Technology, training and transition: evidence from the Western Balkans[1]

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Abstract

This study addresses the link between technological change and employer-provided training in the Western Balkans. It is hypothesised that firms subject to technological change have an increased demand for skills and one mechanism to accommodate this demand is by providing additional training for their workforce. To test this proposition data are extracted from the European Bank for Reconstruction and Development-World Bank Business Environment and Enterprise Performance Survey (BEEPS) from waves 2002 and 2005. Probit and tobit estimations are used to analyse the impact of technological change upon training incidence and intensity. The findings of this analysis suggest that firms that undergo technological change are indeed more likely to provide training and there is some evidence that they provide a greater training intensity. This positive association between technological change and training suggests that one way to address under-investment in training in the Western Balkans is by enhancing incentives for firms to undertake technological change.

Key words: training, technological change, Western Balkans

JEL: J24, O15.

[1] The authors would like to thank the GDNet-assigned mentor for this paper Professor of Economics Ira Gang for his generous and continuous support and advice. We are grateful to GDNet for financial support for this project. Finally, additional thanks are due to Dukagjin Pupovci and Avdullah Hoti for their contributions.

1. Introduction

The last few decades have witnessed major changes in technologies, accompanied by major increases in the supply of more educated workers and generally rising returns to education (Spitz, 2004). In order for organisations to fully reap the benefits from these changes the availability of appropriate skills in their workforce is crucial (Acemoglu, 1997). Theoretical models have been developed hypothesising a positive relationship between skills development and technological development at firm level for which some supportive empirical evidence is available (Redding, 1996; Acemoglu, 1997 and Scicchitano, 2004). Bassanini et al. (2007) report a positive relationship between investment in R&D as percentage of GDP and training incidence in EU countries suggesting that continuing training plays a key role in augmenting and adapting workforce skills to meet the needs of new technology. However, there remains a scarcity of empirical studies analysing the link between technological change and training provision at firm level and none have addressed this relation in transition economies, where technological changes have generally been extremely rapid in the last two decades. Employer provided training is an important source of human capital development after individuals enter the labour market (Hansson, 2009). Evidence suggests that such training provides benefits both to employers and workers, but the main benefits are reaped by employers (Hansson, 2009). Using data for Russian firms, Tann et al. (2008) find that training increases the productivity of workers. The findings that training provides benefits to firms and that to fully benefit from technological change firms need to upskill their workforce together provide a rationale for employer-provided training. However, analyses available both for developed, developing and transition economies suggest that there is a widespread underinvestment in training (Stevens, 2001; Bassanini et al., 2007; Tan

et al., 2008) which has led to proposals from researchers for government intervention to create incentives for the expansion of training provision.

Below we empirically examine the influence of technological change both on the incidence of training, the probability of firms providing training, and training intensity, the average number of workers that received training over the past 12 months. We use firm level data extracted from the EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS). The regression sample consists of Western Balkans economies: Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia and Yugoslavia (Serbia and Montenegro). Our findings indicate that in Western Balkan economies, technology changes positively impact on both training incidence and intensity. Statistics from the BEEPS survey also reveal that firms in the Western Balkans are less likely to provide training and the share of workers that undertake training is much lower than in firms in more developed economies. Taking into account the relatively lower quality of education in transition economies, low training provision may present an even more important problem, especially if these economies aim to benefit from rapid technological change.

The arguments are structured as follows. Section 2 contains a brief review of human capital developments in transition countries and identifies key trends in the development of the Western Balkan labour markets. Section 3 provides an introduction to the BEEPS dataset, including an explanation of key definitions, followed by the introduction of the main hypotheses and explanation of the research approach adopted. In Section 4 empirical findings are presented and the concluding section summarises the main findings, explores their policy implications and considers how this research programme may be further advanced.

2. Human capital and labour markets in transition

2.1 Human capital and transition

At the start of the transition process in Central and Eastern Europe a common perception was that one of the few advantages possessed by these economies was in the quantity of their human capital. Both in terms of the average years of schooling of their workforce and the proportion of skilled workers they appeared to be well-endowed relative to economies with much higher per capita income. However as shown by Beirne and Campos (2007), just as the factories were inefficient so were the educational systems in CEECs and the outputs from those systems were largely poorly matched with the requirements of the new labour market. Commander and Kollo (2008) show that transition in CEECs exerted a strong bias against unskilled workers, who have disproportionately been displaced from the employed workforce. They find that the structural changes in CEECs which were raising the skill content of blue-collar work have been reinforced by the effects of technological change. Commander and Kollo also point out that much of the previous vocational education and training system in CEECs was designed to produce process and or firm-specific skills: skills not transferable to the restructured or new firms in the emerging market economy. They found in Romania and Hungary, that technological and organisational changes in firms were positively related to this upskilling, however this relationship was absent amongst the more slowly restructuring Russian firms. The latter finding was confirmed by Tann et al. (2008) who found that even the high and rising demand for educated and skilled workers in Russia, together with persistent skill shortages, had not induced most enterprises to take responsibility for training their employees in-house. This evidence of persisting under-

investment in training by Russian firms may have particular relevance to our study of the Western Balkans where industrial restructuring is also relatively slow.

