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IZA World of Labor
Evidence-based policy making

The importance of informal learning at work

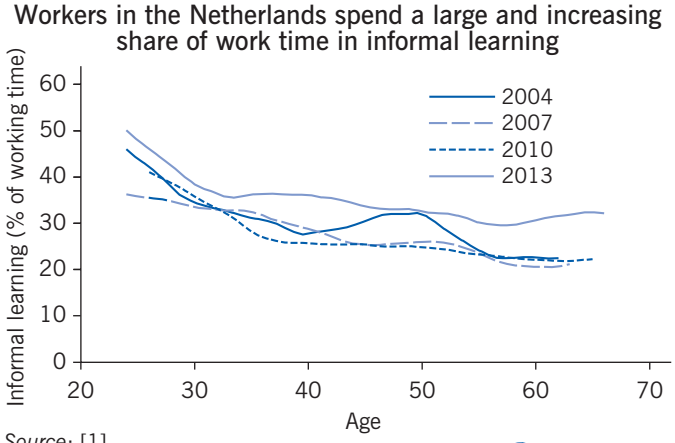
On-the-job learning is more important for workers' human capital development than formal training

Keywords: informal learning, human capital, learning by doing, knowledge spillovers, high performance workplace

ELEVATOR PITCH

Although early human capital theory recognized the relevance of workers' experience, its focus was on education and formal training. Recent studies find that much of the performance of newly hired workers is driven by learning by doing or learning from peers or supervisors in the workplace. Descriptive data show that workers learn a lot from the various tasks they perform on the job. Informal learning at work seems to be relevant for all age groups, although it drives more of the performance of younger workers. Informal learning is far more important for workers' human capital development than formal training courses.

Workers in the Netherlands spend a large and increasing share of work time in informal learning



Source: [1].

KEY FINDINGS

Pros

- Informal learning is more important to workers' performance than formal training.
- Learning by doing is often an automatic byproduct of productive work.
- New hires have a steep performance increase in their first year of employment.
- Knowledge spillovers between peers in the workplace contribute to firm productivity.
- Keeping a worker's skills up-to-date through informal learning becomes more important when skill demands change frequently due to technological and organizational innovations and when mandatory retirement ages are raised.

Cons

- The skills acquired through informal learning in one firm are less evident to other employers than those acquired through formal training.
- Informal learning involves costs when less proficient workers are less productive in their jobs.
- Most firms do not have adequate human resource management strategies to optimize informal learning in the workplace.
- The causal effects of informal learning on worker performance are still unclear.
- The economic literature on informal learning is underdeveloped.

AUTHOR'S MAIN MESSAGE

Steep performance increases among new hires and the large share of work time in which workers perform tasks that impart new skills indicate that informal learning is the main driver of human capital development in the workplace. Knowledge spillovers among co-workers are also an important part of informal learning. Rapidly changing skill demands and rising mandatory retirement ages make informal learning even more important for workers' employability throughout their work life. Policies tend to emphasize education and formal training, and most firms do not have strategies to optimize the gains from informal learning at work.

MOTIVATION

To remain competitive in the global economy, a firm's workforce has to have adequate skills and be committed to keeping those skills up-to-date. Many policymakers thus emphasize lifelong learning because continual technological change alters skill demands. But the emphasis is usually on formal training courses to the neglect of informal learning in the workplace, which current evidence suggests to be far more important for skill development. Although most firms are aware of the importance of informal learning, they do not know how to optimize the learning potential of the workplace to boost worker performance.

The human capital literature focuses mainly on investments in formal education and training. However, some studies have investigated learning by doing from a macroeconomic perspective—and more recently from a microeconomic one. The microeconomic studies usually attempt to measure the effects of work experience or tenure. Education (human resource development) science has a large research pool on workplace learning, which is defined as "the process of acquiring job-related knowledge and skills, through both formal training programs and informal social interactions among employees" [2]. Remarkably, this definition does not include learning by doing. Meanwhile, the rich recent economic literature on peer effects in the workplace focuses particularly on effects due to social pressure rather than effects due to knowledge spillover [3]. More comprehensively, informal learning in the workplace could be defined as the acquisition of skills through learning by doing as well as by watching other workers, taking instructions, and receiving supervision or feedback from supervisors or co-workers.

