{\theta}-w+F)^2}{2\varepsilon\bar{\theta}}-F\right] \qquad (11)$$
$$\Leftrightarrow\quad \theta\geq\theta_P^*\equiv\bar{\theta}-\frac{(h-1)}{2k\varepsilon h\bar{\theta}}\left[h\bar{\theta}^2-(w-F)^2\right]$$

where θ_P^* is the ability threshold above which firms with P jobs will offer OJT to their workers. Since it is a lower bound, notice that OJT varies inversely with θ_P^*, namely, the lower θ_P^*,the higher the OJT intensity. From (11) it can be observed that, not surprisingly, OJT declines with its cost (k) and increases with its return (h). More interesting is the result that, for a given wage, OJT for permanent workers increases with the firing-cost gap F. The insight is that, as

firing cost go up, workers' job stability increases since lower productivity workers are less likely to be dismissed. This induces a longer expected horizon for the firm to recoup its initial investment on OJT.

Using a similar reasoning we can derive the ability threshold for temporary workers, such that,

$$
\begin{aligned}
& W_T^t(\varepsilon,\varsigma) \geq W_T^u(\varepsilon,\theta) \\
\Leftrightarrow \quad & \theta - k(\bar{\theta}-\theta) + (1-q)\left[\frac{(h\bar{\theta}-w)^2}{2\varepsilon h\bar{\theta}}\right] \geq \theta + (1-q)\left[\frac{(\bar{\theta}-w)^2}{2\varepsilon\bar{\theta}}\right] \qquad (12) \\
\Leftrightarrow \quad & \theta \geq \theta_T^* \equiv \bar{\theta} - \frac{(h-1)}{2k\varepsilon h\bar{\theta}}(1-q)\left[h\bar{\theta}^2 - w^2\right]
\end{aligned}
$$

where θ_T^* is the corresponding ability threshold above which firms with T jobs provide OJT to their workers. As before, OJT is decreasing in k and increasing in h. Yet, OJT decreases as q increases since a higher quit rate implies more job instability and therefore a shorter expected duration for the firm to recover the OJT investment on the worker.

A comparison of θ_P^* and θ_T^* immediately reveals that an individual holding a temporary contract will unambiguously receive less training than under a permanent contract as long as $F>0$. In effect, this result holds whenever $\theta_P^* < \theta_T^*$ which is equivalent to $\left[h\bar{\theta}^2 - (w-F)^2\right] > (1-q)\left[h\bar{\theta}^2 - w^2\right]$. Given our assumption that firms pay the same wage for both types of contract and its allowed range of variation, the previous inequality is always verified. Finally, recalling that $q'(F)>0$, it is straightforward to find that the higher the value of F (i.e., the higher the degree of dualism in the labour market) the higher the OJT gap between permanent and temporary workers.

4. DATASET AND VARIABLES

The population of interest is defined by those individuals aged 16- 65 who participated in the Spanish section PIAAC and had the status of employees at the time of the survey. Out of the 6055 individuals who fully responded to the questionnaires, the sample size of those who were employees is reduced to about 2500 individuals.

Our main control variable, *temporary contract*, is a dummy variable that takes the value 0 when the individual has a permanent contract and value 1 when the contract is a temporary one (defined in PIACC as having a fixed-term contract, temporary employment with an employment agency, or some kind of training contract).

As argued earlier, our empirical approach consists of two stages. First, we focus on testing whether having a temporary contract is associated with a lower propensity of being involved in training activities provided by the firm. Next, we analyze how the amount of and intensity of

training affects the employees' human capital, approximated by literacy and numeracy skills according to the scores available in the PIAAC database. Both the illustrative model and the related literature suggest that temporary workers in highly segmented labour markets tend to accumulate less human capital through OJT than workers with permanent contracts. As argued in the Introduction, this could be due to supply and demand factors. As regards the former, firms invest less in the specific human capital of their temporary workers because they anticipate that the short duration of this type of contract, aggravated by a highly dual EPL as our model highlights, does not make it profitable to invest on their workers. With regard to demand, as stressed by Dolado et al. (2013), temporary workers have lower incentives to get trained because, due to the low temp-to-perm conversion rates, this does not help them to reach stable jobs.

To empirically evaluate whether these predictions hold, we consider as training outcomes two proxies of specific human capital accumulation at the workplace. First, we use a dummy variable, D^{OJT}, which takes the value 1 if the worker claims to have attended a training session organized in the workplace or provided by their supervisors or colleagues in the past 12 months, and 0 otherwise. According to PIAAC, these training sessions should be characterized "by planned periods of training, instruction or practical experience, using the normal methods of work." They include, for example, "training or instruction courses organized by the directors, managers or colleagues to help the respondent to do their job better or to familiarize them with their new tasks."

While the D^{OJT} dummy variable is an indicator of training activities within the firm, it does not accurately reflect the intensity of these activities. To address this issue, we use a second outcome variable which measures the number of training activities attended by the worker during the past 12 months, n^{OJT}. It should be noted that, in accordance with the design of the survey, the respondent should count all training tasks that are interrelated as a single activity, even if they have taken place on different days,. The essential feature of each activity is that it should be designed "to facilitate the adaptation of personnel to a particular set of new competences". Therefore, the variable n^{OJT} reflects the intensity of investment in new competences regardless of their level of difficulty or the time that has been devoted to each one of them. [1]

According to our theoretical reasoning, workers under temporary contracts receive less OJT than permanent workers those with permanent contracts. Yet, an interesting feature which has not been explicitly considered in our model is that, despite receiving less training, temporary workers may not perceive this as a problem since their skills requirements on these jobs could be low in general. The PIACC database allows us to explore this issue through the

1.PIAAC also provides a subjective measurement that reflects to some degree the intensity with which the worker acquires new skills in the job. In the survey, workers are asked to indicate, approximately, the frequency with which their job involves learning new skills. Besides the problem of interpretation often encountered with such subjective statements, this variable does not have enough variation to be really informative: over 90% of respondents reply that their job involves learning new skills "at least once a month." For these reasons, we have decided to discard it in this study.

availability of a subjective measure of workers' demand of higher OJT. In particular, we use a dummy variable, denoted as $more^{OJT}$, which takes the value 1 if the worker claims that she needs more training to perform her job tasks properly, and 0 if otherwise.

