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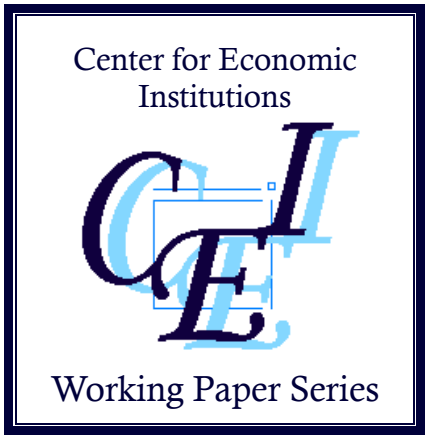

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Investment in human capital in post-Soviet countries: Why are firms not training more? [1]

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Abstract

Using STEP employer surveys data in Armenia, Azerbaijan, Georgia and Ukraine, this paper investigates how innovation, openness to international business contacts, use of computer at work and skills shortages affect employer-provided training in post-Soviet countries. It examines different types of training (less formal on-the-job training along with more formal in-house and external training) provided to white-collar or blue-collar workers. After controlling for a range of firm characteristics, we find a positive link between technological innovation and intensity of training of all types provided to white-collar workers that points to the technology-skills complementarity. Besides, the level of computer use at work is a significant determinant of the incidence and intensity of external training provided to white-collar and blue-collar workers.

Keywords: employer-provided training, innovation, computerization, STEP employer survey, transition countries

JEL classification: J24, M53, P36

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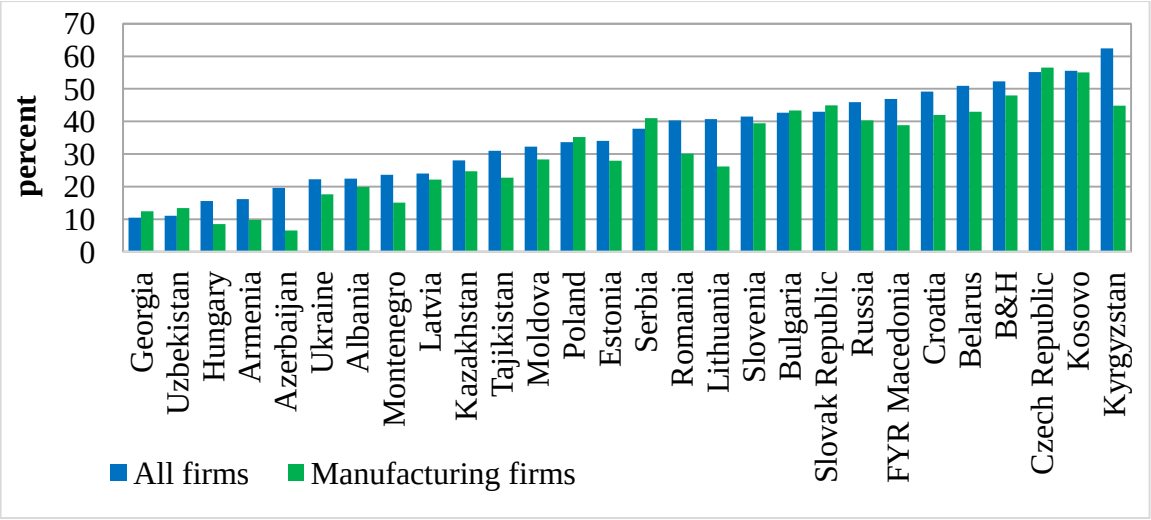
1. Introduction

Employer-provided training is a strategic investment for developing workers' lifetime human capital and maintaining firms' competitiveness and growth. In many transition economies initial education and training systems often fail to equip the increasingly scarce cohorts of youth with appropriate generic and technical skills (Sondergaard et al., 2012). Meanwhile, older individuals are at a high risk of skills obsolescence and qualification mismatch because their credentials and skills often do not meet current job requirements (Kupets, 2016). Regular training provided by firms to their employees, along with other forms of adult education and training, is the key to alleviate skills shortages, increase productivity of an aging workforce and boost competitiveness of firms and economies.

The benefits of firm-led training for post-school human capital accumulation and wage growth of workers as well as for driving innovation and productivity levels of firms are well documented in the literature in developed countries (see, for example, Lynch, 1994; Dostie, 2015) and in some transition and developing economies (Almeida et al., 2012). Despite these potential benefits, on the one hand, and complains of local firms about skills shortages, on the other hand, relatively small share of firms provide formal training to their workers in lower-income post-Soviet countries, especially in Georgia, Armenia, Azerbaijan and Ukraine covered in this study (Figure 1).

Figure 1. Incidence of formal training programs for permanent full-time employees in transition countries, 2011-2014



Source: Author's calculations based on the EBRD-World Bank BEEPS V Survey conducted in 2011-2014, with over 60 percent of firms surveyed in 2013.

Note: Sample weights according to median eligibility are applied along with the Stata command *svy: tab*. The question is formulated as follows: 'Over fiscal year [insert last complete fiscal year], did this establishment have formal training programs for its permanent, full-time employees?'.

In many other countries where the proportion of firms that offer training is relatively high, the share of workers who participate in training is fairly low. For example, according to the BEEPS V survey, 44.9 percent of manufacturing firms in Kyrgyzstan reported about providing formal training to their workers, but on average only 35.7 percent of production workers and 20.1 percent of non-production workers were trained over the year. Even larger discrepancy between the incidence and intensity of training has been found in Russia based on the Russia ICA survey of large- and medium-sized manufacturing firms in 2005 (Gimpelson et al., 2010).

There are several plausible interpretations in the theoretical and empirical literature for a relatively low investment of firms in training of their employees in developed countries (see review in Section 2), including the poaching externality, liquidity and informational constraints, reliance on informal learning-by-doing, hiring talents from the external labor market or training only a few key employees, and a lack of effective institutions that would help circumvent the potential market failures in the training provision. Only a limited number of studies tested various factors determining the incidence of employer-provided training in the transition context, and they are mainly focused on Russia alone [2] or on a large sample of transition economies which demonstrated different progress in transition reforms and economic restructuring.[3] Besides, these studies provide insufficient evidence on the possible polarization in training opportunities for white-collar versus blue-collar workers and on the effect of technological innovations, including computerization of jobs, on the provision of training of different types. This knowledge gap is mainly due to the limitations in the available cross-country surveys of firms which usually do not include appropriate information about training opportunities and skill use for different types of workers.

Using a rich firm-level dataset based on the World Bank STEP survey of employers in Armenia, Azerbaijan, Georgia and Ukraine, this paper partly addresses this knowledge gap.[4] The advantage of this survey is that information about skills demand, skills usage, training and cooperation of employers with

[2] Studies using firm-level data (including Lazareva et al., 2006; Gimpelson, 2010; Gimpelson et al., 2010) are focused predominantly on manufacturing firms. Recent descriptive study by Avraamova et al. (2016) is based on the survey of HR managers of enterprises and organizations in priority sectors (ICT, energetic and transport systems) in Moscow and two oblasts in Russia. Berger et al. (2001) and Lazareva (2006) use individual-level data from the Russian Longitudinal Monitoring Survey.

[3] Popov (2014) examined the effect of credit constraints on the incidence of formal training in a sample of transition countries based on the BEEPS survey in 2005. Using the BEEPS surveys in 2002 and 2005, Gashi and Adnett (2012) explored the link between technological innovation of firms and the incidence and intensity of employer-provided training in five Western Balkan countries. Almeida and Aterido (2011, 2015) analyzed the causal effect between employment protection regulations or size groups and the incidence of training in Eastern and Central European economies along with other countries (called 'developing' by the authors) based on the World Bank Enterprise surveys conducted in 99 countries between 2002 and 2007.

[4] See detailed information about the Skills Towards Employability and Productivity (STEP) program and about the surveys in Pierre et al. (2014).

education and training institutions is gathered with respect to the different types of workers.[5] Furthermore, information on training provided by the firm is more comprehensive than in the popular firm-level data in transition and developing countries such as EBRD-World Bank Business Environment and Enterprise Performance Survey (BEEPS) and World Bank Enterprise Survey. Specifically, detailed information is collected about training on the workplace premises (in-house training) and outside the workplace (external training). In addition to formal in-house training by the firms' dedicated trainers or external trainers, it is also possible to measure the incidence and intensity of less formal on-the-job training provided by more experienced co-workers, supervisors (mentors) or managers. According to de Grip (2015), informal learning in the workplace is far more important for workers' human capital development than formal training courses and is less expensive alternative for firms to keep workers' skills up-to-date. The paper considers training provided by firms to their workers and does not discuss any learning activities that workers undertook independently from their employers or vocational training of the unemployed.

Armenia, Azerbaijan, Georgia and Ukraine represent an interesting case to examine the patterns and determinants of employer-provided training in a setting where vast structural changes have been observed over the last 25 years but numerous challenges are still ahead. These former Soviet Union countries have shown slow progress in important transition reforms, especially in governance, enterprise restructuring and competition policy (EBRD, 2013). The legal and administrative environment is not conducive for fostering innovation, technological advances and knowledge-based growth, especially among small and medium enterprises in traditional sectors. Hence, many firms which are focused on defensive cost-cutting strategies rather than on technological advances may consider systematic investment in training of their workers unnecessary and costly. On the other hand, Armenia, Azerbaijan, Georgia and Ukraine are countries belonging to the Eastern Partnership initiative of the EU and are increasingly involved in a global competition. A perspective of better access to the Western European markets and the need to further integrate into global supply chains encourage local firms to move to higher value-added activities by introducing new products, technologies and organizational practices. This triggers an increase in the training needs of leading companies.

Adult education and training in Armenia, Azerbaijan, Georgia and Ukraine is critical not only to address the global challenges of technological innovation, globalization and evolving skills demands but also to reduce the lag effect of transition and to respond to a worsening demographic outlook (Bodewig

[5] Some limitations of the STEP employer survey are discussed in Section 3.

and Hirshleifer, 2011; Koettl et al., 2015).[6] To offer relevant public policy interventions aimed at promoting employer-provided training in these countries, it is important to understand the needs of local firms in employee training and constraints to its provision depending on the background and workforce characteristics of firms.