Together these findings suggest that the development of human capital, and of continuing training in particular, may be an important determinant of successful transition. This is turn suggests that both increasing investment in, and reform of, public schooling are important if employment and inequality objectives are to be met, as are the reform of vocational training and improved certification. Indeed, Rutkowski's (2007) analysis of labour market developments in the EU8+2 draws attention to their emerging skill shortages. Skill shortages have become one of the main constraints on business expansion in these economies, partly fuelled by a large out-migration of skilled workers to the EU15. In these countries skill shortages coincide with high unemployment rates and low rates of labour force participation, reflecting mismatch between the supply of human capital and that required by the expanding private sector in these countries.

In this analysis we are firstly concerned about the extent to which the developments in CEECs' labour markets reviewed above are replicated in the Western Balkans. Secondly, we are interested in the extent to which technological and organizational changes in Western Balkan firms have induced the expansion of on-the-job training. We briefly address the first of these questions in the following section.

2.2 Labour Markets in the Western Balkans

The labour markets in the Western Balkans have been relatively slow to adjust to the challenges of gaining competitiveness in a globalised world economy. In this region the achievement of macroeconomic stability was not followed by a rapid recovery of output and subsequently employment, as was generally the case for the EU8 (Mickiewicz, 2005). Instead, long-term and youth unemployment rose whilst participation rates fell and the latter have remained low in these countries. Rather than labour adjustment taking place through job creation in the secondary and tertiary sectors, subsistence agriculture and the informal economy generally expanded their shares of total employment (Rutkowski, 2006, Schiff, et al., 2006).

As shown by Luo (2007) for Croatia, Nikoloski (2007) for Macedonia and Tiongson and Yentsov (2008) for Bosnia and Herzegovina, labour market transitions in the Western Balkans differ significantly by gender, age, education and geographical location. In the economic conditions of the Western Balkans returns to education are disproportionately in the form of an increased probability of finding market employment, rather than in the wage premiums found in more advanced economies (Hoti, 2007, Gjipali, 2007). A further element of labour market adjustment in the Western Balkans has been the relatively low cumulative inflow of FDI (EBRD, 2007), which has elsewhere generally been a key element in promoting productivity growth in transition economies. The relatively slow pace of transitional change in the Western Balkans means that even into the second decade of transition the restructuring of enterprises was disproportionately focused on defensive cost-saving measures, rather than with technological and organisational improvements. Together these characteristics suggest that the interaction between human capital development and technological change in the Western Balkans is likely to be very

different from that found in OECD economies and the more advanced European transition economies.

3. Data, hypotheses and econometric approach

To examine the link between technological change and training provision we extract data from the European Bank for Reconstruction and Development (EBRD)-World Bank Business Environment and Enterprise Performance Survey (BEEPS). The BEEPS is a joint initiative of the European Bank for Reconstruction and Development and the World Bank Group. We use cross-section data for 2002 and 2005 of firms in Western Balkan economies: Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia and Yugoslavia (Serbia and Montenegro).

The principal consideration for the design of the BEEPS 2005 sample was to minimise changes so as to preserve as much comparability with the BEEPS 2002 sample as possible. In both waves, the sample structure for BEEPS was designed to be as representative (self-weighted) as possible of the population of firms within the industry and service sectors, subject to the various minimum quotas for the total sample. The minimum quotas were as follows: the sectoral composition of the total sample in terms of manufacturing versus services was to be determined by the relative contribution of GDP, subject to a 15 percent minimum for each category; at least 10% of the total sample should be in the small, 10 percent in the medium and 10 percent in the large size categories whereas firms employing only one employee and more than 10,000 were excluded; at least 10 percent of the firms had to have foreign control and 10 percent state control; at least 10 percent of the firms were to be exporters; at least 10 percent of firms should be in the category of ‘small city or countryside; in 2002 wave enterprises that were established later than 2000 have been excluded whereas in 2005 those that have been established in 2002, 2003 and

2004 were excluded. Firms operating in sectors subject to government price regulation and prudential supervision were excluded from the sample. However, when designing the sample structure, for certain parameters where statistical information was not available, enterprise populations and distributions were estimated from other accessible demographic and socio-economic data. This was the case for FYROM and Yugoslavia (Serbia and Montenegro). For these countries detailed information of population breakdowns (by sector activity, size, etc) was not readily available, therefore, samples were designed based on other countries with similar demographic/socio-economic profiles. Table 1 provides information on sample size for each country and for the two waves.

INSERT TABLE 1 HERE

According to Synnovate (2005a, b and c) for the countries included in our study, it was mainly the answers provided in relation to questions on financial data, tax evasion and corruption that were of dubious quality. Fortunately in our case, none of these questions are central to our proposed analysis, though in FYROM Albanian-owned companies declined to participate in the study. There are no other significant issues that have been previously raised with regard to this dataset that may influence our findings.