It is plausible that differences in the training processes within the firm generate differences in workers' promotion opportunities to reach better contracts. However, the extent to which these differences in human capital accumulation could lead to differences in general human capital that the worker could use in other firms remains an open question. To address this issue, we analyze the effect of OTJ activities on the two measurements of general cognitive skills reported in the Spanish PIAAC sample, namely, the scores achieved on the literacy and numeracy tests.

Table 1 presents descriptive statistics of the main outcome variables in the subsequent empirical analysis, i.e., the availability and intensity of OTJ activities, the perception on the efficacy of the training process and, finally, the scores in both tests.

Table 1. Descriptive Statistics (PIAAC)

Panel A	**No. Obs.**	**Pop. 16- 65 years[a]**	**Employed[a]**	**Employees[a]**	
PIAAC sample	6055				
Sample with ages between 16 and 65 years old	5954				
Type of workers	3060	53.18			
Self-employed	547	9.41	17.69		
Employee	2513	43.77	82.31		
Temporary	589	9.71	18.26	22.18	
Panel B	Training and abilities by type of contract[a]		Difference (%)	Stand. Dev.[b]	P-value
	Permanent	**Temporary**			
Percentage of employees with training activities	48.43	31.81	**16.62 (52.25)**	2.35	0.000
Average number of activities	2.85	2.23	**0.62 (22.32)**	0.29	0.053
Percentage which believes it needs training	39.55	35.42	**4.13 (11.66)**	2.48	0.096
Index of literacy[c]	262.68	255.63	**7.05 (2.76)**	2.10	0.001
Index of numeracy [c]	260.94	246.81	**14.13 (5.73)**	2.00	0.000
	$D^{OJT}=1$	$D^{OJT}=0$			
Index of reading literacy [c]	268.89	254.69	**14.20 (5.58)**	1.51	0.000
Index of numeracy [c]	268.09	249.44	**18.65 (7.48)**	1.49	0.000

Notes: A worker has a temporary contract when he/she has a fixed-term contract, a temporary job with a temporary work agency or any type of training contract. D^{OJT} takes the value 1 when the worker claims to have attended training activities in the last 12 months, and 0 in the opposite case. The indices of *literacy* and *numeracy* are measurements attributed from the responses to exercises which are part of the survey. *Literacy* measures the ability to understand and use texts (written or in a digital format) in different contexts, while *numeracy* measures the use, application, interpretation and communication of mathematical information and ideas.
[a] Percentages of population estimated using weights of the whole sample as weightings.
[b] Using the replication method JK1.
[c] Using the attributed value 5.

At first sight, the results of Table 1 are fairly consistent with the basic predictions of the model. As can be observed, temporary workers undertake less training activities than permanent workers. This finding is robust both in the *extensive margin* (i.e., using D^{OJT} as a measure of the

availability of training) and the *intensive margin* (i.e., using n^{OJT} as a measure of the intensity of training). Further, in line with our previous conjecture, the results for $more^{OJT}$ suggest that the reduced OJT of temporary workers does not translate into a greater demand of extra training. Finally, both literacy and numeracy scores are significantly lower among temporary workers.

However, it is important to stress that the negative relationship found between temporary contracts and OTJ activities does not necessarily imply causality. In particular, the results in Table 1 do not allow us to state that workers accumulate less specific human capital in the firm because their contract is a temporary one. The main reason for why this may be a misleading conclusion is that both the type of contract and training activities could be jointly affected by other variables. For example, consider a worker with a high level of motivation to perform well in the job. Then, precisely because of this feature, this individual could influence his/her employer to obtain a permanent contract and freely choose to participate intensively in OJT activities. In that case, we would observe a positive correlation between having a permanent contract and participation in training activities but the intense process of accumulating specific human capital would be the result of the high motivation of the individual, not of holding a permanent contract. To avoid such confounding issues in our analysis, it is essential to control for a vast array of potential factors which simultaneously affect the respective outcome variables (i.e., both variables related to training activities as well as the skills competence variables) and the treatment variable (in our case, the type of contract).

To do so we present in the next section the estimates of several econometric models which include two types of controls. First, we use the individuals' basic characteristics such as age, gender, educational attainment, marital status, whether they have children, immigrant status and parental educational background. In addition, we will also control for a potentially key variable which often is not available in other datasets but which PIAAC reports. This is the degree of motivation of the worker, measured by a dummy variable, denoted as *motivation*, which takes the value 1 when the individual claims to feel identified "to a great extent" or "to a very great extent" with learning new skills, with working out difficult tasks, with relating new things to what they already know, and with seeking more information when they do not understand something". Secondly, in some specifications we also control for occupational dummies (as measured by the ISCO08 classification to two digits) and industry dummies (as measured by the one-digit classification from the fourth ISIC revision).