The paper documents several interesting findings. As one could expect, on-the-job training (learning from managers, supervisors or peers) is the most popular type of training in post-Soviet countries, most likely due to a lower cost and simplicity in delivery. Problems with finding skilled white-collar workers in the external labor market and sometimes high worker turnover encourage firms to provide different types of training. After controlling for many firm characteristics, we find a positive link between technological innovation and the propensity of firms to provide training of all types to white-collar workers that is a sign of complementarity between technology and skills. Besides, we find evidence of the positive effect of information technology and computerization on the demand for skilled labor: the level of computer use at work is a significant determinant of the incidence and intensity of external training provided to both white-collar and blue-collar workers. Interestingly, an important determinant of almost all types of training and both types of workers is whether a firm has international business contacts. This suggests that international orientation of firms in post-Soviet countries and technological spillovers from advanced economies provide a strong incentive to invest in continuous training and development of workers to thrive and compete successfully in an ever-changing global environment. However, micro and small private firms operating in less technology-intensive sectors and having no international business links prevail in all four countries. As they are significantly less likely to provide formal training to their workers either because of no need to upgrade the skills level of their workers or because of the multiple constraints to the provision of formal training, the overall incidence and intensity of training tends to be low in the analyzed countries, especially if less formal on-the-job-training is not taken into account.

The rest of the paper proceeds as follows. Section 2 discusses alternative reasons why many firms tend to under-invest in employee training based on the literature review in developed, developing and transition countries. Section 3 briefly describes the data and definitions of the main variables used. Section 4 documents the differences across four post-Soviet countries in the incidence and intensity of different types of training provided by firms to white- and blue-collar workers. Section 5 provides estimation results on the determinants of training in the pooled sample of countries by types of training

[6] Bodewig and Hirshleifer (2011) and Taurelli et al. (2013) present available evidence on the extent and patterns of adult education and training provision in Azerbaijan, Armenia, Georgia, Ukraine and some other countries in the region, its legal framework, governance, funding and policy recommendations.

and workers, with the probit model for the incidence and the Tobit model for the intensity of training. Section 6 summarizes the main findings answering the question if investment in employer-provided training in post-Soviet countries is really low and why.

2. Why do firms limit investment in employee training: Literature review

There are several interpretations in the literature for why firms limit their training investments. The economic theoretical literature on private sector training summarized by Leuven (2005) [7] analyzes investment of firms in human capital depending on the type of training (general, specific or transferable), competition in the labor and product markets, liquidity constraints, specific sources of labor market imperfections such as monopsonistic or oligopsonistic markets for skilled workers, information asymmetries, search frictions, firing and hiring costs, minimum wages and trade unions. The major explanation for under-investment in general and transferable training in competitive labor markets is the poaching externality as competitors can hire away trained workers, thereby imposing a loss on the training firms. The poaching externality is also possible in imperfect markets 'as any source of imperfect competition leading to wages below marginal product, combined with any source of uncertainty about labor turnover, makes that the worker and the firm do not internalize positive externalities and under-invest' (Leuven, 2005, p. 108). Overall, existing theories on the effect of market imperfections on employer-provided training offer ambiguous predictions and empirical studies in developed countries display mixed results (Picchio and van Ours, 2011).

Recent literature that combines arguments from labor economics research and organization learning theory and identifies training as an important part of human resource management (HRM) practices suggests alternative explanations for the limited propensity of many firms to invest in formal training (Neirotti and Paolucchi, 2013). First, firms may prefer decentralized and informal training, especially if the rates of return on formal training are low and the link between technological or organizational changes and training is not strong. Second, firms may prefer to acquire target competences by hiring experienced workers from the external labor markets than to develop them internally through on-the-job training. According to Neirotti and Paolucchi (2013), firms tend to follow a dichotomy in their resource management processes depending on the industries and competencies. Training is regarded to be meaningful in industries where: '(1) the need to build new competencies is continuous rather than episodic; (2) human resources are more trainable; and (3) firms adopt organic configurations'. Otherwise, firms may prefer 'grafting' competencies from outside. Besides, it is

[7] The basic papers include Becker (1962), Hashimoto (1981), Stevens (1994, 2001) and Acemoglu and Pischke (1998, 1999).

stressed that training alone is not sufficient for continuous learning and effective allocation of human capital; it should be complemented with other high-performance HRM practices.[8] Finally, studies following the resource-based and organizational learning approaches suggest that firms may involve in continuous and comprehensive training just a limited proportion of employees, predominantly those appointed to key positions or who are talented 'high-potentials' (Neirotti and Paolucchi, 2013). The latter argument is supported by the data from the Adult Education Survey 2007 in EU countries which demonstrates that managers, professionals and associate professionals (top three occupational groups) are more likely to participate in formal and non-formal education and training than workers from lower occupational groups (Bodewig and Hirshleifer, 2011).

Comparative study of private sector training in the United States, some European countries and Japan argues that the differences in the structure of training systems and institutions that support these systems including schools, banks, employer organizations, and trade unions help explain different levels of training across developed countries (Lynch, 1994). Germany and Japan have effective private-sector training systems – apprenticeship schemes in Germany and extensive company training based on investments in both firm-specific technical skills and employment relations, low employee turnover, lifelong training by job rotation, hierarchical teaching and self-study in Japan. These training systems have been supported by company-friendly institutions and high level of basic educational achievement of the workforce that helped circumvent the potential market failure in the training provision observed in the United States and the United Kingdom.

In addition to the fear of high worker turnover and poaching externality, hiring of experienced workers from the external labor markets and reliance of firms on informal learning-by-doing, side effects of firing and hiring costs and minimum wages,[9] studies in developing and transition countries offer other important explanations for a relatively low incidence and intensity of training in lower-income countries. Some firms may face severe constraints in financing the training programs. Using the BEEPS data for 25 transition economies and addressing potential endogeneity issues, Popov (2014) found an empirical support for this argument: firms with various types of credit constraints are less likely to provide formal training to their skilled employees than better-off companies.

Other firms can fail to invest in formal training due to the lack of know-how for its delivery, including finding appropriate training programs, qualified trainers and training institutions, or because of

[8] Such practices include thorough human resources selection procedures, cross-functional team working, quality circles, job rotation, knowledge-sharing mechanisms, incentive systems linked to performance, and encouragement of employees to allocate more time to exploratory learning (Neirotti and Paolucchi, 2013).

[9] We do not mention the "hold-up" problem observed in developed countries (Leuven, 2005) as the bargaining power of workers and influence of unions over HRM practices is fairly weak in post-Soviet countries, especially in small private firms in the services sector.

the limited knowledge or skepticism about the effectiveness of formal training with respect to the skills acquired and subsequent benefits for productivity (Almeida et al., 2012; Taurelli et al., 2013). Based on the empirical analysis of employee training in Russia, Berger et al. (2001) suggested that increased uncertainty associated with the shocks of economic transition and restructuring in post-socialist countries and with subsequent revaluation of activities and skills depressed training activities of firms and workers in the 1990-s. Furthermore, inertia in the activities of training institutions inherited from the Soviet economic system often made the returns to additional training negative.

As smaller firms are more likely to face the above mentioned credit and informational constraints and in general are less likely to invest in formal training of workers, the widespread presence of micro- and small enterprises in many transition countries may provide other explanation for the relatively low incidence of training compared to more advanced EU countries (Sondergaard et al., 2012; Bodewig and Hirshleifer, 2011).

However, low levels of formal employer-provided training in developing and transition countries do not necessarily imply under-investment as many firms may find investment in comprehensive employee training unnecessary in view of their relatively low technological base and innovation activity and, therefore, the low skill content of jobs (Almeida et al., 2012; Gimpelson, 2010). In this case the optimal level of training is likely to be low and firms tend to rely on informal learning-by-doing or on hiring workers with the necessary skills from the external market.

Comparing the incidence of employer-provided training in 2005 vs. GDP per capita used as a measure of how advanced the economies are, Bodewig and Hirshleifer (2011) argue that training rates on average do not appear to be low in transition economies compared to more technologically advanced countries, given their lower level of income. Moreover, adult education and learning is not equally important in all transition countries. On the one extreme, there are more technologically advanced countries facing a demographic decline and moving closer to the technological frontier (new EU member states and Russia) which face higher and increasing importance of adult training. On the other extreme, there are less advanced economies facing a demographic expansion (Azerbaijan, Albania and Central Asian countries) with no need to prioritize adult learning. And the rest countries (including Armenia, Georgia and Ukraine) that are between these two groups need to balance between promoting adult education and addressing other challenges in their education systems (Bodewig and Hirshleifer, 2011).

Given a huge heterogeneity of firms in terms of their technological base and skill content of jobs within countries, it is important to analyze the extent and determinants of employer-provided training in transition countries using the detailed firm-level data and distinguishing between several types of

workers and training. To our knowledge, the determinants of the training provision of firms have not been rigorously explored empirically in post-Soviet countries, apart from Russia. The comparative study by Koettl et al. (2015) and brief country-level studies (Rutkowski 2013 a, b and 2015) based on the STEP employer survey data provide only a quick overview of the provision of training by firms for two types of workers. These studies indicate the link between the incidence of employer-provide training and few firm characteristics such as firm size, international business contacts and introduction of new technology, products or processes within the last 3 years.

Our study extends the number of examined firm characteristics and includes important variables related to employment of workers of a given type such as duration of filling a vacancy, share of workers which are fully qualified for a given job, importance of different types of skills during hiring and the highest level of computer use involved in their job. By analyzing the link between the likelihood of training and computer use at work we hope to contribute to the mushrooming literature on the effects of computerization on demand for skilled labor (started by Autor et al. (2003) and followed by many others) and the digital dividends (World Bank, 2016).

3. Data and definitions

We use the pooled firm-level data based on surveys of employers in Armenia, Azerbaijan, Georgia and Ukraine within the World Bank Skills Towards Employability and Productivity (STEP) program.[10] The cross-sectional surveys were conducted in 2012-2013 in Georgia, in 2013 in Armenia and Azerbaijan, and in 2014 in Ukraine by local survey firms and then cleaned by the World Bank STEP team.[11] The initial country-level random samples included 384 establishments (called workplaces) in Armenia, 316 workplaces in Azerbaijan, 354 workplaces in Georgia, and 702 workplaces in Ukraine.[12] While providing crucial information on skills and labor market outcomes in post-Soviet countries, the STEP employer surveys have some important limitations such as small samples covering only selected economic sectors and differences in the time of the survey.