We use training incidence and intensity as dependent variables, derived from the question '*do you offer formal training to your employees? If yes, what percent of employees in each category received training in 2001 (in 2002 questionnaire) and over the last 12 months (in 2005 questionnaire).* In 2002 the groups were divided into: managers, professional, skilled, unskilled and support workers and in 2005 in: skilled, unskilled and non-production workers. From this question we derive two dependent variables:

Training incidence: a dummy variable equal to one if any employee received training regardless of the group they belong and zero otherwise;

Training intensity: consisting of zeros for those firms that have not provided any training and positive for those that have trained workers.

We compute a dependent variable measuring the average share of workers trained.

For both measures of training, we estimate two econometric specifications:

a) Specification 1 includes variables measuring: employment structure; measures of technological change; degree of competition; share of the firm owned by foreigners profitability and size of the firm.

b) Specification 2 in addition to variables included in specification 1 includes country dummies, with Croatia as the reference category. This will enable an analysis of whether other Western Balkan economies differ in their training behavior from Croatia, a country that is more economically developed.

Since the production process varies across industries, industry dummies are included in both specifications.

Summary statistics for the variables are provided in Appendix 1 (Table A1). In 2005 around 48 percent of enterprises provided some training to their workforce compared to 41 percent in 2002. As for intensity of training, i.e. the share of workers that undertook training during the previous 12 months, this doubled over this period, from just 7 per cent in 2002 to 14.5 percent of employees having received training in 2005. Although, the measurement of technology has been subject to investigation for many years, no convincing simple measure has been developed

(Sanders and Weel, 2000). To measure whether the enterprise introduced new technology we use the management's response to the question '*Has your firm acquired new production technology over the last 36 months?'.* We deploy a dummy variable equal to 1 if an enterprise responded positively to having introduced new technology and zero otherwise. In 2002, 34 percent of enterprises reported having introduced new technology whereas 40 percent did so in 2005. Another measure of technological change is computed by a dummy variable equal to one if the enterprise introduced a new production line in the previous 36 months. We find that in both waves around 40 percent of enterprises introduced a new production line. The BEEPS survey provides information on another commonly used measure for technological change: R&D expenditures. Unfortunately in both waves there is a significant number of missing observations for this question; 78 percent and 43 percent in 2002 and 2005 respectively. Another problem presented in 2005 is that firms are asked to report expenditures in USD and, since sales in 2005 wave are reported in intervals, we cannot calculate R&D expenditures as a share of annual sales. For these reasons we are not able to use this variable in our estimation analysis.

There are two sources for firms to secure additional skilled labour, from the external labour market and by training their existing workforce. In transition economies where skilled labour is not readily available in the external labour market, firms facing an increased demand for skills should be more likely to provide training. We include a variable indicating whether the availability of skilled and educated workers was viewed as a problematic factor for business growth. It is anticipated that if firms consider skills to be an obstacle to their business growth they will be more likely to undertake training activities. In 2002 around 46 percent of firms noted that skills and education of available workers is a problematic factor for their business growth,

whereas this figure declined to 22 percent in 2005. This may indicate that skill mismatches have lessened as transition proceeds in these economies.

In 2002, enterprises are asked '*when considering their main product line or main line of services is your technology less, about the same or more advanced that that of your closest competitor*'. Using this question we drive a binary variable equal to one if the enterprise considers its technology as more advanced and zero if responds that the technology is the same or less advanced than that of competitors. Data suggest that in 2002 around 30 percent of firms consider that their technology is more advanced than that of their rivals. Assuming that technology is complementary to skills and training is a mechanism for upskilling, we expect that firms with more advanced technologies are more likely to train and also train more workers. Akin to general training models, we also hypothesise that firms facing high levels of competition may be discouraged from investing in training because of the 'poaching risk'. Furthermore, since with increased competition net profit margins generally fall, firms attempting to minimise their costs might be more tempted to cut their training costs. We test the influence of competition, by defining two dummy variables; the first one 'one to three competitors' equals one if the enterprise reports operating in a market with one to three competitors and the second dummy variable 'four or more competitors' equal to one if an enterprise operates in a market with four or more competitors. The reference category is that the firm responded that it operates in a market with no competitors[2]. Data suggest that the degree of competition across the two waves has

[2] Another specification estimated with a benchmark category being *one to three competitors* and results do not changes.

increased; in 2002, 31 percent for firms responded that operate in a market with four and more competitors a figure that has increased to 79 percent in 2005.

We also include a variable measuring the profit margin of the enterprise. It can be argued that enterprises are more likely to engage in training when they have higher margins since such firms may be more able to bear the cost of training. However, we can also argue that firms with higher profitability may not have the incentive to provide training, being satisfied with their current margins. Hence a priori we are not certain about the expected sign of this variable. Data show, that the average profit margin of respondents increased from 18 to 22 percent from 2002 to 2005.

Following Snower's (1996) predictions, we hypothesise that the greater the proportion of skilled workers in their workforce the more likely a firm is to update its technology and, based on our central hypothesis, the more likely it is to invest in training. The term 'skilled' is very broad and all encompassing (Bloom et al., 2004) and the most commonly used measures of skills are qualifications (Leitch, 2006). In this Survey there exists information about the percentage of skilled and unskilled workers and also their qualification level. In both waves we posses information on the share of employees holding a university or a higher to degree and in 2005 also information on the share of workers having undertaken vocational education. Data suggest that the skill content of the workforce across the two waves has not changed significantly; in both waves the average share of skilled workers has been at around 26 percent of the workforce. In 2005 the share of workers with a university degree was 24 percent, an increase of seven percentage points from the 2002 wave.