In addition to standard regression models in this paper we follow a second approach which involves controlling for selection in observables using propensity score matching techniques (PSM). In our setup, PSM involves matching each individual holding a temporary contract with one or more individuals who hold permanent contracts but who are similar in all other observable characteristics to a temporary worker. In this way, we effectively create matched "treatment" and "control" samples who hold temporary and permanent contracts being identical in every other observable respect (Rosenbaum and Rubin, 1983). If matching is sufficiently good, differences in mean outcomes (eg., OJT availability and intensity, cognitive scores) may be used as estimates of the causal effect of holding a temporary contract . As is well known, one advantage of PSM over regression analysis is that it is non-parametric instead of imposing functional form restriction, such as linearity on the outcome equations.

5. EMPIRICAL RESULTS

5.1 Regression models

The first set of results concerning regression models is reported in Table 2. They are expressed in terms of marginal effects and correspond to the estimation by maximum likelihood of a *probit* model to explain the probability of receiving training at the workplace (D^{OJT} = 1) depending on our explanatory variable of interest, *temporary contract*, and on a wide array of controls.

Table 2. Probit Model (Marginal Effects). Dependent variable: D^{OJT}

	[1]	[2]	[3]	[4]
Temporary contract	**-0.1636*** **	**-0.0923*** **	**-0.0795*** **	**-0.0774*** **
	(0.0223)	**(0.0265)**	**(0.0284)**	**(0.0306)**
Job tenure	---	0.0053***	0.0049***	0.0035**
		(0.0014)	(0.0015)	(0.0016)
Age	---	0.0132*	0.0179**	0.0150*
		(0.0071)	(0.0084)	(0.0088)
(*Age*) ^{2} / 100	---	-0.0002**	-0.0002**	-0.0002**
		(0.0001)	(0.0001)	(0.0001)
Woman	---	-0.0359*	-0.0376*	-0.0117
		(0.0205)	(0.0219)	(0.0270)
Middle educational level	---	0.1279***	0.1359***	0.0947***
		(0.0286)	(0.0305)	(0.0329)
High educational level	---	0.2731***	0.2550***	0.1578***
		(0.0227)	(0.0258)	(0.0328)
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
No. obs.	2503	2501	2258	2206
Pseudo R-sq.	0.015	0.065	0.074	0.102
Prob. obs.	0.4371	0.4374	0.4353	0.4424

Note: The marginal effects of the dichotomous variables are calculated as the change of the estimation of the probability when the variable changes from 0 to 1. The *temporary contract* variable is a dichotomous variable which takes the value 0 when the individual has a permanent contract and 1 when he/she has a temporary contract. *Job tenure* measures the duration of the current job. *Middle educational level* is a dichotomous variable which takes value 1 when an individual has vocational training at an intermediate level, the baccalaureate, or old higher baccalaureates and pre-university courses. *High educational level* takes a value of 1 when the individual has a tertiary education degree. The variables about the educational level of the parents are dichotomous variables for the three levels of education. *Civil status* reflects whether the individual is married, *children* reflects whether they have children, and *immigrant* reflects whether the individual was born in this country. The *motivation* variable takes the value 1 when the individual claims to feel "greatly" or "very greatly" identified with the learning of new skills, working out difficult tasks, relating new things to what they already know, and looking for information when they don't understand something. The variables of *occupation* are obtained with the ISCO08 to two digits while the variables of *sector* are obtained with the one-digit classification from the fourth ISIC revision.
Levels of significance: * p<0.10, ** p<0.05, *** p<0.01

In column [1], we present the results in the case when the type of contract is the only covariate in the *probit* model. In column [2], job tenure, worker's age and its square (as a proxy for potential experience, given the higher educational level reached), gender (female = 1) and educational level (with a low level as the reference category) are included as additional covariates. In column [3], the previous group of controls is extended by also including dummy variables of the parents' educational level, marital status, immigrant status and the degree of motivation of the worker. Finally, in column [4], dummy variables of sector/industry and occupation are also added, thereby constituting the more general specification of the *probit* model. For convenience, this ordering by columns, from the most restrictive specification to the most general, is kept for the rest of Tables to be presented in this section. It is also important to note that the number of observations in the different specifications varies slightly because some controls are not available for all individuals analyzed in the larger samples.

The main result in Table 2 is that, in line with our main hypothesis, the estimated coefficient on the "*temporary contract*" dummy variable is negative and statistically very significant in all specifications. Furthermore, the estimates suggest that the marginal effect is quantitatively very relevant. In the absence of further controls (column [1]) , having a temporary contract is associated with a reduction in the probability of receiving OTJ of 16.4 percentage points (pp.), where the baseline probability of receiving OTJ among permanent workers is 43.7%. By progressively adding further covariates, the estimated marginal effect is halved, falling to about 8-9 percentage points, a result which is fairly robust across columns [2] to [4]. Therefore, one can infer from this evidence that the detrimental effect of contractual instability on the specific training received in the workplace is sizeable. For example, the marginal effect in the specification with all of the controls (reported in column [4]) implies that, for the typical worker with a permanent contract, switching to a temporary contract reduces the probability of receiving training at the workplace by 18 % (= -0.08/.44).

With respect to the other controls, it is worth pointing out that a higher educational level increases the probability of receiving OJT and also that that probability also increases with age up to a threshold of about 30 years due to the concave shape of the quadratic polynomial for this variable. Furthermore, although statistically less significant than the above-mentioned estimates, there is evidence about women having a lower probability of OJT, although this gender effect disappears as the number of controls in columns [3] and [4] is extended. In this regard it should be pointed out that another variable (not reported in Table 2) which has been included in all the specifications is whether the individual has a part-time job (where the reference category is full-time work). Its inclusion did not change any of the previous results, either in this Table or in any of those shown further below, but it did cancel out the above-mentioned gender effect. This is probably explained by the high incidence of part-time working schedules among female employees, making it impossible to identify whether the relevant covariate is gender or working part time. Finally, although not reported to save space, the variables of immigrant status and motivation proved to be significant in columns [2] and [3], with negative and positive signs, respectively. However, the effect of *motivatio*n becomes weaker on adding the set of occupational and industry dummy variables.