The questionnaire of the STEP employer surveys is divided into five modules. Module 1 collects some basic information about the firm and about the composition of its workforce at the level of 1-digit occupation, as categorized by the International Standard Classification of Occupations (ISCO). Module 2 asks about the skills used by the current workforce. Module 3 on new hires asks about hiring

[10] More information about the STEP program and about the surveys can be found in Pierre et al. (2014).
[11] Final data sets for Armenia, Azerbaijan and Georgia are publicly available through the World Bank's Microdata Catalog (http://microdata.worldbank.org/index.php/catalog/step/about).
[12] Although the unit of observation in STEP surveys is an establishment (workplace) that can be a unit of a large firm, in this study we use the words "firms", "establishments", "workplaces" and "employers" interchangeably.

procedures and preferred skills. Module 4 collects information about training and compensation. Final module 5 inquires about self-assessed financial performance and growth prospects, innovations, clients, obstacles to growth (labor-related and general), and financial information. Financial information collected for two consecutive years – the average listed number of employees, total wage bill, operating expenses, cost of goods sold and sales – has many missing or inconsistent values because firms in post-Soviet countries are often wary of providing sensitive information about their business to outsiders. For this reason, we avoid using any financial indicators in our study.

An advantage of the STEP employer surveys is that information about skills demand, skills usage, training and cooperation with education and training institutions in Modules 2-4 is gathered with respect to different types of workers. However, the procedure of selecting typical workers was quite different in the two groups of countries. In Armenia, Azerbaijan and Georgia, information was collected for the two randomly chosen broad types of workers (occupations) represented in the firm, using a random sticker approach.[13] A white-collar worker (or type A worker in the survey) is defined as a worker that belongs to one of the top three occupational groups according to the ISCO, namely Managers, Professionals, and Associated professionals and technicians. Likewise, a blue-collar worker (or type B worker in the survey) is chosen from a list of six lower-level occupational groups: Clerical support workers, Service and sales workers, Skilled agricultural workers, Craft and related trades workers, Plant and machine operators, and Elementary occupations. In Ukraine, the procedure is based on selection of three occupations defined at the 4-digit ISCO level with which the establishment is experiencing major skills gaps.[14]

In view of the different procedures used, we transformed the variables collected for the three types of workers based on detailed occupations in Ukraine to the two broad types (white- vs. blue-collar workers) as in Armenia, Azerbaijan and Georgia. If there were more than one occupation belonging to a white-collar (or blue-collar) category among the three pre-selected occupations, we used information for the earliest occupation reported. But there were also cases, when all three occupations selected by a surveyed firm belonged to only one broad category. Out of 702 firms in the Ukrainian sample, 92 firms

[13] The procedure is the following: (i) the interviewer establishes which occupation types are present in the firm; (ii) the interviewer refers to a pre-given sticker on the front of the questionnaire, which lists the occupations under the two broad types, and selects the first occupation that appears on the list and is present in the firm. The stickers are generated by an Excel macro, which is provided by the STEP team to the survey firm. Each sticker lists the 10 occupation types in a random order (Pierre et al., 2014).

[14] The procedure in Ukraine is the following: (i) respondent is asked to evaluate the level of skills gap (major, minor or no skills gap) for all occupations that are present in the establishment; (ii) then he/she should choose three occupations among those defined with "major skills gap" which are the most important for the company. If there are no occupations with major skills gap or they are less than three, a respondent chooses occupations at the column "minor skills gap" (and then "no skills gap"). After this selection, the questions were asked about Type 1/2/3 worker.

reported information about all three occupations belonging to a blue-collar category, and 308 firms selected occupations which belonged to a white-collar category only. Despite these data transformations that helped to merge the Ukrainian data set to the data from the other three countries, differences in the initial definition of typical workers might affect the results of our comparative study on training and therefore should be always kept in mind.

Once firms with missing data about training were removed, we are left with about 1660 firms in our pooled sample for the analysis of training provided to white-collar workers and 1377 firms for the analysis of training of blue-collar workers. The number of observations in the regression analysis is even smaller as some explanatory variables had missing values. Although we apply sample weights to correct for potential biases in the initial samples, the results on the point estimates of the incidence and intensity of training in four countries should be interpreted with caution, especially in Georgia, where two thirds of surveyed firms are in the construction sector, and in Ukraine, where the sample represents only four sectors (agribusiness growers, agribusiness food processors, renewable energy, and IT).

We measure the firm-level incidence of training of three main types and for two types of workers (white- and blue-collar) by deriving dummy variables from the following questions:

- On-the-job training: 'Did the [WORKER TYPE_] employees in your workplace receive any training last year on the premises of the workplace? What share of the [WORKER TYPE_] employees in your workplace received training on the premises of the workplace of each of the following types in the last 12 months?'. Relevant answers to the second question include two options in the questionnaire in Armenia, Azerbaijan and Georgia – (i) on-the-job training (learning as they worked at the job, with help from more experienced workers) and (ii) training by the firm's managers, technical persons, peers, etc. – which both appeared in one option in the Ukrainian questionnaire. A dummy variable equals one if the establishment gave an affirmative answer to the first question for the respective type of worker and reported non-missing non-zero value for the share of employees who received on-the-job training or training by the firm's managers.

- Other in-house training: questions and approach to the definition of the outcome dummy variables are the same as above, but relevant answers to the second question include the other three options offered in the questionnaire – training by the firm's dedicated trainers, training on the firm's premises with external trainers (consultants, private training companies, government institutions, etc.), and other (open-end option).

- External training: 'Did the [WORKER TYPE_] employees in your workplace receive any formal training organized by the firm, outside the workplace last year? What share of the [WORKER

TYPE_] employees in your workplace received outside training of each of the following types in the last 12 months?'. A dummy variable equals one if the establishment gave an affirmative answer to the first question for the respective type of worker and reported at least one non-missing non-zero value for the share of employees who received external training: (i) at a technical or vocational education and training public school, (ii) through private training providers, (iii) through equipment suppliers (for example, a company selling computers providing training on software), (iv) at some NGOs or international organizations, or (v) other (open-end option).

Based on these basic three types of training we created two dummy variables for 'Any training' depending on the type of worker (white- and blue-collar). They equal one if at least some training of the above mentioned types was provided by the firm to workers of the respective type in the last 12 months, and 0 otherwise (given availability of information about white- or blue-collar workers in general). For additional cross-checks we also created dummy variables for 'Any in-house and external training' by types of workers, 'Other in-house or external training' (excluding initial on-the-job training) by types of workers, and 'Any training, any workers'. But we still prefer to distinguish between types of training and types of workers in the main empirical part, as only disaggregated information provides unique insights into different factors that influence the decision of firms to provide training of a certain type to workers from different occupational groups.

As the STEP employer survey does not include information about hours of training while data about the average number of days per year for trained workers of a given type were collected only for formal in-house training, we measure the intensity of training in terms of the share of workers trained, similar to Gashi and Adnett (2012). If the establishment reported different shares of workers trained through different methods within three major types – on-the-job, other-in-house and external training – we used the share corresponding to the maximum reported value to define the intensity of training of a given type. Hence, our measures of intensity refer to the most widespread methods of training used within the establishment.[15]

Following the theoretical and empirical literature on investment of firms in human capital we also construct firm-level controls that may play important role in explaining the patterns of employer-provided training in post-Soviet countries. Their definitions are provided in the Annex Table A.1

[15] Overall in the sample, these methods are usually on-the-job training (learning as they worked at the job, with help from more experienced workers) for on-the-job training of both white-collar and blue-collar workers; training on the firm's premises with external trainers (for example, consultants, private training companies, government institutions) for other in-house training of white-collar workers, but training by the firm's dedicated trainers for other in-house training of blue-collar workers; and training through private training providers for external training of both white-collar and blue-collar workers.

whereas more details about their potential effect are provided in Section 5 on the determinants of training.

Table A.2 in Annex reports the summary statistics for the main variables of interest in the pooled sample that allows comparing profiles of non-training vs. firms providing any training by types of workers. As expected, training firms tend to be significantly larger and more open to innovations in technology and products/ processes/ services. A significantly larger share of training firms as opposed to their non-training counterparts have international business contacts, operate in capital cities and perform their economic activity in industry (training of blue-collar workers) or in business services (training of white-collar workers). They also much more often report labor supply issues (labor availability or finding workers with previous experience) as a serious obstacle to their growth but they tend to have better financial performance and growth prospects (self-assessed). All training firms and those training white-collar workers have on average a significantly larger share of professionals and technicians and a significantly smaller share of managers. The latter finding is attributed to the fact that the share of managers decreases with the size of firms determined in terms of permanent employment, and smaller firms with a relatively large share of managers are less likely to invest in employee training. Meanwhile, firms training blue-collar workers have on average a significantly larger share of skilled blue-collar workers and a smaller share of unskilled blue-collar as opposed to their non-training counterparts.

There are also huge and significant differences between training and non-training firms in their composition by characteristics related to employment of white-collar and blue-collar workers, namely duration of filling a vacancy and the highest level of computer use involved in their job. Interestingly, about 60 percent of firms training blue-collar workers report that their workers do not use computers at all. Yet, this share is 12 percentage points smaller than among firms which do not provide any training to blue-collar workers.

4. Provision of different types of training by firms in Armenia, Azerbaijan, Georgia and Ukraine

4.1. Incidence of training by type of workers and type of training

In this section we analyze the estimated incidence of various types of training provided by firms in four post-Soviet countries to two types of workers – white-collar and blue-collar workers. Table 1 indicates that from 27.6 percent of firms in Georgia to 53.9 percent in Armenia provided at least some type of training to their workers during the last 12 months prior to the survey (last column).

However, the incidence of training appears to be much lower if we exclude on-the-job training (learning from managers, supervisors or peers) which is the most popular type of training, especially for

blue-collar workers. This suggests that firms usually provide orientation on-the-job training by their managers or skilled workers which is less costly and less time-consuming than other forms of in-house training or external training. Only in Armenia firms reported higher incidence of external training of white-collar workers than that of on-the-job training.