DISCUSSION OF PROS AND CONS

Economic literature on informal learning

The relevance of learning by doing was recognized by early human capital theorists. The earnings function, developed in the 1960s by Jacob Mincer, explains workers' wages based on education and work experience, though work experience was included mainly to better estimate the returns to education, which was the early focus of human capital theory. Using a different macroeconomic and firm perspective, another early study emphasized informal workplace learning in explaining why an increase in per capita income cannot be fully explained by an increase in the capital–labor ratio and why an increase in knowledge accounts for part of economic growth [4]. This increase in knowledge, the study argues, is acquired by learning through experience: "Learning can only take place through the attempt to solve a problem and therefore only takes place during activity" [4]. Various studies show that informal learning is an important driver of declining unit costs of production in manufacturing as well as in service sectors [5].

Other early theorists dealt with workplace learning more explicitly, focusing on the learning potential of a job: "The fundamental hypothesis is that individuals learn from their working experience. Firms supply learning opportunities in the form of different types of work-learning activities, and to that extent engage in a kind of joint production, for learning is a by-product of market goods production" [6]. Thus, connecting the market for learning opportunities with the market for jobs yields package deals in which workers simultaneously sell the services of their skills and purchase a job that offers a particular opportunity to learn, though purchasing a job entails a cost. From a worker's perspective, accepting a job at the start of one's career that enables the

worker to develop the skills needed to obtain higher paying jobs later can be a good strategy to maximize lifetime income. This conceptual model was further developed in the theory of career mobility, which posits that workers may opt for a job with a high learning potential but a lower wage if it offers more opportunities for upward career mobility [7]. From the worker's perspective, accepting a job with a low wage but a high learning potential can be a good strategy to maximize lifetime income [5].

More recently, the economic literature has explored the impact of the high-performance workplace on the firm's performance, where a high-performance workplace is defined as a workplace that employs workers in jobs with a high learning potential. Although the high-performance workplace is not defined uniformly in the literature, many definitions include the delegation of responsibility to autonomous problem-solving teams, job duties that cover a wide range of tasks, and frequent job rotation. Obviously, workplace learning is at the heart of the high-performance workplace. First, workplace learning is a necessary complement to the continuously changing and increasing demand for skills. Second, offering jobs with a high learning potential will increase workers' motivation for their work and involvement in the firm [5].

Skill demands in the labor market change frequently in all sectors of the economy as a result of skill-biased technological and organizational changes, especially those associated with information technologies and related changes in the organization of the production process. Workplace learning is particularly important because of the growing demand for multi-skilled workers—workers with computer skills, problem-solving skills, and high-level communication and social skills—which induces a shift from "intratask learning" to "intertask learning" [8]. Intertask learning arises when workers can use the information and skills acquired at one task to improve their performance at other tasks [5]. Not all new technologies require more informal learning at the workplace, however. A study on call-center agents distinguishes between different kinds of technological innovations developed in call centers [9]. While workflow automation technologies increase the learning time that new hires need to become fully competent in their job, technologies that facilitate the interaction between customer service agents and their customers reduce the time that new hires need to become fully competent.

However, technological and organizational changes are not merely a driver of changing skill demands. In dynamic jobs, workers continuously face skills obsolescence; but the changing skill demands also foster a continuous learning process at work as well as greater participation in formal training, because most workers learn the skills that are needed to work with a new technology in the workplace. This explains why workers who are employed in industries with high rates of technological change are better able to retain their productivity at an older age than workers in sectors that are less dynamic [5]. Workers who experience skill obsolescence appear to learn more on the job and participate more often in training, which lowers the risk of employment loss [10]. These studies suggest that the net effect of gradual technological and organizational change on workers' human capital is often positive, because workers continuously acquire new skills related to the new technologies they have to work with.