A further dummy variable is included equal to one when an enterprise indicates that a foreign company is its largest shareholder. In BEEPS dataset there is a question asking about the percentage of shares owned by a foreign company. The expectation is that the greater the shares of a foreign company in the firm the greater chances to provide training and also a greater training intensity. The rationale for this is that foreign firms bring new working approaches, practices and technologies which all demand a greater need for skills i.e. training. Carstensen and Toubal (2004) provide some evidence that in transition economies human capital is an important determinant for ownership share of a foreign company (intensity). In 2002 and 2005, only eight and six percent of firms reported that a foreign company was the largest shareholder in their firm. The average of shares owned by a foreign company in enterprises had declined from 14 to 11 percent by 2005.

The potential number of employees who can participate in training will increase with the size of the firm. Economies of scale may lower a firm's unit costs of training. Further, larger firms are more likely to establish internal labour markets which may lower labour turnover and hence further encourage firms to train. With increased opportunities for promotion, labour turnover may be reduced raising the probability of establishment benefiting longer from their training activities. Since the number of employees is reported in intervals we use the variable identifying whether the enterprise is small, medium or large, using as the reference category large enterprises. In this sample the majority of enterprises are small, with only around 10 percent of enterprises being large.

Specification 1:

$$Training\ incidence/intensity_i = Intercept + Technological\ change\ measures_i + Foreign\ ownership_i + Degree\ of\ market\ competition_i + Labour\ force\ characterisitcs_i + Firm\ characteristics_i + \varepsilon_i$$

Specification 2:

$$Training\ incidence/intensity_i = Intercept + Technological\ change\ measures_i + Foreign\ ownership_i + Degree\ of\ market\ competition_i + Labour\ force\ characterisitcs_i + Firm\ characteristics_i + Country\_dummies_i + \varepsilon_i$$

where i indexes firms and ε_i is the usual white-noise error term. The reference category for countries is Croatia.

Data for our training and technological change measures by country are provided in Appendix Table A2. From Table A2 it can be seen that both training measures have increased in all economies apart from Serbia, which experienced a slight decline in training incidence. In both waves the highest training incidence is found amongst Croatian firms, while the training intensity is highest in FYROM. With regard to the incidence of technological change, in 2002 Croatian enterprises had the highest incidence of introduction of new technology whilst in 2005 it was Bosnia and Herzegovina that had the highest incidence. The proportion of firms introducing new technology has increased in all Western Balkan economies, with a similar increase in the incidence of new production lines (Serbia and Montenegro are the exception). Having analysed data from the two waves next we present our empirical analysis.

3.1 Econometric approach

In this study we initially estimate the probability that a firm provided training for its employees in the previous 12 months, using a discrete choice (probit) model. In the case of training intensity our variable consists of zero values for those firms that have not provided training at all and continuous positive values for those that have provided training. Since we have zero values for the dependent variable, using Ordinary Least Squares (OLS) would generate negative fitted values (i.e., negative predictions for the dependent variable). Moreover, because the distribution of the dependent variable is "left-censored" at zero, it clearly cannot have a conditional normal distribution (Wooldridge, 2002: p.596). Even if the sample is restricted to only those observations with positive values of the dependent variable, the expected value of the dependent variable cannot have a linear relationship with the independent variables (Wooldridge, 2002, p.518). Coefficients should not be estimated by the sub-sample of observations with $y_i>0$, for two reasons. First, the observations with $y_i=0$ contain relevant information on the parameters and standard errors; and, second, because in the sub-sample of observations with $y_i>0$ the error terms do not have a zero mean as they come from a truncated distribution (Heij et al., 2004 p.495). Consequently, OLS - or any kind of linear regression - is not appropriate with a dependent variable of this type, because the coefficient estimates will be biased and inconsistent.

With this structure of the dependent variable, we require a "corner solution model", of which the tobit model is the 'canonical form' (Wooldridge, 2002, pp.518-19 and Greene, 2003, p.778). The maximum likelihood (ML) estimation for tobit model involves dividing observations into two

sets. The first set contains uncensored observations, which ML treats in the same way as any linear regression model (LRM); and the second set contains censored observations.

The tobit model provides unconditional marginal effects explaining two effects: first, the probability of a positive response i.e. the probability of firms providing any training; and second, for positive responses the impact of explanatory variables on, in our case, training intensity i.e. the average share of employees that undertook training in the pervious 12 months. Tobin (1958, p.25), who developed the tobit model, argued that because an explanatory variable may be expected to influence *both* the probability of a positive response *and* the observed value, it would be inefficient to throw away information on the value of the dependent variable. Since we can take into account both of these effects with the tobit model, we will use this model for our empirical work.