An important implication from this analysis is that if firms are asked only about formal training programs for their permanent full-time employees as in the BEEPS or World Bank Enterprise Survey, estimated incidences are expected to be lower than in the case when less formal on-the-job training is also included. Moreover, a formal training program is likely to involve courses offered to a number of employees whereas any training during the year can reflect some training provided to just one employee (Frazis et al., 2000). Therefore, it is important to take into account different types of training, both informal and formal, either for one employee or for a larger group of them, before making decision on whether employer-provided training rate is really low in a given country.

Another interesting finding from the data in Table 1 is that the incidence of external training is higher than the incidence of other in-house training in all countries, except for Azerbaijan. This implies that training firms in the other three countries often do not have dedicated trainers and probably lack relevant premises for formal workplace training, and therefore they prefer to train their workers outside.

Table 1. Share of firms providing training to workers by type of worker and type of training (%)

Country	White-collar					Blue-collar					White-collar OR blue-collar	
	On-the-job training	Other in-house training	External training	Other in-house OR external	Any training	On-the-job training	Other in-house training	External training	Other in-house OR external	Any training	Other in-house or external	Any training
Armenia	25.7	9.1	28.3	32.2	42.7	26.5	5.6	6.8	10.4	29.0	35.9	53.9
Azerbaijan	35.9	20.9	13.9	25.2	42.1	37.1	17.3	4.2	18.2	38.8	28.1	48.7
Georgia	14.7	4.3	12.2	12.7	21.5	20.7	5.7	8.2	11.1	25.2	15.9	27.6
Ukraine	27.8	7.8	12.0	15.9	35.1	26.1	6.0	7.1	11.8	32.3	17.4	40.0

Source: Author's calculations based on STEP Employer Surveys: Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

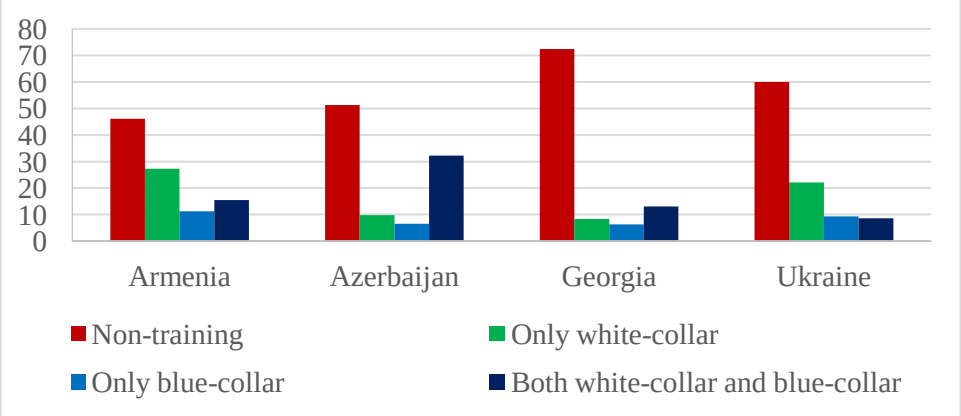
Note: Weighted with sample weights. Only firms with non-missing answers are included in the analysis.

There is a striking difference between the shares of firms providing external training to white-collar versus blue-collar workers (Table 1). Rutkowski (2013 a) argues that external training is supposed to provide more advanced skills, and therefore a higher incidence of external training provided to highly-educated white-collar workers is consistent with the complementarity between education and training observed in developed countries. However, we cannot argue that firms in post-Soviet countries tend to train managers, professionals and technicians (white-collar workers) more than clerical support

workers, services and sales workers, craftsmen, operators and laborers (blue-collar workers), if we compare the incidence of any training provided to white-collar versus blue-collar worker (Table 1) that includes on-the-job training.

After splitting all firms in the sample into 4 groups – non-training firms, firms training only white-collar workers, firms training only blue-collar workers and firms training both types of workers (Figure 2), we can see that in Azerbaijan and Georgia the share of firms that train both types of workers exceeds the share of firms that train only workers from top occupational groups. The opposite situation is in Armenia and Ukraine where the number of firms providing training only to white-collar workers is twice larger compared to the share of firms training both types of workers. This discrepancy is mainly due to the cross-country differences in the sectoral composition of surveyed firms and occupational composition of their workforce.

Figure 2. Composition of firms by their training status (%)



Source: Author's calculations based on STEP Employer Surveys: Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Weighted with sample weights. Only firms with non-missing answers are included in the analysis.

Table A.3 in Annex shows that there is expected relationship between the occupational composition of the workforce and training status of firms in Armenia, Georgia and Ukraine: at firms training only white (blue)-collar workers the overwhelming majority of their permanent employees represent white (blue)-collar professions, whereas firms training both types of workers have almost equal shares of these groups of workers in their staff. In Azerbaijan the trend is roughly the same, but blue-collar workers prevail regardless of the firms' training status.

4.2. *Intensity of training by type of workers and disaggregated type of training*

This section looks beyond training incidence and provides some information about intensity of training, measured as the average share of workers provided with training of some type, and duration of such training measured in days per year. Available information for internal and external training in 4 countries is offered in Tables 2 and 3, respectively.

Table 2 reveals that the majority of workers of a given type receive some type of internal training in Armenia, Georgia and Ukraine. In Azerbaijan the intensity of internal training is quite low compared to the other three countries. Combining this result with the one for the incidence of internal training (Table 1), we see that relatively more firms in Azerbaijan reported about providing at least some type of internal training but they offered this training to a smaller share of employees. The similar discrepancy was discussed in Introduction for Kyrgyzstan and Russia.

Furthermore, Azerbaijan stands out in terms of the shortest duration of internal training, especially for white-collar workers. This suggests that internal training in Azerbaijan is usually an orientation training aimed at equipping workers with some basic firm-specific skills. In the other three countries firms reported on average lower incidence of internal training (Table 1) but if they did provide training they embraced more workers and provided them with longer training courses (Table 2).

Table 2. Average share of workers and duration of internal training by type of worker and method of training

		On-the-job training		**Other in-house training**	
		On-the-job training (learning by doing, with help from more experienced workers)	Training by the firm's managers, technical persons, peers, etc.	Training by the firm's dedicated trainers	Training on the firm's premises with external trainers (consultants, private training companies, government institutions, etc.)
			White -collar workers		
Armenia	Average share (%)	64.9	59.4	61.5	60.5
	Average days per year		39.0	24.4	23.5
Azerbaijan	Average share (%)	48.2	39.8	38.7	37.3
	Average days per year		11.2	9.3	8.2
Georgia	Average share (%)	69.2	75.8	59.2	76.3
	Average days per year		22.6	12.1	25.2
Ukraine*	Average share	81.3		44.3	56.7
	Average days per year	24.7		12.4	14.8
			Blue-collar workers		
Armenia	Average share (%)	70.2	67.0	52.6	61.5
	Average days per year		34.5	42.5	33.4
Azerbaijan	Average share (%)	49.8	38.6	42.5	31.0
	Average days per year		9.8	30.0	29.3
Georgia	Average share (%)	70.1	83.0	76.3	86.2
	Average days per year		17.4	74.7	29.9
Ukraine*	Average share (%)	82.1		63.0	57.5
	Average days per year	11.8		61.3	10.1

Source: Author's calculations based on STEP Employer Surveys: Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Weighted with sample weights. Only firms with non-missing non-zero answers are included in the analysis. * In the Ukrainian survey information for on-the-job training is collected without distinguishing between two methods.

Table 3. Average share of workers provided with external training by type of worker and method of training (%)

	At a technical or vocational education and training public school	Through private training providers	Through equipment suppliers (for example, a company selling computers providing training on software)	NGO's or international organizations
		White-collar workers		
Armenia	20.0	42.9	36.1	39.4
Azerbaijan	31.8	73.3	34.8	34.3
Georgia	47.9	63.0	65.1	56.8
Ukraine	81.1	67.5	64.2	49.1
		Blue-collar workers		
Armenia	15.0	52.2	18.1	32.2
Azerbaijan	28.5	73.6	38.2	-
Georgia	87.3	72.6	64.0	69.3
Ukraine	58.2	83.3	86.5	59.6

Source: Author's calculations based on STEP Employer Surveys: Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Weighted with sample weights. Only firms with non-missing non-zero answers are included in the analysis.

Tables 3 and 1 reveal a discrepancy between the incidence and intensity of external training for white-collar workers in Armenia, similarly to the one observed in Azerbaijan in the case of internal training. Another interesting finding from Table 3 is a fairly high share of blue-collar workers covered by external training, although the average incidence of such training reported in Table 1 is generally low. This means that few firms that can afford external training of workers try to use different forms of training and embrace as many workers as possible. This is particularly the case in Ukraine where an acute shortage of highly-skilled blue-collar workers encourages leading firms to use both internal and external training to address the existing skills gaps.

5. Determinants of employer-provided training in post-Soviet countries

5.1. Empirical approach

In order to examine different factors that explain the behavior of firms in post-Soviet-countries with regard to provision of internal and external training to white-collar and blue-collar workers, we use the pooled sample of firm-level cross-sectional data in four countries (Armenia, Azerbaijan, Georgia and Ukraine) and apply two models – a probit model for the propensity of firms to provide training (that is training incidence) and a Tobit model for the share of workers that undertook training of a given type as

reported by firms (that is training intensity). An econometric model can be generally expressed in a linear form as:

$$Training_{ijct} = \alpha + \beta X_{ijc} + \gamma Z_{ijct} + \delta D_{jc} + \varepsilon_{ijct},$$

where index *i* stands for a firm, *j* is a sector, *c* is a country, and *t* is a type of worker (white-collar or blue-collar),

the dependent variable *Training* in the probit model is a dummy variable identifying whether the firm has provided training to its workers of a given type in the past year prior to the survey, four different dependent variables depending on the type of training – on-the-job training, other in-service training, external training or any of these types of training – are used in the study;

the dependent variable in the Tobit model is the left-censored variable of the share of workers trained (consisting of zeros for those firms that have not provided training of a given type); three different dependent variables depending on the type of training – on-the-job training, other in-service training, external training – are used in the study;

X_{ijc} is a vector of firm-level covariates that do not depend on the type of worker covered by training;

Z_{ijct} is a vector of worker type-specific firm-level covariates;

D_{jc} denotes a vector of country-sector fixed effects (overall 17 dummies), which are included to capture the effects of various unobservable characteristics that are common across firms within countries and sectors, and

ε_{ijct} is the error term.