We next report in Table 3 the results from estimating the coefficients of a count data model based on the *Negative Binomial* distribution (this distribution is used after rejecting the equality of mean and variance implied by the more restrictive *Poisson* distribution), in order to detect the discrete nature of the dependent variable, namely, the number of training activities which the worker has attended over the past 12 months, n^{OJT}. The results for our variable of interest, *temporary contract*, are similar to those obtained in Table 2, in the sense that this covariate systematically exhibits a negative sign, indicating again that holding a temporary contract reduces the number of OJT activities. However, unlike what happened in the *probit* model for D^{OJT}, the estimated coefficient on this variable is only statistically significant at the 10 percent level when all the controls are included. This may be because the number of individuals who report this information (around 1000) represent less than half the sample size used in the *probit* model.

Table 3. Binomial Negative Model (Coefficients). Dependent variable*: n^{OJT}*

	[1]	[2]	[3]	[4]
Temporary contract	**-0.1999*** **	**-0.1666** **	**-0.14845** **	**-0.1299***
	(0.0512)	**(0.0614)**	**(0.0684)**	**(0.0709)**
Job tenure	---	0.0076*	0.0052	0.0049
		(0.0039)	(0.0041)	(0.0043)
Age	---	-0.0152	-0.0417*	-0.0109
		(0.0193)	(0.0231)	(0.0236)
(*Age*) ^{2} / 100	---	0.0066	0.0401	0.0043
		(0.0239)	(0.0277)	(0.0281)
Woman	---	-0.0144	-0.0367	-0.1367**
		(0.0543)	(0.0576)	(0.0657)
Middle educational level	---	0.0574	-0.014	-0.0645
		(0.0846)	(0.0900)	(0.0923)
High educational level	---	0.2234***	0.0954	0.0094
		(0.0688)	(0.0769)	(0.0906)
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
Dispersion Coefficient	-0.8518***	-0.8766***	-0.8999***	-1.1637***
	(0.0689)	(0.0695)	(0.0736)	(0.0823)
No. obs.	1092	1092	981	974
Pseudo R-squared	0.001	0.005	0.015	0.056

Note: The variable n^{OJT} measures the number of training activities which the worker has attended in the last 12 months. See the note in Table 2 for the definition of the controls.
Levels of significance: * p<0.10, ** p<0.05, *** p<0.01

Finally, in Table 4 we present the results of estimating another *probit* model, this time applied to explaining the probability associated with the dummy variable on the need of a higher level of training, $more^{OJT}$. Although the estimated marginal effect on the *temporary contract* variable

is positive in all cases, it is statistically significant only in column [1]. In agreement with our discussion in the previous section, this lack of statistical significance could be due to the fact that some of the additional controls (especially the educational level or the dummies of occupation and sector) may be detecting the potential mismatch between the training of the individual and the job requirements in a much more accurate way than the type of contract the individual holds.

Table 4. Probit Model (Marginal Effects). Dependent variable: *more*^{OJT}

	[1]	[2]	[3]	[4]
Temporary contract	**0.0532****	**0.0168**	**0.0148**	**0.0175**
	(0.0225)	**(0.0260)**	**(0.0276)**	**(0.0295)**
Job tenure	---	0.0016	0.002	0.0011
		(0.0013)	(0.0014)	(0.0015)
Age	---	0.0210***	0.0201**	0.0215***
		(0.0067)	(0.0080)	(0.0083)
(*Age*)^{2} / 100	---	-0.0003***	-0.0003***	-0.0003***
		(0.0001)	(0.0001)	(0.0001)
Woman	---	-0.0209	-0.0251	0.0126
		(0.0197)	(0.0210)	(0.0259)
Middle educational level	---	0.0807***	0.0749**	0.0483
		(0.0282)	(0.0300)	(0.0319)
High educational level	---	0.1588***	0.1492***	0.0685**
		(0.0228)	(0.0257)	(0.0321)
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
No. obs.	2508	2506	2262	2235
Pseudo R-sq.	0.002	0.023	0.025	0.071
Prob. obs.	0.3792	0.3795	0.382	0.3834

Note: The marginal effects of the dichotomous variables are calculated as the change in the estimate of the probability in the caseof a change of the variable from o to 1. The variable *more*^{OJT} takes the value 1 if the worker claims to need more training in order to properly perform his/her work tasks and 0 if otherwise. See the note from Table 2 for the definition of the controls.
Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01

A brief summary of the main findings reported so far indicates that holding a temporary contract exhibits a negative relationship with the first two outcome variables (training availability and intensity) we have considered. However, we do not find evidence that temporary workers demand more training which we . Yet, this Moreover, the finding that this estimated relationship effect is more robust to model specification and highly statistically significant only when the dependent variable is D^{OJT} may be due to the lower measurement error of this outcome variable than the other two.

In view of these results, the next step is to check whether the availability or the intensity of OJT activities has an effect on the scores obtained by the individuals in the PIAAC *literacy* and *numeracy* tests. Tables 5 and 6, respectively, present the results derived from estimating a

linear regression model by OLS, where the outcome variables are the scores and the variables of interest are the two measurements of OJT for which a greater relationship to temporary contract has been found, namely D^{OJT}, and to a lesser extent, n^{OJT}. Note that in both models the *temporary contract* treatment variable is not included as a regressor in order to test if the effect of this variable on the scores is mainly brought about through the amount of OTJ received at the workplace, and not directly.

Tables 5 and 6 present the estimated coefficients in a regression where the dependent variable is *literacy* and *numeracy*, respectively. Columns [1] and [2] in both Tables differ in that D^{OJT} is used as a covariate in the first column while n^{OJT} is used in the second column.