4. Empirical findings: determinants of training incidence and intensity

4.1 Training incidence

For the training incidence we employ a binary choice model i.e. the probit model and focus on marginal effects of estimates. Subject to data availability, as previously explained we incorporate variables commonly used in explaining firm's training behaviour, however our primary concern is with those explanatory variables that are hypothesised to drive training needs, in this case measures of technological change variables.

In Table 2 we provide results for the determinants of training incidence for two specifications and two waves. In all estimations the likelihood ratio test overwhelmingly rejects the null that all

the estimated coefficients are jointly insignificant (i.e., in effect, zero). Hence, the explanatory variables are jointly highly significant.

From Table 2 it can be noted that, conforming to our predictions, firms which introduced new technology in the past are more likely provide training in both waves, though the marginal effect is bigger in 2005. However, only amongst the 2002 respondents do we find that firms that introduced a new production line were more likely to provide training. Similarly, only in the 2002 wave were firms that had a more advanced technology, in comparison to their competitors, more likely to provide training. Description of the BEEPS dataset presented above indicates that the two waves are not fully independent, which implies that a formal statistical test is not possible (Wooldrdige, 2006, p.145). However, an examination of the interval estimates of the coefficients of variables measuring the presence of technological change (*introduction of new technology* and *introduction of a new product)* in both waves does not suggest that there is a difference in the values.

Consistent across both waves, we find that the greater the share of workers with a university degree the greater the likelihood of firms providing training, consistent with Snower' predictions that it is cheaper to train more educated workers hence more likely to provide training. Another explanation could be that due to the relatively low quality of the education system in transition economies there is a need to train even workers with a university degree, though these are relatively cheaper to train. In 2002, firms that believed that the availability of skills and educated labour was a deterrent to their business growth were more prone to train. This could suggest that firms use training as a mechanism to meet the demand for skills that are not readily available in

the labour market. We also find that in 2002 the greater the profit margin the less likely were firms to provide training, which could suggest that relatively profitable firms have no incentives to sponsor training. However, in 2005 we do not find any statistically significant impact of profit margin upon the training incidence. As anticipated we find evidence that small firms are less likely to provide training, though this evidence is weak for the later wave. This finding may suggest that through time the difference in training provision according to the size of firms is disappearing. One rationale may be that to gain and remain competitive all firms during later transition, regardless of their size, need to increase their labour productivity, in part by training their workers. In relation to variables measuring foreign ownership the findings suggest that only in 2002 was training incidence higher in those firms with a greater proportion of shares owned by foreigners.

Results for Specification 2 reveal that in 2002, when compared to Croatian firms, those in other Western Balkan economies had a lower probability of providing training. In relation to the percentage of workers that receive training, data suggest that in 2005 firms in Bosnia and Herzegovina and Croatia provide a significantly higher percentage of workers when compared to firms in other countries included in this sample.

INSERT TABLE 2 HERE

Finally, looking at the results from the two waves we find evidence that firms that introduce new technology are more likely to provide training. Next we will analyse whether this association is supported also for training intensity.

4.2 Training intensity

Before we proceed with interpretation of our empirical findings for training intensity, we first report statistical tests and checks on the appropriateness of the tobit estimation. The likelihood value comparing the "full" model with an "intercept only" model is reported for both waves and the null hypothesis that the model did not have greater explanatory power than an 'intercept only' model (Borooah, 2002, p.20) is rejected. As consistency of the ML estimators crucially depends upon correct specification of the likelihood function (Verbeek, 2004 p.225), testing for misspecification is of fundamental importance for the validity of our estimates and our subsequent inferences. We use the F-test to test the null hypothesis that neither the probability nor the sizes of non-zero responses depend on the explanatory variables. In both years and specifications, the test overwhelmingly rejected the null that all the estimated coefficients are jointly insignificant (i.e. in effect, zero). Hence, the explanatory variables are jointly highly significant, even though the "pseudo R-squared" measures are low (0.04 and 0.02 in 2002 and 2005 respectively). This does not necessarily suggest a weak fitted mode because tobit-estimates are not chosen to maximise R-squared but to maximise the log-likelihood function (Wooldridge, 2002, p.529).

In Table 3 we provide empirical findings for training intensity i.e. the share of workers that undertook training. We report unconditional marginal effects that account for both the probability that firms provide training and train a greater percentage of their workers Our prediction of a positive influence of technological change upon training intensity is supported only in 2005. In 2005, firms that introduce new technologies trained almost eight percent more of their workers compared to those that have not introduced new technology. We cannot easily explain why this finding is not supported in 2002, however we do find evidence for that year that

those firms that introduced a new production line trained a greater share of workers and that those firms who believed that they were more technologically advanced than their competitors also had greater training intensity. As expected we find that the greater the share of workers with a university degree the greater the share of workers that undertake training for both 2002 and 2005. This again supports the rationale that educated workers are cheaper to train and produce faster and better benefits from training. In 2002 we find that firms that find skills are a barrier to business growth train a greater share of workers. Again in 2002 only do we find that the greater the profit margin the smaller the share of workers receiving training. Findings suggest that small firms provide less training in 2002 only and no difference related to the size of firms is found in 2005 wave. The presence of foreign owners and its intensity has no statistically significant influence upon the intensity of training. Findings for Specification 2 reveal that compared to Croatia in 2002, firms in Albania and Serbia and Montenegro trained a lower share of workers. In wave 2005 firms in Bosnia and Herzegovina also provided training to fewer workers when compared to Croatian firms.