Standard errors are clustered at the country and sector level to adjust for heteroscedasticity within countries and sectors.

Below we provide the list of our firm-level controls with regard to the potential explanations of (under)investment in employee training from the literature reviewed in section 2:

- *poaching externa*lity: worker turnover is a serious obstacle to growth. It is expected that firms that recognize the problem of high worker turnover are likely to under-invest in training;
- *credit/ financing constraints*: 1) access to finance is more constraint to doing business than labor-related issues; 2) self-assessed financial performance in the last fiscal year. Popov (2010) found that access to finance and to bank credit in particular is associated with a significantly lower incidence of formal training in transition countries. Our variable of access to finance which is measured in the STEP survey as an obstacle to doing business growth compared to labor-related issues is, therefore, expected to have a negative sign. At the same time, companies that assess their financial performance as stable or good are expected to have higher indicators of training than 'poor performers';

- *firing and hiring costs*: employment protection legislation is a serious obstacle to growth. According to the findings of Almeida and Aterido (2011), a stricter enforcement of labor regulations is associated with a higher investment of firms in training even though the magnitude of the effect is very small. We do not have information about enforcement of labor regulations at the firm level and can use only self-assessment by employers of employment protection legislation as a problem to their growth. Taking into account that less than 10 percent of firms in our sample consider employment protection legislation as a severe and very severe labor-related problem (Table A.2 in Annex), probably because labor regulations have been gradually liberalized in post-Soviet countries (Muravyev, 2014) or because they are not strictly enforced at the firm level, we expect no significant effect of this variable on the incidence and intensity of training;

- *size*: permanent employment and the size group based on it. A positive association is expected between the firm size and indicators of training. Smaller firms tend to provide less training in developed countries as they typically face more credit and informational constraints than faced larger companies (Dostie, 2015). Moreover, larger firms may have a better capacity to screen employees before hiring, lower required rates of return on investment in training and greater ability to absorb losses associated with the poaching externality (Frazis et al., 2000). Almeida and Aterido (2015) added that important differences between smaller and larger firms in terms of their ability to invest in technology and integrate into global markets, in the shares publicly owned companies and in the educational attainment of the workforce might also explain why smaller firms have lower incidence of training in developing countries. Gimpelson et al. (2010) argued that larger manufacturing firms in Russia resorted to a training option as they were often prone to labor hoarding but firing of redundant workers was constrained by strict employment protection legislation. We would like to add our explanation which is relevant in the context of post-Soviet countries: many large long-standing firms, which are predominantly state-owned or being privatized during the 1990-2000s, inherited a well-developed system of employee training either at their own firm-level centers or at affiliated education and training institutions, while most de-novo private smaller firms lack such opportunity to train their workers;

- *hiring workers from external markets*: 1) filling a vacancy for a worker of a given took 30 days or more; 2) labor supply is a serious obstacle to growth. It is expected that if it is more difficult to find a worker with relevant skills in the external market, firms are more likely to provide more training to available workers, especially initial on-the-job training. If the main reason for inability to fill a vacancy within a month is high expectations of job candidates with regard to wages and/ or working conditions (which is the case in post-Soviet countries as documented in Koettl et al., 2015), less

competitive firms might use training of workers to compensate for lower wages paid to them and/ or to upgrade the initial skill level of new workers that had agreed to take these jobs;

- *innovation, technological base*: 1) firm introduced new technology in the past 3 years; 2) firm introduced new products/ processes/ services in the past 3 years. Previous literature has found a strong positive relationship between the variables measuring innovation activity of companies and indicators of training (see, for example, Acemoglu, 1997, 1998; Dostie, 2015; Popov, 2014). Dostie (2015) discussed the causal link between innovation and training mainly in the direction from training to innovation, arguing that continuous firm-sponsored training guarantees access to 'leading-edge knowledge' and thus has a positive impact on the propensity of firms to innovate. Taking into account that the STEP surveys asked firms about introduction of new technology, products, processes and services within the last 3 years while the reference period for the questions about training was the last 12 months, we think that interpretation of the causal link from innovation to the training propensity of firms is more appropriate in our study.[16] Moreover, it is quite unlikely that in post-Soviet countries workers get 'leading-edge knowledge' during their internal or external training and then encourage employers to introduce new technologies or products, unless this training takes place in some technologically advanced country or transnational corporation;

- *skill content of jobs*: 1) share of professionals, clerical and service workers and skilled blue-collar workers; 2) level of computer use at work by a worker of a given type. As has been shown in the previous section, firms which have relatively higher share of managers, professionals and technicians tend to provide training to white-collar workers whereas firms which have relatively higher share of workers from the other occupational groups are more interested in training of blue-collar workers. Besides, if firms report a higher level of computer use at work by workers of a given type, such firms are expected to invest more in training of such workers to upgrade their skills in line with rapid changes in information technology. The latter hypothesis is based on the complementary relationship at the firm level between computers and skills which has been described in detail and tested in the US by Bresnahan et al. (2002);

- *satisfaction with the level of education and skills of workers*: 1) education of workers is a serious obstacle to growth, 2) share of workers of a given type fully qualified for their job. If employers are less satisfied with the level of education and skills of their workers, they are expected to be more

[16] Tan et al. (2007) tested the hypothesis of complementarity between innovation and training among Russian manufacturing firms and examined determinants of simultaneous decisions about innovation and training in a bivariate probit model. After comparing the estimates of the probability of one investment activity – innovation or training – conditional on the other taking place, the authors came to conclusion that training is necessary to complement investment in innovative activities but firms may have many other reasons for training than just to support innovation.

active in upgrading worker skills to the necessary level. However, it is also possible that some firms that report skills gaps do little to improve their situation, either because of institutional and informational constraints or due to a lack of working capital. Such firms are referred to as market losers or non-competitive in the labor market (Gimpelson et al., 2010).

- *other determinants*: ownership, international business contacts and location. Some studies in developing and transition countries (among others, Gashi and Adnett, 2012; Popov, 2014; Almeida and Aterido, 2015) test the effect of ownership, especially with foreign capital, on the incidence of training as it is expected that foreign companies bring new technologies, procedures, and approaches that might increase their provision of training to workers. Likewise, we expect that firms of different ownership but having international business contacts are more likely to provide training to their workers.

Trade unions presence at the firm level to test the 'hold-up' hypothesis is not included as there is no such variable in the STEP employer survey. Most importantly, the bargaining power of trade unions is rather weak in post-Soviet countries and their presence is negligible in non-industrial small private firms which prevail in our sample (see Table A.2 in Annex). We also tested the effect of firms' age but it was insignificant consistently and therefore dropped from the further analysis. Definition of all variables is provided in Table A.1.

5.2. Estimation results

Table 4 reports the point estimates from probit regressions for four different dependent variables measuring the incidence of training of respective type for white-collar and blue-collar workers from the preselected occupational group. Some variables, including wage level and payroll tax, employment protection legislation and access to finance as obstacles to growth, firm age and most important skills during hiring have been dropped from the final model as they were insignificant and did not improve the goodness-of-fit of estimated models. [17] The goodness-of-fit considerably improved when worker type-specific firm-level covariates, especially the level of computer use at work, were added to the model, while sings and significance of the other variables were robust to specification changes. Table 5 display the estimation results of Tobit models for the determinants of the shares of white-collar and blue-collar workers who received training internal or external training from their employers.

Consistent with our expectations, the probability and intensity of training increases with establishment size when controls for other firm characteristics are included and data for four countries are pooled. But there are some differences in the size effect between two types of workers: in the case of

[17] A set of nested models without worker type-specific firm-level covariates and alternative specifications for each type of training and worker is available upon request.

Table 4. Determinants of the incidence of employer-provided training in four post-Soviet countries

	Incidence of training of white-collar workers				Incidence of training of blue-collar workers			
	On-the-job training	**Other in-house training**	**External training**	**Any training**	**On-the-job training**	**Other in-house training**	**External training**	**Any training**
Log(Permanent employment)	0.181***	0.252***	0.125***	0.216***	0.087*	0.242***	0.033	0.085*
	(0.035)	(0.077)	(0.027)	(0.031)	(0.048)	(0.082)	(0.089)	(0.052)
Insiders (managers or employees)	0.092	-0.286**	0.137	0.205	-0.247*	0.043	0.063	-0.142
	(0.145)	(0.137)	(0.146)	(0.198)	(0.131)	(0.273)	(0.315)	(0.211)
Foreign owner	0.058	0.018	0.119	0.012	-0.161	-0.230	-0.569	-0.136
	(0.246)	(0.245)	(0.279)	(0.236)	(0.192)	(0.271)	(0.493)	(0.210)
Government owner	-0.035	-0.223	-0.220	-0.097	0.085	0.265	-0.041	0.059
	(0.356)	(0.402)	(0.323)	(0.354)	(0.363)	(0.534)	(0.506)	(0.374)
Other ownership	-0.298	-0.182	0.291*	-0.073	-0.236	0.072	0.200	-0.085
	(0.245)	(0.188)	(0.155)	(0.217)	(0.224)	(0.207)	(0.176)	(0.190)
Capital city	0.048	0.105	0.173	0.114	0.138	0.442***	-0.031	0.157
	(0.100)	(0.138)	(0.176)	(0.101)	(0.136)	(0.170)	(0.163)	(0.130)
New technology	0.225***	0.389***	0.231*	0.300***	0.138*	0.037	0.213	0.115*
	(0.069)	(0.148)	(0.120)	(0.052)	(0.077)	(0.147)	(0.201)	(0.066)
New products/ processes/ services	0.264**	0.510***	0.137	0.135*	0.084	0.343***	0.333	0.090
	(0.114)	(0.147)	(0.087)	(0.080)	(0.121)	(0.098)	(0.236)	(0.121)
International business contacts	0.351***	0.462***	0.519***	0.473***	0.264**	0.384**	0.135	0.220*
	(0.101)	(0.174)	(0.091)	(0.097)	(0.123)	(0.189)	(0.233)	(0.112)
Stable financial performance	0.015	-0.264*	-0.373***	-0.185*	0.125	-0.210	-0.215	0.063
	(0.126)	(0.145)	(0.116)	(0.112)	(0.127)	(0.165)	(0.209)	(0.118)
Good and very good financial performance	0.171	-0.042	-0.118	0.006	0.319***	-0.063	-0.092	0.280**
	(0.125)	(0.132)	(0.136)	(0.085)	(0.121)	(0.148)	(0.179)	(0.118)
Labor supply is a serious obstacle	0.202**	0.229**	0.320**	0.301***	0.119	0.109	0.308	0.171*
	(0.090)	(0.094)	(0.129)	(0.078)	(0.084)	(0.161)	(0.188)	(0.090)
Education is a serious obstacle	-0.047	-0.223	-0.038	-0.054	-0.055	0.066	-0.024	-0.041
	(0.112)	(0.142)	(0.143)	(0.129)	(0.096)	(0.181)	(0.149)	(0.097)
Worker turnover is a serious obstacle	0.181	0.241**	-0.090	0.130	0.264**	0.103	-0.168	0.196**
	(0.121)	(0.116)	(0.158)	(0.142)	(0.107)	(0.155)	(0.208)	(0.099)
Share of professionals and technicians	0.006***	0.008*	0.001	0.006***	0.000	-0.008*	0.006	0.000
	(0.002)	(0.005)	(0.002)	(0.002)	(0.004)	(0.005)	(0.008)	(0.004)
Share of clerical and service workers	-0.000	0.001	-0.003*	-0.002	0.002	-0.003	0.011**	0.003
	(0.002)	(0.004)	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.003)
Share of skilled blue-collar workers	0.003	-0.001	-0.005**	-0.000	0.007**	-0.006	0.013***	0.008**
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.003)
Characteristics related to workers of a given type (white/ blue-collar workers, respectively)								
Filling a vacancy took 30 days or more	0.090	-0.374**	-0.068	0.062	0.384	0.273	0.327*	0.404
	(0.139)	(0.163)	(0.195)	(0.191)	(0.248)	(0.244)	(0.189)	(0.246)