Table 5. Ordinary Least Squares (Coefficients). Dependent variable*: Literacy* scores.

	[1]	[2]	[3]	[4]
D^{OJT}	**3.5467****	---	**2.072**	**1.2566**
	(1.5939)		**(1.6009)**	**(1.6095)**
n^{OJT}	---	**0.5380****	---	---
		(0.2557)		
Job tenure	0.2672**	0.3766**	0.1667	0.0734
	(0.1059)	(0.1727)	(0.1085)	(0.1119)
Age	2.6996***	2.6412***	3.4779***	3.6443***
	(0.5096)	(0.8166)	(0.5709)	(0.5850)
$(Age)^2 / 100$	-4.2135***	-4.1243***	-4.9442***	-5.1794***
	(0.6347)	(1.0341)	(0.6886)	(0.7046)
Woman	-9.2612***	-7.8979***	-7.4145***	-9.7869***
	(1.5476)	(2.3168)	(1.5449)	(1.9085)
Middle educational level	24.1234***	24.1112***	21.7160***	17.6391***
	(2.2114)	(3.6625)	(2.2112)	(2.3179)
High educational level	45.3710***	45.8212***	36.8107***	24.6992***
	(1.8098)	(2.8883)	(1.9208)	(2.2671)
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
No. obs.	2807	1162	2536	2475
R-sq.	0.250	0.219	0.295	0.327

Note: Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01

As can be observed, the results indicate that both variables exhibit a positive relationship with on scores in the PIAAC tests, though its statistical significance is low in the last two columns of Table 5. Furthermore, this estimated coefficient tends to be larger and statistically more significant in Table 6, where the relationship between D^{OJT} and *numeracy* is examined. Hence, from the comparison of the estimates in both Tables with the raw differences reported in Table 1 between the PIAAC scores achieved by employees with and without OJT (14.2 pp. in *literacy*

and *18.6* pp. in numeracy), we get that, *ceteris paribus*, the availability of such specific training activities account for 15 % (2 pp.) and 28% (5 pp.) of the raw score gaps in *literacy* and *numeracy*, respectively.

Table 6. Ordinary Least Squares (Coefficients). Dependent variable: *Numeracy* scores.

	[1]	[2]	[3]	[4]
D^{OJT}	**7.4523*** **	---	**5.7716*** **	**3.7712** **
	(1.6198)		**(1.6325)**	**(1.6500)**
n^{OJT}	---	**0.3888**	---	---
		(0.2555)		
Job tenure	0.3878***	0.3854**	0.2628**	0.1511
	(0.1055)	(0.1728)	(0.1094)	(0.1135)
Age	2.5632***	3.1910***	3.1082***	3.2456***
	(0.5295)	(0.8415)	(0.5917)	(0.6103)
$(Age)^2 / 100$	-4.1618***	-4.8786***	-4.6634***	-4.8173***
	(0.6566)	(1.0565)	(0.7117)	(0.7327)
Woman	-16.9921***	-14.6935***	-16.3784***	-16.4630***
	(1.5759)	(2.3156)	(1.5976)	(1.9500)
Middle educational level	25.9530***	27.3051***	23.1693***	18.6021***
	(2.2359)	(3.6899)	(2.2672)	(2.4043)
High educational level	48.1732***	48.5652***	39.9913***	27.4181***
	(1.8621)	(3.0138)	(1.9874)	(2.3328)
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
No. obs.	2807	1162	2536	2475
R-sq.	0.288	0.247	0.322	0.35

Note: See the notes of Tables 1 and 2 for definitions of the variables.
Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01

Therefore, our evidence suggests that the availability of training at the workplace and, to a lesser extent, the intensity of this training is associated with a significant improvement of workers' cognitive skills. In order to check if this correlation is mainly due having a temporary contract, this covariate is also included in the previous specifications, in addition to the two training variables. The main result that we find (not reported in the Tables for sake of brevity) is that the coefficient on *temporary contract* is never significant and the estimated coefficients on D^{OJT} and n^{OJT} hardly experience any significant changes. Thus, we conclude that OJT plays an important role in explaining the PIAAC scores.

Finally, Tables 7 (dependent variable: *literacy*) and 8 (dependent variable: *numeracy*) report the estimated coefficients obtained from the reduced forms of the previous models in which the two training variables considered previously are now replaced by the *temporary contract* covariate, to which the remaining array of controls are gradually added. The idea of these

reduced forms is that, if the mechanism we explore is valid, we should expect a negative relationship of this treatment variable on the PIAAC scores. In other words, *ceteris paribus*, being a temporary worker has a negative effect on the scores mainly through the reduction of the amount of OJT provided at the workplace and not so much through other alternative channels. The results are supportive for this hypothesis, since the coefficients on the *temporary contract* dummy variable is always negative and statistically significant in all specifications, albeit only at the 10 percent level in columns [3] and [4]).

Table7. Ordinary Least Squares (Reduced Form). Dependent variable: *Literacy* scores

	[1]	[2]	[3]	[4]
Temporary contract	**-6.5503*** **	**-5.0915*** **	**-4.9321** **	**-4.0831* **
	(2.2086)	**(2.1914)**	**(2.3618)**	**(2.2537)**
Job tenure	---	0.2758**	0.1982*	0.0748
		(0.1174)	(0.1204)	(0.1236)
Age	---	3.2708***	3.6018***	3.5278***
		(0.5666)	(0.6226)	(0.6257)
(*Age*) ^{2} / 100	---	-0.0479***	-0.0511***	-0.0505***
		(0.0070)	(0.0075)	(0.0075)
Woman	---	-8.3752***	-7.2715***	-9.6194***
		(1.6260)	(1.6280)	(1.9786)
Middle educational level	---	22.3422***	21.6332***	17.4162***
		(2.3669)	(2.3380)	(2.4210)
High educational level	---	42.0032***	37.3696***	24.7004***
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
No. obs.	2513	2447	2266	2244
R-sq.	0.003	0.262	0.291	0.321

Note: See the notes of Tables 1 and 2 for definitions of the variables.
Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01

Table 8. Ordinary Least Squares (Reduced Form). Dependent variable: *Numeracy* scores.