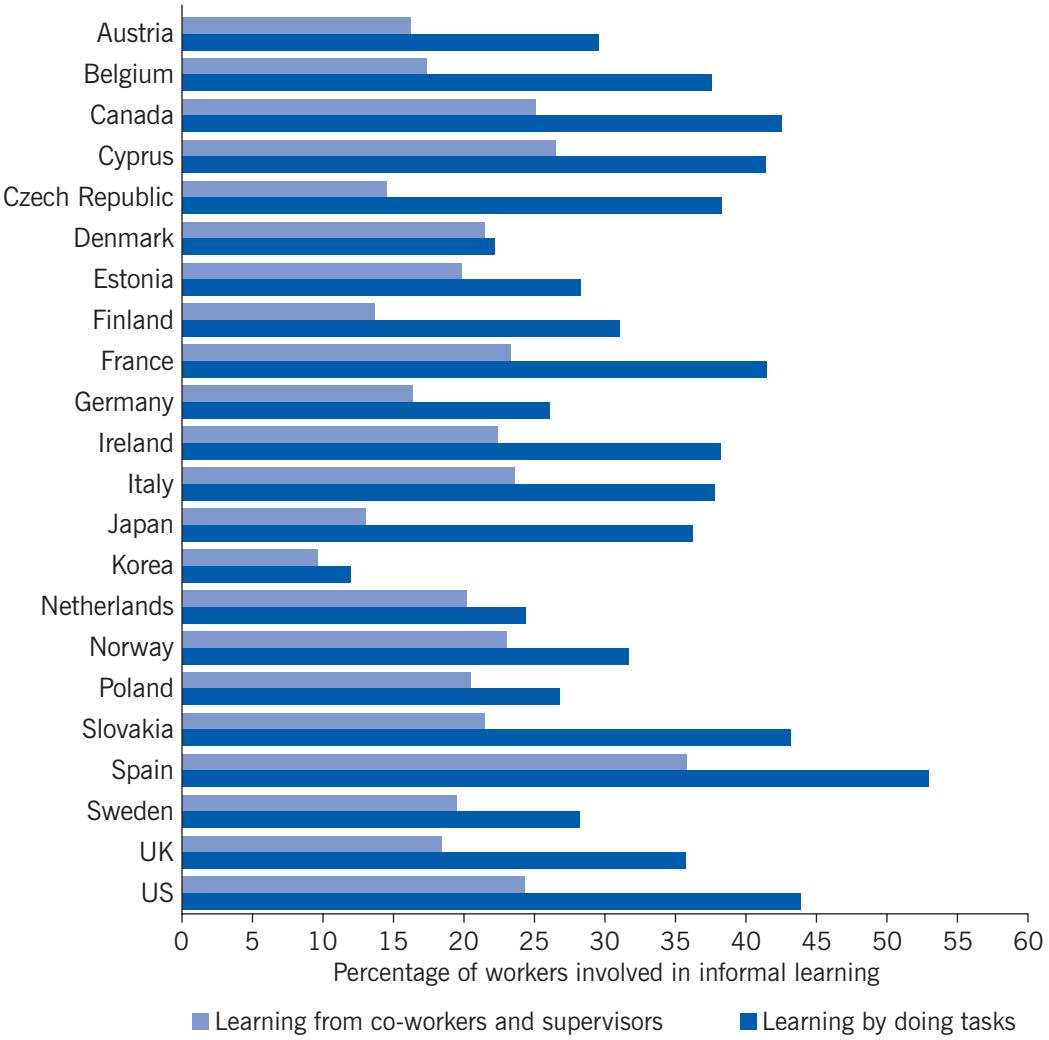
Relevance of informal learning

The OECD's Program for the International Assessment of Adult Competencies (PIAAC) measures the relevance of informal learning at the workplace in its member countries.

Many workers report that informal learning at work—learning by doing or learning from supervisors or co-workers—is relevant for them on a daily basis, although there are large differences across countries (Figure 1). The percentage of workers who are involved in learning by doing every day ranges from 12% in Korea to 53% in Spain, while the percentage of workers who learn new things from supervisors or co-workers ranges from 10% in Korea to 36% in Spain.

Although this measure of learning by doing might be highly subjective, these differences across countries probably also reflect differences across countries in how work is organized as well as differences in related interactions in the workplace. Moreover, these differences might reflect variations in initial vocational education across countries. In that respect, some of the differences are remarkable, especially between Germany (where most workers acquire their vocational skills during formal apprenticeships) and the US (where workers have to acquire most occupational skills at work). In Germany, 26% of workers report engaging in learning by doing every day compared with 44% of

Figure 1. Many workers perceive that informal learning at work is relevant for them on a daily basis, selected OECD countries, 2012



Source: OECD Skills Surveys. Paris: OECD, 2013. Online at: http://www.oecd.org/site/piaac/

workers in the US. That difference is also reflected in the extent to which workers learn new things from their supervisors or co-workers every day: 16% of workers in Germany compared with 24% in the US.