INSERT TABLE 3 HERE

Findings presented in this section suggest that technological change is a factor inducing firms to provide training in Western Balkan economies, with some evidence that it also influences positively training intensity. Evidence provided in this section broadly supports the proposition that training is an important mechanism to upgrade the workforce and enables firms to adjust to new skill demands related to technological change.

5. Concluding remarks

Empirical investigation in this article is based on information from the BEEPS dataset for 2002 and 2005 for the Western Balkan economies. Our primary focus lies upon investigating the determinants that drive firms' demand for training. To analyse this we focus on variables explaining whether the firm has introduced new technology or a new production line as measures for technological change. We anticipate that when firms experience technological change there is a greater probability of firms providing training (incidence) and also that a greater share of workers receive training. Overall, our findings suggest that technological change induces firms to train and increase training intensity, though the latter is more strongly supported by evidence from the latest wave. In addition to the slow restructuring of firms in the Western Balkans, the weaker support for the latter relationship in the earlier wave may be due to the type of technologies employed in the earlier period, which may have been less skill intensive. However, since we do not posses data on the type of technology we cannot at this stage investigate this further. We find that the greater the share of workers holding a university degree the greater the training incidence and intensity. In 2002, we find that when skills are considered as a barrier to business growth there is a greater probability for employers to provide training and also a greater share of workers that receive training. An explanation for this is that firms use training as a mechanism to meet their need for skilled labour not readily available in the market. Our findings suggest that in 2002 the greater profit margin the fewer workers trained and also less willingness for firms to sponsor training, which implies that those firms content with their economic situation provide less training.

The wider training literature consistently focuses on the issue of under-investment in training i.e. the divergence of private and socially desired levels of training, proposing various policy measures to induce greater training provision. The data we use in this study do not enable us to assess directly whether there is under-investment in training. However, since lifetime learning and the expansion of employer-provided training is a priority in most European economies it may suggest that this is an issue that needs to be targeted in transition economies as well, all aiming to gain EU membership. Brixiova et al. (2009) and Tann et al. (2008) argue that despite the evidence that training produced benefits both to the firm and employees, there is an underinvestment in training which presents an impediment to economic growth. Our analysis is consistent with this argument, suggesting a need for government intervention to create incentives for private investment in training. Our evidence indicates that one way for government to induce training provision is also by providing incentives for technological change.

Finally, it is necessary to highlight that this empirical analysis is subject to some limitations, stemming from the data availability. Data do not enable us to distinguish between productivity-enhancing and other non-productivity related training and we have no measure of the quality of the former. Related to the measures of training, the dataset we use in our empirical work do not provide any information on the training expenditures or the length of training. We noted that there exist no direct measure of technological change and in our empirical analyses we used the best available measures that the datasets provided. However, for these measures we had no additional information regarding the type of technologies adopted and whether the technological change required more skilled workers or a greater skill intensity of the workforce, the exact timing when new technologies were introduced, or if those technologies could be fully utilised

with the existing workforce and the available skill supply. These limitations provide opportunities for further research.

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Table 1. Countries included in empirical analyses (waves)

Countries included	**2002**	**2005**
	Sample	**Sample**
Albania	170	204
Bosnia and Herzegovina	170	200
Croatia	170	236
FYROM	170	200
Serbia and Montenegro	250	300
Total observations	**930**	**1,400**

Synnovate, 2005a, b and c.

Table 2: The Determinants of training incidence (marginal effects probit), 2002 and 2005