	[1]	[2]	[3]	[4]
Temporary contract	**-12.5522*** **	**-4.5196** **	**-3.8685* **	**-3.5884* **
	(2.2851)	**(2.2124)**	**(2.2375)**	**(2.2010)**
Job tenure	---	0.3751***	0.2631**	0.1115
		(0.1190)	(0.1217)	(0.1253)
Age	---	3.2379***	3.4562***	3.4258***
		(0.5779)	(0.6392)	(0.6438)
(*Age*) ^{2} / 100	---	-0.0486***	-0.0509***	-0.0503***
		(0.0071)	(0.0077)	(0.0077)
Woman	---	-15.8232***	-15.6563***	-15.7823***
		(1.6537)	(1.6757)	(2.0082)
Middle educational level	---	23.6664***	22.8811***	18.3916***
		(2.3976)	(2.3863)	(2.4894)
High educational level	---	44.2566***	40.2667***	27.2830***
		(2.0353)	(2.0713)	(2.3874)
Educational level of parents	No	No	Yes	Yes
Civil status, children	No	No	Yes	Yes
Immigrant	No	No	Yes	Yes
Motivation	No	No	Yes	Yes
Dummies by Sector and Occupation	No	No	No	Yes
No. obs.	2513	2447	2266	2244
R-sq.	0.012	0.289	0.313	0.345

Note: See the notes of Tables 1 and 2 for definitions of the variables.
Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01

5.2 Propensity score matching

We next present estimates of the relationship between temporary contract and OJT availability and numeracy scores using a PSM estimation method. For illustrative purposes, the reported results are restricted to these two outcome variables because they are the ones where the estimates presented above exhibited higher statistical significance. We use the nearest neighbour matching procedure which is available in the *teffects* Stata 11 command, because it computes more accurate standard errors than those computed by bootstrapping in other popular PSM estimation commands, as is the case of *psmatch2* (see Abadie and Imbens, 2011). After imposing the common support condition, we report two estimates of interest that are provided by this command: the average treatment effect (ATE) and the average treatment effect on the treated (ATT).

To assess the quality of the matching, Table 9 presents the differences between the mean values of a subset of the covariates (occupational and industry dummies are not reported to save space) which are used to match the treatment (temporary contract, TC) and control (permanent contract, PC) groups. Overall, the figures in Table 9 confirm that our treatment and comparisons, though initially different, appear to be very similar after the matching with

no significant statistical differences in the means of the reported values and only two significant ones among the 42 background variables used in PSM. They correspond to two of the (omitted) occupational and industry dummies.

Table 9. Quality of matching procedure

	Treated (TC)	Control (TC)	% bias	*p*-value
Tenure	3.6482	3.6825	-0.9	0.145
Age	34.914	34.389	1.5	0.424
Age2	13.348	13.083	2.1	0.597
Female	0.5335	0.5493	-1.3	0.126
Deduc2	0.2178	0.2071	2.6	0.662
Deduc3	0.3214	0.2978	7.9	0.223
Deduc4	0.0071	0.0059	4.6	0.469
Married	0.5214	0.5032	3.9	0.542
Children	0.4464	0.4257	4.3	0.485
Migrant	0.2071	0.2136	-3.0	0.244
Motivation	0.4534	0.4732	-4.1	0.313
Df_ed2	0.1517	0.1375	1.0	0.497
Df_ed3	0.1142	0.1071	2.3	0.704
Dm_ed2	0.1182	0.1092	8.2	0.417
Dm_ed3	0.0696	0.0864	-6.7	0.195

Note: Calculations performed with the *teffects* module in Stata 11. Statistics for the remaining controls considered in column (4) of Tables 2 and 8 have been omitted for brevity but are available upon request.

Finally, Table 10 displays the ATE (column 2) and ATT (column 3) estimates of the relationship between *temporary contract* and OJT availability (D^{OJT}) and *Numeracy* test scores using PSM estimation. For convenience we also append in column 1 the estimate of the marginal effect of temporary contract on D^{OJT} appearing in Table 2, as well as the OLS estimate of the coefficient

on such variable in the regression model for the *Numeracy* score in Table 8. As can be observed, the PSM estimates are very similar to the probit and OLS ones. Although they are slightly less significant than the probit/OLS ones, they point out to an unambiguously negative effect of holding a temporary contract on both outcome variables. In fact the ATE estimates are a bit higher than the ATT and probit/OLS estimates, suggesting that to the extent than temporary contract has a causal effect on these two outcomes, that effect would be somewhat higher for individuals less likely to work under have such a contract.

Table 10. Temporary contract, training availability and numeracy score

	[1] Probit/OLS	[2] PSM:ATE	[3] PSM: ATT
D^{OJT}	-0.0765***	-0.1035***	-0.0699**
	(0.0293)	(0.0334)	(0.0323)
Numeracy score	-3.5884*	-5.9952**	-4.1304*
	(2.2010)	(2.5925)	(2.6002)

Note: Column 1 reports the probit marginal effects presented in in Table 2 whereas columns 2 and 3 show ATE and ATT-PSM estimates including all the covariates in the most extensive specification as controls. We impose the common support condition using the *teffects* Stata command which implements nearest-neighbour matching on an estimated propensity score. The standard errors implemented in *teffects psmatch* are those derived by Abadie and Imbens (2012).

Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01

Overall the results presented in this section are consistent with the basic prediction of our model. Temporary workers are significantly less likely to engage in OJT activities at the workplace that workers under permanent contracts, even after controlling for a wide array of individual and job characteristics which include workers' motivation. By contrast, temporary workers do not seem to differ from permanent workers in their perceptions regarding the appropriateness of their training with respect to the skills requirements in their current jobs. Finally, both the scores on literacy and numeracy skills are significantly lower for workers who receive less training. Moreover, among those who receive OJT, the scores are lower for those who receive less training.

6. CROSS-COUNTRY EU EVIDENCE ON OJT AND SKILLS GAPS

To provide further evidence on the validity of the mechanisms discussed in the previous two sections, we devote this section to report results for four EU reference countries about which PIAAC contains information on all the variables which has been used before in the empirical analysis carried out for Spain. These four countries are classified in two groups,

(I) France and Italy as two other examples of countries with dual labour markets but to a lesser extent than Spain.

(II) Denmark and the UK as examples of more unified labour markets where temporary contracts are used by firms as stepping stones to more stable jobs rather than as dead ends (see Booth et al, 2002).

In Panel A of Table 11 PIAAC-based information is reported for Spain (also included in group I) and the four reference countries concerning the following outcomes: (i) rates of temporary work, (ii) perm-temp gaps in the availability of OJT, (iii) perm-temp gaps in Numeracy scores, and (iv) perm-temp gaps in Literacy scores. Paralleling the discussion for the case of Spain, Panel B presents in turn the values of two main indicators of the degree of dualism in those countries: (i) the 2012 EPL gap between the firing costs (in terms of weekly wages) of an unfair dismissal of a permanent worker with five years of tenure in a firm and the severance pay associated to hiring five temporary workers in sequence with a one-year contract each, and (ii) the temp-to perm conversion rates in 2010. To compute the EPL gap we have made use of the information provided in the Doing Business dataset of the World Bank as well as of the results reported in Boeri et al (2013). For example, in 20012 the dismissal costs of an unfair dismissal of a permanent worker in Spain were 33 days of wages per year of service, so that after 5 years the total amount received by the worker would be 165 days of wages (=5x33). Each temporary worker was compensated with 10 days of wages per year of services for the non-renewal of her contract, so that the cost of the alternative strategy of hiring five temporary workers in sequence amounts to 50 days of wages (=5x10). Thus the EPL gap is 115 days of wages (165-50) or about 16.6 weekly wages. As regards the temp-to-perm transition rates, they have been taken from Eichhorst (2013).

As can be observed in Panel A, the countries in group (I) tend to have slightly higher rates of temporary work than the countries in group (II) but much higher gaps in terms of OJT availability, being this gap even negative in Denmark. The fact that the differential in OJT availability is high even when the rates of temporary work are not too dissimilar possibly reflects that temporary contracts in group (II) play the role of springboards to better jobs whereas they are often dead-end jobs in group (I). Countries in group (II) exhibit lower gaps in Numeracy skills but higher gaps in Literacy skills. Concerning set of indicators of labour market dualism, as expected countries in group (II) have much lower EPL gaps and much higher temp-to- perm transition rates confirming the interpretation given above about the probation nature of temporary jobs in those countries.

Next, Table 12 presents the estimated coefficients for these countries of the *temporary contract* dummy on the four main outcome variables that were considered before: OJT availability (D^{OJT}), OJT intensity (n^{OJT}), *Literacy* score and *Numeracy* score. For comparative reasons we add the corresponding estimates for Spain in the first column of results. The specification considered is the one with the largest number of covariates.

Table 12. Outcomes and Indicators of Labour Market Dualism in EU reference countries

Panel A	**Outcomes** [(a)]				
	Spain	**France**	**Italy**	**Denmark**	**UK**
Rate of Temporary Employment *(%)*	**27.5**	**17.0**	**22.1**	**16.6**	**20.2**
OJT Gap (Perm - Temp)	**16.6**	**13.6**	**10.9**	**-3.1**	**5.3**
Literacy Score Gap *(Perm - Temp)*	**7.1**	**5.7**	**3.8**	**7.4**	**9.9**
Numeracy Score Gap (Perm - Temp)	**14.1**	**11.8**	**7.1**	**2.9**	**5.2**
Panel B	**Indicators**				
	Spain	**France**	**Italy**	**Denmark**	**UK**
EPL Gap *(wkly. wages after 5 years)* [(b)]	**18,0**	**9.8**	**9.3**	**4.3**	**5.4**
Temp-to-Perm Conversion Rate [(c)]	**6.6**	**13.2**	**21.7**	**43.2**	**51.8**

Notes: The term "Gap" always refer to the difference between workers with permanent and workers with temporary contracts.

[(a)] Source: PIAAC.

[(b)] Gap in firing costs in weekly wages after 5 years of work in the event of a wrongful or unfair dismissal. Source: Doing Business WB and Boeri, T. (2013).

[(c)] Transition rates from temporary to permanent jobs in 20112. Source: Eichhorts (2013).

As can be inspected, though the results for Spain are generally stronger, there is a strikingly similarity with those obtained for France and Italy: having a temporary job has a negative and often statistically significant effect on OJT and competences. By contrast, holding a temporary contract does not have a detrimental effect on either outcome in Denmark and the UK.