Share of workers fully qualified for their job	-0.003** (0.001)	0.000 (0.003)	0.002 (0.002)	-0.001 (0.002)	-0.005** (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.005** (0.002)
Straightforward use of computer	-0.245* (0.128)	-0.252 (0.246)	0.111 (0.169)	-0.170 (0.118)	0.265** (0.123)	0.598*** (0.187)	0.173 (0.195)	0.316** (0.142)
Moderate use of computer	-0.051 (0.143)	-0.031 (0.137)	0.275*** (0.088)	0.078 (0.129)	0.111 (0.096)	0.513*** (0.161)	0.655*** (0.142)	0.321** (0.129)
Complex and specialized use of computer	0.151 (0.137)	0.196 (0.163)	0.451*** (0.157)	0.331** (0.150)	0.305 (0.357)	0.526** (0.264)	0.565 (0.364)	0.340 (0.352)
N	1460	1438	1460	1460	1186	1186	1168	1186
pseudo R^2	0.191	0.302	0.194	0.211	0.114	0.269	0.158	0.108

Source: Author's calculations based on the STEP Employer Surveys (World Bank): Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Tables report coefficients from probit regressions where the dependent variable is the incidence of training by type, defined as a dummy equal to 1 if the firm provided training of a given type in the last 12 months prior to the survey, and to 0 otherwise. Standard errors clustered at the country and sector level are shown in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All regressions include a constant and country-sector dummies. Individual local owner, Poor and very poor financial performance, and No use of computer are omitted categories. Definition of variables is provided in Annex Table A.1.

white-collar workers the relationship between the size of firms and indicators of training is significant for all types of training, whereas in the case of blue-collar workers it is strongly significant only for in-house training. This finding supports our hypothesis that larger firms benefit from having their own training centers for blue-collar workers inherited from the Soviet era. The positive coefficient of the capital city dummy which is significant only in the case of other in-house training of blue-collar workers implies that such firms are predominantly located in the capital cities.

Interestingly, only firms with insider ownership are found to significantly differ in terms of the probability and intensity of training – other in-house training of white-collar workers and on-the-job training of blue-collar workers – from the base category of firms owned by a local individual of a family. Firms with 'other' ownership are marginally different from the majority of firms owned by a local individual of a family with respect to external training of white-collar workers. This suggests that other firm attributes than ownership play a more important role in explaining the propensity of surveyed firms to train their workers. In alternative specification we tested the effect of a dummy variable for foreign ownership instead of 4 dummies for different types of ownership, but its effect was also insignificant.

Innovative firms that introduced a new technology in the last 3 years prior to the survey are more likely to provide internal and external training to their workers, but the effect is statistically strong only for white-collar workers. It is marginally significant for on-the-job training of blue-collar workers when the incidence of training is examined (Table 4) and insignificant in the case of training intensity (Table 5). This result brings support to the complementarity hypothesis between technology and skills at the firm level and an important role of employer-provided training that links education and advanced technology. Besides, introduction of new products, services or processes is associated with higher incidence and intensity of in-house training for both types of workers. This suggests that formal training sessions are organized on the premises of firms to ensure that more workers understand the features or technical details of new products or services and can then explain these details to their less experienced colleagues and customers.

Having international business contacts appears to be a very strong determinant of the incidence and intensity of training of white-collar workers, and to a lesser extent blue-collar workers. Firms with international business contacts have a larger incentive to train their workers because they might have more technologically advanced and skill-intensive production induced by technological and knowledge spillovers from their business partners. Furthermore, they are more likely to face pressures on continuous workforce skills development to meet the international quality standards and compete successfully in local and international markets.

Table 5. Determinants of the intensity of employer-provided training in four post-Soviet countries

	Intensity of training of white-collar workers			Intensity of training of blue-collar workers		
	On-the-job training	**Other in-house training**	**External training**	**On-the-job training**	**Other in-house training**	**External training**
Log(Permanent employment)	11.003***	14.333***	7.009***	4.959	14.502***	4.114
	(2.817)	(4.463)	(2.444)	(3.776)	(5.358)	(10.126)
Insiders (managers or employees)	9.916	-25.869**	11.712	-19.210*	-5.434	7.380
	(10.967)	(10.385)	(14.727)	(9.805)	(22.574)	(35.325)
Foreign owner	5.785	6.791	16.061	-2.921	-2.125	-57.365
	(14.336)	(15.072)	(23.347)	(14.734)	(21.622)	(56.166)
Government owner	5.970	-14.571	-19.913	8.859	22.085	-12.329
	(23.963)	(29.268)	(23.171)	(28.437)	(39.551)	(56.852)
Other ownership	-19.850	-11.676	24.714*	-15.354	4.325	20.359
	(18.270)	(12.385)	(14.397)	(20.238)	(16.196)	(20.463)
Capital city	5.833	6.138	16.728	15.305*	36.999**	-3.521
	(6.357)	(9.907)	(15.022)	(8.341)	(15.988)	(18.272)
New technology	17.601***	31.862**	22.940**	11.332	1.652	25.309
	(5.726)	(12.631)	(11.382)	(7.561)	(12.207)	(25.388)
New products/ processes/ services	21.142**	38.157***	10.434	6.219	26.978***	37.796
	(10.172)	(11.161)	(8.189)	(10.019)	(9.646)	(25.975)
International business contacts	23.337***	33.850**	42.200***	17.911*	30.033*	14.493
	(8.228)	(15.265)	(7.274)	(10.855)	(17.397)	(25.473)
Stable financial performance	4.337	-15.833	-33.988***	14.023	-14.356	-25.683
	(10.163)	(9.793)	(9.602)	(9.416)	(13.291)	(23.324)
Good and very good financial performance	12.379	-4.512	-11.909	27.069***	-5.811	-10.426
	(9.566)	(8.719)	(11.536)	(9.275)	(11.923)	(19.229)
Labor supply is a serious obstacle	10.778*	18.070***	27.826**	6.819	9.335	34.145*
	(5.857)	(5.906)	(11.421)	(6.428)	(13.165)	(20.387)
Education is a serious obstacle	1.389	-17.252*	-1.404	-5.315	-0.951	3.581
	(6.891)	(10.322)	(11.124)	(6.383)	(13.881)	(15.676)
Worker turnover is a serious obstacle	17.862*	21.531**	-8.049	22.062***	7.087	-17.673
	(9.261)	(8.963)	(13.309)	(8.346)	(12.681)	(21.953)
Share of professionals and technicians	0.461***	0.592	0.036	-0.004	-0.556	0.538
	(0.132)	(0.367)	(0.170)	(0.315)	(0.344)	(0.864)
Share of clerical and service workers	0.029	0.132	-0.150	0.219	-0.173	1.191**
	(0.139)	(0.318)	(0.177)	(0.219)	(0.282)	(0.552)
Share of skilled blue-collar workers	0.280*	-0.083	-0.471**	0.586**	-0.410	1.359***
	(0.155)	(0.227)	(0.229)	(0.229)	(0.353)	(0.460)
Characteristics related to workers of a given type (white/ blue-collar workers, respectively)						
Filling a vacancy took 30 days or more	8.306	-27.290***	-2.159	26.122*	18.868	36.148*
	(10.821)	(9.467)	(16.776)	(15.202)	(18.465)	(20.204)

Share of workers fully qualified for their job	-0.264**	-0.023	0.212	-0.432**	-0.168	-0.159
	(0.125)	(0.208)	(0.149)	(0.197)	(0.159)	(0.262)
Straightforward use of computer	-25.572***	-19.298	5.362	19.887**	44.614***	21.997
	(8.039)	(20.324)	(15.202)	(8.576)	(12.141)	(21.752)
Moderate use of computer	-5.270	-7.018	19.080**	9.148	37.407***	73.715***
	(10.075)	(11.036)	(7.426)	(7.040)	(13.645)	(15.960)
Complex and specialized use of computer	9.700	8.600	31.395***	32.973	45.719**	70.590*
	(8.988)	(11.514)	(11.215)	(25.185)	(22.618)	(39.300)
N	1460	1460	1460	1186	1186	1185
pseudo R^2	0.052	0.109	0.061	0.027	0.098	0.071

Source: Author's calculations based on the STEP Employer Surveys (World Bank): Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Tables report coefficients from tobit regressions where the dependent variable is the intensity of training by type, defined as the share of workers of a given type covered by training of a given type in the last 12 months prior to the survey (left-censored at 0 for firms that did not provide training). Standard errors clustered at the country and sector level are shown in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. All regressions include a constant and country-sector dummies. Individual local owner, Poor and very poor financial performance, and No use of computer are omitted categories. Definition of variables is provided in Annex Table A.1.