	2002; specification 1			2002; specification 2			2005; specification 1			2005; specification 2		
Explanatory variables	**dy/dx**	**Std. Err.**		**dy/dx**	**Std. Err.**		**dy/dx**	**Std. Err.**		**dy/dx**	**Std. Err.**	
Technological change measures												
New production line introduced	0.09	0.05	*	0.08	0.05	*	0.02	0.05		0.01	0.05	
New technology introduced	0.16	0.05	***	0.16	0.05	**	0.21	0.05	***	0.22	0.05	***
Technology more advanced than that of rivals	0.16	0.05	***	0.20	0.05	***						
Labour force characteristics												
Share of skilled workers	0.003	0.003		0.002	0.003		0.000	0.003		0.001	0.00	
Share of workers with university degree	0.004	0.001	***	0.004	0.00	***	0.004	0.001	***	0.004	0.00	***
Share of workers with vocational education							0.001	0.00		0.001	0.00	
Skills a barrier to growth	0.18	0.05	***	0.19	0.05	***	0.02	0.06		0.01	0.06	
Profit margin	-0.01	0.00	***	-0.01	0.00	***	0.00	0.00		0.001	0.00	
Firm Characteristics – Reference Groups: large, more than three competitors; a foreign company not the largest shareholder												
Small	-0.26	0.08	***	-0.22	0.08	***	-0.16	0.09	*	-0.13	0.09	
Medium	-0.12	0.08		-0.09	0.09		-0.07	0.10		-0.02	0.10	
One to three competitors	-0.02	0.07		0.00	0.07		-0.20	0.25		-0.20	0.25	
Four and more competitors							-0.25	0.22		-0.24	0.22	
Foreign company is the largest shareholder	-0.09	0.11		-0.09	0.12		0.05	0.13		0.01	0.14	
% shares owned by a foreign company	0.002	0.001	**	0.001	0.00		0.001	0.001		0.00	0.00	
Industry dummies: manufacturing a reference category												
Mining	0.07	0.19		-0.02	0.19		0.15	0.22		0.14	0.22	
Construction	-0.02	0.08		-0.04	0.08		-0.04	0.09		-0.03	0.09	
Transportation	0.27	0.10		0.25	0.10	**	-0.04	0.10		-0.05	0.10	
Trade	0.01	0.06		-0.02	0.06		0.01	0.06		0.02	0.06	
Real estate	0.20	0.09	**	0.14	0.10		0.05	0.12		0.00	0.13	
Hotels	0.01	0.09		0.01	0.10		0.13	0.12		0.13	0.12	
Other	0.39	0.09	***	0.39	0.10	***	0.20	0.15		0.22	0.14	
Country dummies: Croatia as a reference category												
Albania				-0.34	0.06	***				-0.16	0.08	**
Bosnia and Herzegovina				-0.22	0.07	***				-0.25	0.08	***
FYROM				-0.16	0.07	**				-0.10	0.08	
Serbia and Montenegro				-0.20	0.07	***				-0.18	0.08	**
Number of observations	**527**			**527**			**457**			**457**		

Notes: a) Dependent variable is Training incidence, whether or not the firm offers formal training for employees. Western Balkans is Albania, Bosnia and Herzegovina, Croatia, FYROM, and Serbia and Montenegro. Small are firms with less than XXX worker; medium are firms with up to 49 workers; medium 50-249 and large with more than 250. b) Standard errors are robust to heteroskedasticity. c) ***, ** and * denote significance at 1, 5 and 10 percent, respectively.
Source: World Bank Enterprise Survey, 2002 and 2005; our calculations.

Table 3: The Determinants of training intensity (unconditional marginal effects tobit), 2002 and 2005

	2002; specification 1			2002; specification 2			2005; specification 1			2005; specification 2		
Explanatory variables	**dy/dx**	**Std. Err.**		**dy/dx**	**Std. Err.**		**dy/dx**	**Std. Err.**		**dy/dx**	**Std. Err.**	
Technological change measures												
New production line introduced	**2.73**	**1.17**	**	2.52	1.15	**	0.12	2.25		0.01	2.23	
New technology introduced	1.08	1.17		0.96	1.15		**7.61**	**2.25**	***	8.17	2.25	***
Technology more advanced than that of rivals	**3.89**	**1.20**	***	4.34	1.23	***						
Labour force characteristics												
Share of skilled workers	-0.001	0.08		-0.02	0.08		**-0.22**	**0.13**	*	-0.21	0.13	
Share of workers with university degree	**0.10**	**0.03**	***	0.08	0.03	***	**0.17**	**0.05**	***	0.17	0.05	***
Share of workers with vocational education							0.07	0.05		0.07	0.05	
Skills a barrier to growth	**3.00**	**1.28**	**	2.99	1.28	**	-1.42	2.46		-1.53	2.46	
Profit margin	**-0.20**	**0.06**	***	-0.19	0.06	***	0.05	0.08		0.06	0.07	
Firm Characteristics – Reference Groups: large, more than three competitors; a foreign company not the largest shareholder												
Small	**-3.97**	**2.06**	*	-2.82	1.91		-4.68	3.77		-3.94	3.74	
Medium	-0.23	1.94		0.40	1.99		-1.00	3.65		0.24	3.70	
One to three competitors	1.90	1.91		2.05	1.90		-7.04	7.74		-5.99	8.04	
Four and more competitors	Dropped because of perfect collinearity						-14.77	11.83		-13.46	11.72	
Foreign company is the largest shareholder	-0.03	2.60		0.11	2.59		-0.21	4.62		-2.02	4.31	
% shares of a foreign company	**0.03**	**0.02**	*	0.02	0.02		0.04	0.05		0.05	0.05	
Industry dummies: manufacturing a reference category							7.95	11.59				
Mining	2.35	5.34		1.37	4.78		-0.16	4.21		7.14	11.58	
Construction	-2.05	1.42		-2.29	1.31		-1.51	3.60		0.05	4.16	
Transportation	2.75	2.42		2.43	2.39		3.90	2.85		-1.65	3.53	
Trade	-0.68	1.35		-1.17	1.27		5.51	5.00		4.25	2.87	
Real estate	2.81	2.27		1.34	2.14		5.73	6.39		4.58	4.95	
Hotels	0.69	2.53		0.66	2.51		5.20	6.31		5.46	6.32	
Other	**11.55**	**4.29**	***	10.67	4.08					6.13	6.20	
Country dummies: Croatia as a reference category												
Albania				-4.40	1.28	***				-1.42	2.97	
Bosnia and Herzegovina				-2.09	1.40					-6.31	2.80	**
FYROM				-0.56	1.49					1.87	3.06	
Serbia and Montenegro				-2.84	1.32	**				0.23	3.21	
Observation summary		527		527			457			457		
Left-censored at 0		335		335			225			225		
Uncensored observations		192		192			232			232		