Table 10. Summary of Estimated Effects of Temporary Contracts on OJT and PIAAC scores

Dependent Variable	Spain	France	Italy	Denmark	UK
OJT availability D^{OJT}	**-0.0774*** **	**-0.0609*** **	**-0.0494** **	0.0249	-0.0120
	(0.0306)	(0.0244)	(0.0268)	(0.0342)	(0.0253)
no. obs.	2206	3156	2035	2718	4002
OJT intensity n^{OJT}	**-0.1299***	**-0.1034***	**-0.2673***	**0.1169***	-0.0046
	(0.0709)	(0.0574)	(0.1548)	(0.0675)	(0.0675)
no. obs.	974	873	506	1168	2124
Literacy Scores	**-4.0831***	**-2.2708***	**-3.6018** **	0.5237	**1.2345***
	(2.2357)	(1.3324)	(1.7226)	(0.3773)	(0.6234)
no. obs.	2244	3325	2221	2891	4381
Numeracy Scores	**-3.5884***	**-1.1479***	**-2.2561***	0.3505	0.0987
	(2.2110)	(0.6022)	(0.0075)	(0.3876)	(0.0742)
no. obs.	2244	3325	2221	2891	4381

Note: Levels of significance:.* p<0.10, ** p<0.05, *** p<0.01. The reported estimates are marginal effect in the probit model for OJT availability, coefficients in the Negative binomial model for OJT intensity and OLS coefficients in the regressions for Literacy and Numeracy scores.

7. CONCLUSIONS

We began this paper by observing that the Spanish economy has been characterized in the last two decades by its extremely dual labour market, a low fraction of workers, especially temporary ones, than receive training and a poor TFP growth. On the basis of these considerations, our goal here is to analyze how the gap in employment protection between permanent and temporary workers may have affected a relevant determinant of TFP growth, as is the amount and quality of the firm-provided training that workers receive at the workplace.

To address this issue, we first illustrate by means of a simple theoretical model the mechanism linking labour-market dualism to the deficiency in the training of temporary workers. We show that, in a context where wages are not flexible enough and the firing-costs gap between permanent workers and temporary workers is too high, firms are less inclined to convert

unstable contracts into stable ones. In these circumstances, firms have few incentives to invest in the training for temporary workers and this underinvestment may have negative effects on the skills competences that workers acquire at the workplace.

The cross-sectional database for Spain provided by PIAAC allows us to explore these issues. Specifically, the availability of several different OJT measures, as well as workers' scores on literacy and numeracy tests, allows us to check, firstly, the direct relation between the type of contract held by workers and the amount of OJT they receive and, secondly, whether this type of training affects both literacy and numeracy skills of the workers.

We present econometric results for several outcome variables: two measures of training activities (availability and intensity), a measure of workers' perceptions on the need of greater and better OTJ, and two measures of cognitive skills. For each econometric model, we report results using different specifications. In our broader specification we consider (in addition to the *temporary contract* indicator) a wide set individual and job characteristics, including proxy variables of the workers' family background, ability and motivation.

Our main empirical findings support in general our basic hypotheses, namely the existence of a negative relationship between job precariousness and training at the workplace, as well as a positive relationship between the amount /intensity of OJT activities and workers' cognitive skills. Furthermore, the previous detrimental results seem to hold for other two EU reference countries (France and Italy) which, like Spain, also have highly segmented labour markets. By contrast, they turn out to not to be detrimental in another two countries with more unified labour markets where much lower EPL gaps imply that temporary contracts are mostly stepping stones towards more stable jobs rather than dead-ends.

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APPENDIX

(INTEGRATION by PARTS)

For illustrative purposes, let us consider the case of a trained worker under a P contract where we use the notation $R = w - F$ for the productivity cutoff when a shock hits. Then

$$W_P^t(\varepsilon,\zeta) = \theta - C(\theta) + \left[\int_{\underline{\zeta}(1-\varepsilon)}^{\bar{\zeta}} \max\left(\zeta - w,\ -F\right) dG_\zeta(\varepsilon)\right] =$$

$$= \theta - C(\theta) + \left[\int_{\underline{\zeta}(1-\varepsilon)}^{\bar{\zeta}} \max\left(\zeta - w\ + F,\ 0\right) dG_\zeta(\varepsilon) - F\int_{\underline{\zeta}(1-\varepsilon)}^{\bar{\zeta}} dG_\zeta(\varepsilon)\right]$$

$$= \theta - C(\theta) + \left[\int_{\underline{\zeta}(1-\varepsilon)}^{\bar{\zeta}} \max\left(\zeta - w\ + F, 0\right) dG_\zeta(\varepsilon) - F\right]$$

$$= \theta - C(\theta) + \left[\int_{R}^{\bar{\zeta}} \left(\zeta - w\ \right) dG_\zeta(\varepsilon) + F\int_{R}^{\bar{\zeta}} dG_\zeta(\varepsilon) - F\right]$$

$$= \theta - C(\theta) + \left[\int_{R}^{\bar{\zeta}} \left(\zeta - w\ \right) dG_\zeta(\varepsilon) - FG_\zeta(R)\right]$$

Then, integration by parts for the term $\int_{R}^{\bar{\zeta}} \left(\zeta - w\ \right) dG_\zeta(\varepsilon)$ yields

$$W_P^t(\varepsilon,\zeta) = \theta - C(\theta) + \left[\left(\bar{\zeta} - w_P\right) - (R - w)G_\zeta(R)\right] - \int_{R}^{\bar{\zeta}} G_\zeta(\varepsilon) d\zeta - FG_\zeta(R) =$$

$$= \theta - C(\theta)\zeta + \left(\bar{\zeta} - w\ \right) - \int_{R}^{\bar{\zeta}} G_\zeta(\varepsilon) d\zeta$$

where the last equality follows from $(R - w_P)G_\zeta(R) = -FG_\zeta(R)$.