A Dutch study that developed a measure of the time during which a worker is learning at work shows that workers spend on average 35% of their working time on activities from which they learn [1]. This is far more than the time workers spend in formal training courses: informal learning activities account for 96% of the time in which workers are engaged in activities from which they learn.

The study also examined whether learning intensity is as high for informal training as for a formal training course [1]. Respondents who had participated in a training course in the past two years were asked whether they learned more on average in informal or formal training of the same duration (four or eight hours). Remarkably, the learning intensity of an hour of informal learning is on average as high as an hour of formal training. However, there are gender differences in the reported intensity of training. Significantly more often, male workers report learning less from informal learning than from a formal training course of similar duration, while female workers report learning more from informal learning.

Given the finding that informal learning activities account for 96% of the time that workers are involved in activities from which they learn, informal learning in the workplace is far more important for the human capital development of the working population than formal learning. However, this does not mean that participation in formal training is not important. Formal training and informal learning appear to be complementary, although this finding is probably also due to a selection effect: workers who participate in a training course spend on average five percentage points more time on informal learning in the workplace than workers who do not, and 34% of the workers who participated in formal training report that the training stimulated them to learn more at work [1].

The Dutch study also shows that informal learning has grown in importance, rising from 31% of working time in 2004 to 35% in 2013. Although higher-educated workers spend more time on learning at work (38% of their working time), lower-educated workers still spend a considerable part of their working time on activities from which they learn (26%). However, learning time as a percentage of working time has increased only for workers with an intermediate (vocational) or higher education [1]. As might be expected, younger workers spend more time on activities that improve their competencies than older workers do. However, the learning potential of work appears to increase over time, especially for older workers. This increase might reflect older workers' need to remain productive at a later age in countries that have raised the mandatory retirement age in recent years.

The extent to which workers learn at work is highly correlated with their job tasks (Figure 2) [1]. Workers learn particularly from engaging in new and challenging activities and from cooperating with more experienced colleagues. These are characteristic of the high-performance workplace, which emphasizes job rotation and teamwork. As there is no comparative evidence for other countries, it is uncertain how much these outcomes depend on the learning culture at work in the Netherlands or on other specific institutional characteristics.

Figure 2. The extent to which workers learn varies by job task, 2013

Source: Borghans, L., D. Fouarge, A. de Grip, and J. Van Thor. *Werken en leren in Nederland*. Maastricht University ROA-R-2014/3, 2014. Online at: http://roa.sbe.maastrichtuniversity.nl/roanew/wp-content/uploads/2014/05/ROA_R_2014_3.pdf [1].

Steep performance increase of new hires

Building on the seminal work of Mincer, various studies find work experience to be a relevant determinant of worker performance. New hires, in particular, gain substantially from learning on the job. A study of workers who install car windshields finds a steep increase in performance over the first year of employment: after one year of work, they perform 82% better than they did when they started [11]. A study on new hires in an inbound call center also finds a steep learning curve among newly hired call-center agents that translates into a performance increase of 64% within the first year of employment [12].

In general, both the direct and indirect costs of investments in informal learning are expected to be lower than the costs of investments in formal training. Therefore, it is not surprising that workers spend much more time on informal training than on formal training. However, learning by doing does incur opportunity costs through forgone work time. Therefore, young workers are often expected to pay (part of) these opportunity costs by accepting a lower wage in an apprenticeship, internship, or traineeship position in their first year of employment.

Knowledge spillovers among peers

New hires could also benefit from knowledge spillovers from their more experienced peers in the workplace. The study on call center agents shows that new hires placed in teams with more experienced peers perform significantly better than those placed in teams with less experienced peers [12]. Call-center agents in less experienced teams need 161 hours of investment in learning on the job to become fully proficient, while

agents in more experienced teams need 110 hours. A study on scientists and engineers finds that those who have been in a firm longer learn from their colleagues less often than those with shorter firm tenures [13]. However, scientists and engineers who face a skill gap try to upgrade their skills by deliberately learning from their colleagues.

As mentioned, informal learning and participation in a formal training course are complementary activities. Moreover, this complementarity extends beyond the individual level. A worker's participation in a training course can have informal knowledge spillover effects on workmates [1]. A randomized field experiment finds that the performance of call center agents who did not participate in a training course improved after their workmates had been trained [3]. Once half the members of a work team have been trained, the performance of untrained teammates improves by 2.5%—a quarter of the 10% performance increase of those who participated in the training course [3]. This suggests that firms might benefit from smart training policy designs that include knowledge spillovers to other team members, a less expensive alternative to training all workers.