Right-censored observations at>= 10				
Diagnostics and goodness of fit				
F-test (2002: 19, 508; 23, 504) (2005: 20,437; 24, 433)	3.46	3.23	2.34	2.51
Log likelihood	(1,074)	(1,068)	(1,321)	(1,316.8)
Pseudo-R^2	0.04	0.04	0.02	0.02
Normality test (tobcm) Null:normal errors (p-values)	0.000	0.000	**0.244**	**0.334**

Notes: a) Dependent variable is Training incidence, whether or not the firm offers formal training for employees. Western Balkans is Albania, Bosnia and Herzegovina, Croatia, FYROM, and Serbia and Montenegro. Small are firms with less than XXX worker; medium are firms with up to 49 workers; medium 50-249 and large with more than 250. b) Standard errors are robust to heteroskedasticity. c) ***, ** and * denote significance at 1, 5 and 10 percent, respectively.

Source: World Bank Enterprise Survey, 2002 and 2005; our calculations.

Appendix

Table A1. Descriptive statistics (Western Balkan countries)

	2002			2005		
Variables	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**
Training incidence	**812**	**0.41**	**0.49**	**904**	**0.48**	**0.50**
Intensity of training share of workers that undertook training	**812**	**6.85**	**14.82**	**904**	**14.51**	**22.76**
New product introduced	**829**	**0.42**	**0.49**	**1018**	**0.41**	**0.49**
New technology introduced	**827**	**0.34**	**0.47**	**1004**	**0.40**	**0.49**
Technology more advanced than rivals	760	0.30	0.46			
Share managers	816	14.77	18.92	1001	14.51	17.67
Share professionals	816	16.70	21.89	1001	15.27	21.87
Share skilled workers	816	47.48	31.22	1001	48.70	32.06
Share skilled (managers, professionals and skilled)	816	26.32	7.86	1001	26.16	8.57
Share workers with vocational education				992	16.75	25.63
Share workers with university degree	820	8.50	16.95	992	23.89	26.24
Skills a barrier to growth	842	0.30	0.46	987	0.22	0.42
Profit margin (share of sale price)	715	18.01	9.24	880	21.94	12.15
Small	842	0.73	0.45	1018	0.73	0.44
Medium	842	0.17	0.37	1018	0.19	0.39
Large	842	0.11	0.31	1018	0.08	0.27
Foreign company is the largest shareholder	752	0.08	0.26	988	0.06	0.24
Shares owned by a foreign company (in %)	842	14.06	32.27	1018	10.58	28.82
No competitors	818	0.00	0.05	620	0.02	0.13
One to three competitors	818	0.11	0.31	620	0.20	0.40
Four and more competitors	818	0.89	0.31	620	0.79	0.41
Manufacturing	842	0.30	0.46	1018	0.31	0.46
Mining	842	0.01	0.11	1018	0.01	0.11
Construction	842	0.09	0.29	1018	0.10	0.30
Transport	842	0.07	0.25	1018	0.07	0.26
Trade	842	0.34	0.48	1018	0.32	0.47
Real estate	842	0.08	0.28	1018	0.08	0.28
Hotels	842	0.07	0.26	1018	0.07	0.26
Other	842	0.04	0.19	1018	0.03	0.18

Table A2. Descriptive statistics by countries

2002	Albania			Bosnia and Herzegovina			Croatia			FYROM			Serbia and Montenegro		
Variable	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**
Incidence	151	0.28	0.45	156	0.35	0.48	149	0.50	0.50	200	0.47	0.50	156	0.40	0.49
Intensity	151	4.76	11.50	156	5.25	12.35	149	7.58	14.39	200	10.55	20.44	156	5.03	10.26
New product	152	0.44	0.50	153	0.39	0.49	156	0.51	0.50	204	0.40	0.49	164	0.36	0.48
New technology	151	0.34	0.47	154	0.34	0.48	154	0.36	0.48	204	0.34	0.47	164	0.32	0.47
2005	**Albania**			**Bosnia and Herzegovina**			**Croatia**			**FYROM**			**Serbia and Montenegro**		
Variable	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**
Training incidence	181	0.48	0.50	160	0.46	0.50	183	0.60	0.49	221	0.47	0.50	159	0.38	0.49
Training intensity	181	15.52	23.10	160	13.66	23.04	183	12.53	19.91	221	16.58	24.43	159	13.62	22.74
New product	186	0.39	0.49	180	0.44	0.50	210	0.44	0.50	259	0.39	0.49	183	0.37	0.48
New technology	186	0.40	0.49	176	0.47	0.50	206	0.43	0.50	258	0.36	0.48	178	0.33	0.47