In contrast with findings by Popov (2010), problems with access to financing do not significantly affect the probability of training in our sample of firms from four post-Soviet countries. Self-assessed financial performance is associated with the incidence and intensity of training in the expected direction only in the case of on-the-job training and any training of blue-collar workers. At the same time, firms with stable financial performance seem to be less likely to provide other in-house and external training to white-collar workers than firms that assessed their performance as very poor or poor in the last fiscal year. A likely explanation for this unexpected result is that poorly performing firms choose to train their white-collar workers in hope of getting positive returns from investment in skills and improving its financial performance in the future.

Out of several labor-related obstacles to the operation and growth of firms tested in the models, only labor supply and worker turnover appear to have a statistically significant effect on the probability of training and the share of workers trained, but not for all types of training and workers (Tables 4 and 5). Problems with finding skilled white-collar workers in the external labor market, either because of undersupply (limited labor availability) or because of the difficulty to find workers with previous experience, encourage firms to train more workers using different types of training. As regards training of blue-collar workers, firms reporting labor supply issues as a serious obstacle to growth on average have higher share of workers trained off-the-job but the effect is marginally significant. In contrast with theoretical predictions, high worker turnover is also an incentive for firms to provide training, mainly internally within the firm premises. This suggests that even though employers do face problems with high turnover of workers, they are often forced to provide some firm-specific training to satisfy their skills needs. But interpretation of this causal link may be different: firms that provide training to their workers tend to care more about high worker turnover as an obstacle to their growth as they need to spend more resources on training of new workers.

The composition of the firm workforce, that can roughly measure the skill content of jobs and the target occupational groups for skills development, also has an impact on the training incidence: the higher share of professionals and technicians at the firm the more likely is training for white-collar workers (on-the-job, other in-house, and any); the higher share of skilled blue-collar workers, the more likely is on-the-job and external training of blue-collar workers. The share of clerical and service workers is significantly and positively correlated with indicators of external training only.

Additional worker-specific characteristics measuring the difficulty of hiring a worker of a given type and the share of workers fully qualified for their jobs have significant effects only on some types of training and workers. Moreover, firms experiencing difficulty in hiring white-collar workers appear to

have lower probability of other in-house training than firms which either did not hire workers or filled a vacancy within a month which is unexpected.

Finally, and most importantly, we find evidence of the positive effect of information technology and computerization on the demand for skilled labor after controlling for many other attributes of firms (Tables 4 and 5). Both white-collar and blue-collar workers which use computers at work at the moderate, complex or specialized level are significantly more likely to get external training than their peers from firms where computers are not used at all or used at some basic level. Besides, there is a significant difference in the incidence and intensity of other in-house training of blue-collar workers between firms where these workers use computers at any level and firms which do not require any computer skills from their blue-collar workers. These results support the complementary relationship between computers and skills at the firm level found by Bresnahan et al. (2002). Furthermore, they suggest that not only white-collar workers can reap the benefits of the digitalization and computerization. There are increasingly more jobs for blue-collar workers which require advanced computer skills, and employers become interested in continuous skills development of such workers in view of the significant expected payoff to complementary investments in computer-intensive technologies and employee training. Hence, 'digital dividends' which have spread rapidly in much of the world are also observed in post-Soviet countries. Yet, they are not equally shared across firms and workers and can therefore result in higher inequality (World Bank, 2016).

6. Conclusions

Employer-providing training can play an important role in alleviating skills shortages, fostering technological adoption and increasing productivity of an aging workforce, especially in the late reforming transition countries where systems of initial education and vocational training face multiple challenges and lifelong learning policies are only slowly emerging. Earlier studies based on the EBRD-World Bank BEEPS survey of firms in transition countries argued that the incidence of employer-provided formal training has been fairly low is post-Soviet countries (for example, Sondergaard et al., 2012). Using an alternative data source – the World Bank STEP employer surveys in Armenia, Azerbaijan, Georgia and Ukraine, we find that the estimated incidence of training tends to be much higher, especially for blue-collar workers, if training by managers, supervisors or peers (on-the-job training) is included, along with more formal training provided on the premises of establishments and outside them. Besides, we find no strong evidence that employers are in general more likely to invest in training of managers, professionals and technicians (white-collar workers) than in blue-collar workers as a lot depends on the composition of the workforce and other firm characteristics.

Yet, an overall low incidence of employer-provided training – from 27.6 percent of firms in Georgia to 53.9 percent in Armenia – is mainly attributed to the prevalence of micro and small de-novo private firms which tend to underinvest in training of their workers. As such firms are often concentrated in less knowledge-intensive services such as trade, transport, accommodation and individual services, many of them find little need to improve the skills of their workers via on-the-job or external training because of the low or unchanging skill content of jobs. Others might be negatively affected by the lack of financing and imperfect information about the delivery of training services and expected returns to investment in training but this issue needs further research.

Our empirical analysis reveals that innovative firms (that introduced new technology, service, products or services) and firms with international business contacts are more likely to invest in training. These firms are more skill-intensive and as such depend on continuous workforce skills development. Besides, firms have significantly higher probability of providing advanced forms of training if workers are expected to use computers at their work which is consistent with complementarity between information technologies and skills. For example, over 50 percent of Armenian firms provide external training to blue-collar workers with specialized and complex level of computer use at work as opposed to about 4 percent among blue-collar workers who do not use computer at their work. In contrast with the labor market theory that expects underinvestment in training due to the poaching externality, our study in post-Soviet countries finds that firms reporting high worker turnover as a serious obstacle to their growth seem to be more likely to provide training (mainly initial on-the-job training) to workers than their counterparts. If the main reason for high worker turnover is the gap between expectations of workers and reality with regard to wages or working conditions, less competitive firms might use training of workers to compensate for lower wages and/ or to upgrade the initial skill level of new workers that had agreed to take these jobs.

The main conclusion that emerges from our study is that firms in post-Soviet countries are largely segmented in terms of their investment in human capital. On the one hand, there are competitive, innovative, internationally-oriented firms which invest in continuous training and development of workers to thrive and compete successfully in an ever-changing global environment. On the other hand, there is a huge pool of weaker companies which either do not need regular training of their employees because of the low skill content of jobs or face constraints to training even though they suffer from acute skills shortages. Given this, we would suggest policy interventions that are targeted on the second group of firms and are aimed at promoting an environment conducive to innovations, technological changes and human capital accumulation. These policy interventions should also address the main constraints to employer-provided training in post-Soviet countries, such as a lack of (i) adequate and reliable

information about provision of training and returns to it, (ii) financial support, and (iii) effective public-private partnership in training.

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Annex

Table A.1. Definition of variables

Variable	Definition
Dependent variables	
Incidence of on-the-job training of white/ blue-collar workers	Dummy = 1 if the establishment reported that employees of respective type received any training last year on the premises of the workplace and also reported non-missing non-zero value for the share of employees who received on-the-job training (learning by doing, with help from more experienced workers) or training by the firm's managers, technical persons, peers, etc.; = 0 otherwise (given availability of other information about white/ blue-collar workers)
Intensity of on-the-job training of white/ blue-collar workers	Left-censored variable with values between 1 and 100 representing the maximum number of the shares of employees who received either on-the-job training (learning by doing, with help from more experienced workers) or training by the firm's managers, technical persons, peers, etc.; = 0 if the establishment has not provided any of these two types of training
Incidence of other in-house training of white/ blue-collar workers	Dummy = 1 if the establishment reported that employees of respective type received any training last year on the premises of the workplace and also reported non-missing non-zero value for the share of employees who received training by the firm's dedicated trainers, training on the firm's premises with external trainers (consultants, private training companies, government institutions, etc.) or other training (open-end option); = 0 otherwise (given availability of other information about white/ blue-collar workers)
Intensity of other in-house training of white/ blue-collar workers	Left-censored variable with values between 1 and 100 representing the maximum number of the shares of employees who received training by the firm's dedicated trainers, training on the firm's premises with external trainers or other training; = 0 if the establishment has not provided any of these three types of training
Incidence of external training of white/ blue-collar workers	Dummy = 1 if the establishment reported that employees of respective type received any formal training organized by the firm outside the workplace last year and also reported non-missing non-zero value for the share of employees who received external training at a technical or vocational education and training public school, through private training providers, through equipment suppliers (for example, a company selling computers providing training on software), at some NGOs or international organizations, or at some other place (open-end option); = 0 otherwise (given availability of other information about white/ blue-collar workers)
Intensity of external training of white/ blue-collar workers	Left-censored variable with values between 1 and 100 representing the maximum number of the shares of employees who received external training at a technical or vocational education and training public school, through private training providers, through equipment suppliers, at some NGOs or international organizations, or at some other place; = 0 if the establishment has not provided any of these five types of training
Incidence of any training of white/ blue-collar workers	Dummy = 1 if at least some type of training of the above mentioned type was provided by the establishment to workers of the respective type in the last 12 months; = 0 otherwise (given availability of other information about white/ blue-collar workers)
Control variables	
Sector	Six aggregated sectors based on the main activity of establishment classified in line with NACE Rev.2: Agriculture; Industry (includes Mining and quarrying, Manufacturing, Electricity, gas, steam and air conditioning supply, Water supply; sewerage, waste management and remediation activities); Construction; Trade, Transport, Accommodation (includes Wholesale and retail trade, repair of motor vehicles and motorcycles, Transportation and storage, Accommodation and food service activities); Business services (includes Information and communication, Financial and insurance activities, Real estate activities Professional, scientific and technical activities; Administrative and support service activities); Other (the rest)
Size (employment)	Size is defined in terms of establishment's permanent employment. Four size categories with the EU threshold are: Micro (1-9 employees), Small (10-49 employees), Medium (50-249 employees), and Large (250 and more employees)
Ownership	Five ownership categories based on the question about the largest shareholders in the establishment: Individual local owner (includes Individual from [COUNTRY], Family from [COUNTRY]); Insiders (Managers or employees of the firm); Foreign owner (includes Foreign individual or family, Foreign company); Government owner (that is Government or government agency); Other ownership (includes General public, Domestic company, Bank, Investment fund, Members of the association/ cooperative, Other)