The effect of human resource management practices on informal learning

Informal learning is also positively related to the feedback employees receive at work from their co-workers and supervisors. This holds for positive as well as critical feedback. However, although the high-performance workplace literature, as discussed above, implicitly relates informal learning at the workplace to higher firm performance, the economic literature on the causal effects of human resource management practices on informal learning is sparse. This lack of knowledge may explain why most firms do not have adequate human resource management strategies to optimize informal learning in the workplace.

Labor market non-transparency

From a worker's perspective, a disadvantage of informal learning is that the skills acquired informally are less evident to other employers, which makes the informal learning less valuable in the labor market. Several countries have launched initiatives to recognize acquired competencies or to validate informal learning. Such efforts are an attempt to increase labor market transparency with respect to workers' informally acquired skills by certifying competencies acquired through informal learning in the workplace. From the firm's perspective, this lack of transparency may stimulate firms to invest in informal learning because it gives them more information about the productive skills of their employees than competing firms recruiting in the same segment of the labor market.

Sustainable employment

Older workers have often been less exposed to the informal learning that plays a major role in keeping workers' skills up-to-date. Traditionally, older workers have had long tenures in jobs in which there was very little new learning. In countries that have recently raised the mandatory retirement age, this problem has become more severe. Older workers who continue to work until the new, higher retirement age might be

less motivated to perform than younger workers. Thus, employers might face a skill–wage gap for these older workers. To create sustainable employment, older workers need opportunities to remain challenged in their jobs. Data from the Dutch Lifelong Learning Survey of the Research Centre for Education and the Labour Market show that in the Netherlands there has indeed been an increase in informal learning of older workers since the rise in the retirement age, although with some delay [1].

LIMITATIONS AND GAPS

Research on informal learning in the workplace has been hampered by a lack of adequate data on informal learning, although the OECD's recent PIAAC survey and the forthcoming skills obsolescence and skill mismatch survey of the European Centre for the Development of Vocational Skills (Cedefop) are making a valuable start in producing internationally comparable data in this field. Because of these data limitations, most studies refer to a particular firm, sector, or country, which calls into question the generalizability of the study findings in other institutional settings.

Moreover, measures of informal learning need further development. Work is needed, in particular, on measures of time spent on activities from which a worker learns, of the learning potential of the tasks to be done in various jobs, and of knowledge spillovers in the workplace. Finally, the importance of informal learning for human capital development throughout a person's work life and its potential impact on firm performance highlight the need for better insights into the determinants of informal learning and its impact on workers' performance. Similarly, more knowledge is needed of the causal effects of informal learning on worker performance and of the causal effects of various human resource management practices on informal learning—such as task and job rotation, peer and supervisor feedback, and team composition—on worker performance.

SUMMARY AND POLICY ADVICE

Keeping workers' skills up to date through informal learning is important for their employability because skill demands frequently change in response to technological and organizational innovations. Maintaining work skills has become even more urgent as workers need to remain employable longer because of the rise in many countries in the retirement age at which workers are eligible to receive formal pension benefits.

Although the percentage of workers who are involved in learning by doing every day differs across countries, data on the Dutch working population show that informal learning at the workplace is far more important for workers' human capital development through the life cycle than participation in formal training courses: informal learning activities account for 96% of the time workers spend on activities from which they learn [1]. Differences in informal learning in the workplace are likely due in part to differences in the learning cultures in the workplace or to differences in other institutional settings between countries. Moreover, as the data from the Dutch Lifelong Learning survey suggest, "the learning potential" [6] of jobs in most sectors of industry can be expected to increase as jobs become more complex due to technological and organizational change. This underscores the importance of improving the learning culture in the workplace as a means of fostering human capital development in firms.

Workers learn most from engaging in new and challenging activities and from cooperating with more experienced colleagues. Workers appear to learn a lot from their peers in the workplace. The economic literature on high-performance workplaces suggests that delegating responsibility to autonomous problem-solving teams and creating jobs with a wide range of tasks and frequent job rotation can improve worker performance through informal learning and greater involvement in the firm. However, more knowledge of the causal effects of human resource management practices on informal learning is required.

In several countries, initiatives have been taken to certify the skills workers acquire through informal learning. Formal certification could improve the visibility of workers' human capital gains in the labor market. However, such programs could also make firms more hesitant to invest in the informal learning of their employees, because firms might lose the competitive advantage they gain from having more information on the productive skills of their employees than competing firms.

The finding that participation in formal training increases the productivity of workers who have not been trained also has important implications for firms' training strategies. It suggests that firms might benefit from training policies that internalize these externalities of training, thereby enabling the firm to train just some of their employees instead of all of them.

Creating a learning culture at the workplace should play a major role in a firm's human resource management strategy. That can enable a firm to remain competitive both in its product market by delivering high-quality products and in the labor market by improving its attractiveness for highly productive individuals. A culture of learning in a firm signals to potential employees that the firm offers ample opportunities for further skill development and sustainable employability. Public policy should facilitate the creation of such a culture of learning through a school curriculum that enables graduates to develop a positive attitude and receptivity toward learning in the workplace. Such policies can foster greater cooperation between schools and the business world in the co-creation of training courses that encourage further learning at the workplace.

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Competing interests

The IZA World of Labor project is committed to the *IZA Guiding Principles of Research Integrity*. The author declares to have observed these principles.

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REFERENCES

Further reading

De Grip, A., and J. van Loo. "The economics of skills obsolescence: A review." In: de Grip, A., J. van Loo, and K. Mayhew (eds). *The Economics of Skills Obsolescence Volume 21: Research in Labor Economics*. Amsterdam: JAI Press, 2002; pp. 1–26.

OECD. *Skills Outlook 2013: First Results from the Survey of Adult Skills*. Paris: OECD, 2013. Online at: http://skills.oecd.org/OECD_Skills_Outlook_2013.pdf

Key references

[1] Borghans, L., D. Fouarge, A. de Grip, and J. Van Thor. *Werken en leren in Nederland*. Maastricht University ROA-R-2014/3, 2014. Online at: http://roa.sbe.maastrichtuniversity.nl/roanew/wp-content/uploads/2014/05/ROA_R_2014_3.pdf

[2] Park, Y., and R. L. Jacobs. "The Influence of investment in workplace learning on learning outcomes and organizational performance." *Human Resource Development Quarterly* 22:4 (2011): 437–458.

[3] De Grip, A., and J. Sauermann "The effects of training on own and co-worker productivity: Evidence from a field experiment." *The Economic Journal* 122:560 (2012): 376–399.

[4] Arrow, K. J. "The economic implications of learning by doing." *Review of Economic Studies* 29:3 (1962): 155–173.

[5] De Grip, A. "Economic perspectives of workplace learning." In: Nijhof, W., and L. Nieuwenhuis (eds). *The Learning Potential of the Workplace*. Rotterdam, Netherlands: Sense Publishers, 2008; pp. 15–29.

[6] Rosen, S. "Learning and experience in the labour market." *Journal of Human Resources* 7:3 (1972): 326–342.

[7] Sicherman, N., and O. Galor. "A theory of career mobility." *Journal of Political Economy* 98:1 (1990): 169–192.

[8] Lindbeck, A., and D. Snower. "Multi-task learning and the reorganization of work: From Tayloristic to holistic organization." *Journal of Labor Economics* 18:3 (2000): 353–376.

[9] Sieben, I., A. de Grip, J. Longen, and O. Sørensen. "Technology, selection, and training in call centers." *Industrial and Labor Relations Review* 62:4 (2009): 553–572.

[10] Allen, J., and A. de Grip. "Does skill obsolescence increase the risk of employment loss?" *Applied Economics* 44:25 (2012): 3237–3245.

[11] Shaw, K., and E. P. Lazear. "Tenure and output." *Labour Economics* 15:4 (2008): 705–724.

[12] De Grip, A., J. Sauermann, and I. Sieben. *The Role of Peers in Estimating Tenure-Performance Profiles: Evidence from Personnel Data*. IZA Discussion Paper No. 6164, 2011. Online at: http://ftp.iza.org/dp6164.pdf

[13] De Grip, A., and W. Smits. "What affects lifelong learning of scientists and engineers?" *International Journal of Manpower* 33:5 (2012): 583–597.

The full reference list for this article is available from the IZA World of Labor website (http://wol.iza.org/articles/importance-of-informal-learning-at-work).