Variable	Definition
Location (capital city)	Dummy = 1 if the establishment is located in the capital city; = 0 otherwise
New technology	Dummy = 1 if the establishment introduced new technology during the last 3 years; = 0 otherwise
New products/ processes/ services	Dummy = 1 if the establishment introduced new products/ processes/ services during the last 3 years; = 0 otherwise
International business contacts	Dummy = 1 if the establishment reported that it has international business contacts with entities in other countries; = 0 otherwise
Financial performance	Three categories aggregated from five original answers (Very poor and poor, Stable, Good and very good) to the question 'How would you describe the financial performance of your company in the last fiscal year?'
Growth prospects	Three categories aggregated from five original answers (Very poor and poor, Stable, Good and very good) to the question 'How would you describe the prospects for your company in the coming three years?'
EPL (employment protection legislation) is a serious obstacle to growth	Dummy = 1 if the establishment answered that employment protection legislation/ labor code laws is a severe problem (question 'Can you please indicate how problematic each of the following labor factors is for the operation and growth of your business?', answers 4 and 5 on a scale of 1 to 5, where 1 means 'no problem' and 5 means 'severe problem'); = 0 otherwise
Payroll taxes/ wage rate is a serious obstacle to growth	Dummy = 1 if the establishment answered that either payroll taxes and social security contributions, overall wage level or minimum wage is a severe problem (question 'Can you please indicate how problematic each of the following labor factors is for the operation and growth of your business?', answers 4 and 5 on a scale of 1 to 5, where 1 means 'no problem' and 5 means 'severe problem'); = 0 otherwise
Labor supply is a serious obstacle to growth	Dummy = 1 if the establishment answered that either labor availability or finding workers with previous experience is a severe problem (question 'Can you please indicate how problematic each of the following labor factors is for the operation and growth of your business?', answers 4 and 5 on a scale of 1 to 5, where 1 means 'no problem' and 5 means 'severe problem'); = 0 otherwise
Education of workers is a serious obstacle to growth	Dummy = 1 if the establishment answered that either general education of workers or technical and vocational education and training of workers is a severe problem (question 'Can you please indicate how problematic each of the following labor factors is for the operation and growth of your business?', answers 4 and 5 on a scale of 1 to 5, where 1 means 'no problem' and 5 means 'severe problem'); = 0 otherwise
Worker turnover is a serious obstacle to growth	Dummy = 1 if the establishment answered that high worker turnover is a severe problem (question 'Can you please indicate how problematic each of the following labor factors is for the operation and growth of your business?', answers 4 and 5 on a scale of 1 to 5, where 1 means 'no problem' and 5 means 'severe problem'); = 0 otherwise
Access to finance is a more serious obstacle	Dummy = 1 if the establishment answered that access to financing or cost of financing is a more and much more constraint to doing business (question 'Compared to these labor issues, are the following much more, more, similar, less or much less constraint to doing business?', answers 4 and 5 on a scale of 1 to 5, where 1 means 'much less constraint' and 5 means 'much less constraint'); = 0 otherwise
Hiring a worker of a given type (white/ blue-collar worker) took 30 days or more	Dummy variable based on the question 'Over the past 12 months, on average for [WORKER TYPE _] how many days does it take to fill a position from the time the position becomes open or is created?'. It equals 1 if it the establishment reported 30 days or more; = 0 if it reported less than 30 days or if no positions were open/ created in the past 12 months
Level of computer use at work by a white/ blue-collar worker	Four categories based on the question 'What is the highest level of computer use involved in their job?' with five answers: None, Straightforward (Examples: data entry; sending and receiving emails; printing out an invoice in a shop, posting items in accounting software), Moderate (Examples: using Word or other word processing, or Excel or other spreadsheet, making PowerPoint presentations); Complex (Examples: analyzing information or design, including aided design, or analysis with accounting software; using statistical analysis package, writing macros in Excel, etc.) and Specialized (Examples: software programming; managing computer networks)
Share of fully qualified workers of a given type (white/ blue-collar worker)	Variable based on the question 'What share of [WORKER TYPE _] employees at your firm are fully qualified for the job?'

Table A.2. Descriptive statistics by involvement of firms in training

Characteristic		Total	Non-training firms	Training firms		
				any workers	white-collar workers	blue-collar workers
Sector	Agriculture, %	15.3	18.7	11.3***	7.6***	14.6
	Industry, %	22.9	21.4	24.8*	23.9	28.3***
	Construction, %	17.2	19.2	14.9**	14.2***	17.9
	Trade, Transport, Accommodation, %	19.0	20.9	16.7**	16.8***	18.6**
	Business services, %	20.0	14.7	26.3***	31.2***	15.8**
	Other, %	5.5	5.1	6.0	6.3	4.9
Size	Micro (1-9 employees), %	34.8	42.2	26.0***	26.3***	24.8***
	Small (10-49 employees), %	41.1	39.1	43.5*	41.6	43.6
	Medium (50-249 employees), %	20.1	15.7	25.3***	26.4***	25.9***
	Large (250+ employees), %	4.0	2.9	5.3**	5.6***	5.8**
	Average size (employees)	58.0	46.2	72.0***	76.6***	72.5**
Ownership	Individual local owner, %	65.3	66.2	64.1	63.5**	69.7
	Insiders (Managers or employees), %	14.6	15.4	13.6	13.8	8.8*
	Foreign owner, %	5.5	4.5	6.7**	7.2**	5.4
	Government owner, %	0.2	2.2	2.0	2.2	2.4
	Other ownership, %	12.5	11.7	13.5	13.2	13.7
Location (Capital city), %		33.9	28.3	40.4***	43.8***	35.0
Innovation, introduced new technology during the last 3 years, %		36.7	25.9	49.4***	51.0***	47.3***
Innovation, introduced new products/processes/services during the last 3 years,%		58.2	47.4	70.8***	74.3***	69.1***
International business contacts, %		30.8	19.5	44.4***	50.4***	39.9***
Financial performance (self-assessment)	Very poor and poor, %	17.2	18.2	16.1	16.3	13.9*
	Stable, %	45.1	48.3	41.4***	40.5***	40.3**
	Good and very good, %	37.6	33.4	42.5***	43.1***	45.8***
Growth prospects (self-assessment)	Very poor and poor, %	10.1	11.0	9.1	9.3	8.7
	Stable, %	40.2	42.7	37.4**	36.0**	37.6
	Good and very good, %	49.7	46.4	53.5***	54.7***	53.7
EPL is a serious obstacle to growth, %		9.6	9.1	10.2	9.3	8.4
Payroll taxes/ wage rate is a serious obstacle to growth, %		46.9	46.0	47.9	45.8	42.8
Labor supply is a serious obstacle to growth, %		39.4	34.7	44.9***	46.6***	42.2***
Education of workers is a serious obstacle to growth, %		26.3	24.5	28.3*	28.2	25.7
Worker turnover is a serious obstacle to growth, %		15.3	14.2	16.6	15.7	17.9
Access to finance is a more serious obstacle to growth than labor-related problems, %		31.6	32.2	30.9	29.5	30.2
Occupational structure, average share	Managers	15.0	16.1	13.6***	13.8***	11.8**
	Professionals and technicians	31.6	29.0	34.7***	38.3***	25.4
	Clerical and service workers	17.6	17.1	18.1	17.8	20.9
	Skilled blue-collar workers	20.2	20.8	19.5	16.7***	25.3**
	Unskilled blue-collar workers	15.7	17.0	14.2***	13.4***	16.6*
Hiring a worker of a given type took 30 days or more, %					13.3***	10.6***
Share of fully qualified workers of a given type					86.9	81.8
	Job-specific technical skills, %				36.6	51.5***
Level of computer use at work by a worker of a given type	None, %				8.7***	59***
	Straightforward , %				11.5***	19.1***
	Moderate, %				31.1	13.0
	Complex and specialized, %				48.8***	8.9**
Number of firms in the unweighted sample		1756	972	784	632	456

Source: Author's calculations based on STEP Employer Surveys: Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Training firms refer here to firms that provided any type of training (in-house or external) to their workers of a given type during the last 12 months prior to the survey. ***(**, *) significant difference in the means between training and non-training firms at the 1% (5%, 10%) level, based on *ttest* (two-group mean-comparison test).

Table A.3. Occupational composition of the workforce by training status of firms (%)

Country	Training status	Managers	Professionals and technicians	Clerical and service workers	Skilled blue-collar workers	Unskilled blue-collar workers	Total white-collar	Total blue-collar
Armenia	Non-training	15.4	28.7	28.3	16.6	10.9	44.2	55.8
	Only white-collar	14.3	51.3	16.7	7.2	10.5	65.6	34.4
	Only blue-collar	14.6	14.6	31.9	27.1	11.9	29.1	70.9
	Both white-collar and blue-collar	13.7	33.8	19.3	22.2	11.1	47.5	52.5
Azerbaijan	Non-training	14.3	20.0	34.8	17.1	13.8	34.3	65.7
	Only white-collar	13.8	30.3	34.8	10.4	10.7	44.1	55.9
	Only blue-collar	10.5	13.9	44.3	5.9	25.5	24.4	75.6
	Both white-collar and blue-collar	10.8	25.0	32.0	16.5	15.8	35.8	64.2
Georgia	Non-training	29.4	26.2	9.6	18.7	16.1	55.6	44.4
	Only white-collar	18.3	49.5	4.6	10.7	16.9	67.7	32.3
	Only blue-collar	14.9	21.9	17.1	29.7	16.5	36.8	63.2
	Both white-collar and blue-collar	18.8	29.9	13.7	28.2	9.4	48.6	51.4
Ukraine	Non-training	15.8	35.3	10.0	21.5	17.4	51.1	48.9
	Only white-collar	18.3	59.1	7.8	7.5	7.3	77.4	22.6
	Only blue-collar	13.4	23.7	10.1	36.9	15.9	37.1	62.9
	Both white-collar and blue-collar	10.6	35.0	9.2	27.0	18.3	45.5	54.5

Source: Author's calculations based on STEP Employer Surveys: Georgia (2012-2013), Armenia and Azerbaijan (2013), and Ukraine (2014).

Note: Weighted with sample weights. Information refers to any type of training.