Locus of Control and Investment in Training

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ABSTRACT

We extend standard models of work-related training by explicitly incorporating workers' locus of control into the investment decision through the returns they expect. Our model predicts that higher internal control results in increased take-up of general, but not specific, training. This prediction is empirically validated using data from the German Socioeconomic Panel (SOEP). We provide empirical evidence that locus of control influences participation in training through its effect on workers' expectations about future wage increases rather than actual wage increases. Our results provide an important explanation for underinvestment in training and suggest that those with an external sense of control may require additional training support.

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I. Introduction

Globalization and technological change are rapidly transforming the workplace, generating demand for new skills while rendering other skills obsolete. Equipping workers with the ability to thrive in this changing environment has become a strategic imperative. National governments are working hard to facilitate continuous, lifelong investment in worker training in order to ensure that workers' skills remain up to date, firms continue to be competitive, and workers can maintain their living standards. Training systems are also being touted as mechanisms for achieving social goals, including reduced inequality, active citizenship, and social cohesion. The International Labour Organisation, for example, has an explicit goal of promoting social inclusion through expanded access to education and training for those who are disadvantaged (International Labour Organisation 2008, p. vi).

Work-related training, however, often compounds, rather than mitigates, existing skill differentials—potentially increasing social and economic inequality. In particular, workers with higher ability (as measured by aptitude scores), more formal education, and higher occupational status receive more work-related training than do their less-skilled coworkers.[1] This disparity is puzzling since less-educated workers, in fact, receive relatively high returns from training (see Blundell et al. 1999; Bassanini et al. 2007), and firms appear to be equally willing to train them (Leuven and Oosterbeek 1999; Maximiano 2012). Underinvestment in training may arise for many reasons. There is extensive evidence, for example, that individuals often underestimate the returns to formal education and that the provision of information about those returns can result in increased investment (for example, Nguyen 2008; Jensen 2010, 2012). Information gaps may be particularly severe in the training market because, although the return to education has been studied extensively, we know very little about the return to employment-related training (Haelermans and Borghans 2012). Present-biased preferences can also lead individuals to invest less in training than if their preferences were time-consistent. Finally, individuals' soft skills (for example, self-confidence, willingness to compete, intrinsic motivation, etc.) also influence the human capital investments that they make (Koch, Nafziger, and Nielsen 2015). Developing a deeper understanding of what leads some workers to underinvest in training is fundamental to ensuring that work-related training systems have the potential to deliver social as well as economic benefits.

The aim of this work is to advance the literature by adopting a behavioral perspective on the training investment decision. Specifically, we draw inspiration from Becker (1962) in developing a stylized model of the decision by firms and workers to invest in work-related education and training. Firms are assumed to have perfect information about the productivity of training and its degree of generality, while workers are instead assumed to have subjective beliefs about the returns to training. These beliefs depend on their locus of control. We then use this simplified two-period model to derive testable predictions about the influence that the degree of training generality has on the role of locus of control in training decisions.

1. For reviews of the work-related education and training literature see Asplund (2005); Bishop (1996); Blundell et al. (1999); Bassanini et al. (2007); Leuven (2005); Wolter and Ryan (2011); Haelermans and Borghans (2012); and Frazis and Loewenstein (2006). In particular, there is evidence that general education and employer training are often complements; more skilled workers participate in more training (for example, Asplund 2005; Bassanini et al. 2007; Booth 1991).

Locus of control is a psychological concept that is best described as a "generalized attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences" (Rotter 1966). As people differ in the reinforcement that they have received in the past, Rotter argues that they will also differ in the degree to which they generally attribute reinforcement to their own actions and that these beliefs regarding the internal versus external nature of reinforcement constitutes a personality trait.[2] Those with internal locus of control tend to believe that much of what happens in life is influenced by their own behavior, whereas those with external locus of control are more likely to believe that life's outcomes are driven by external forces, for example, luck, chance, fate, or others.[3] Given these psychological underpinnings, it is quite natural to link locus of control to human capital investments through the returns that individuals expect. Consequently, we allow locus of control to affect training participation through the influence it has on workers' subjective expectations about the relationship between training and future wage growth. Our specific interest in locus of control is motivated by the growing literature demonstrating its importance in many other human capital investment decisions, including health (Cobb-Clark, Kassenboehmer, and Schurer 2014), educational attainment (Coleman and DeLeire 2003; Jaik and Wolter 2016), job search (Caliendo, Cobb-Clark, and Uhlendorff 2015; McGee 2015), internal migration (Caliendo et al. 2019) and self-employment (Hansemark 2003; Caliendo, Künn, and Weißenberger 2016). We are aware of two studies that link locus of control to job training. Fourage, Schils, and De Grip (2013) find that Dutch workers with an internal locus of control have a higher self-reported willingness to train, and Offerhaus (2013) demonstrates that internal-locus-of-control German workers are more likely to participate in work-related, professionally organized training courses. Our research extends these previous studies by providing a theoretical foundation for—and empirical evidence of—the differential effect of locus of control on general versus specific training.

Specifically, our model predicts that internal-locus-of-control (hereafter "internal") workers will engage in more general training than their "external" coworkers because their subjective investment returns are higher. We expect little relationship between specific training and locus of control, however, because the returns to specific training largely accrue to firms rather than workers. We empirically test these predictions using data from the German Socioeconomic Panel (SOEP). Consistent with our model, we find that locus of control is related to participation in general but not specific training. Moreover, we find evidence that locus of control influences participation in general training through its effect on workers' expectations about future wage growth. Specifically, general training is associated with an increase in the expected likelihood of receiving a future pay raise that is much larger for those with an internal rather than external locus of control. However, we find no evidence that the wage returns to general training actually depend on locus of control when we analyze realized post-

2. See also Ng, Sorensen, and Eby (2006), who note that "some people have a dispositional tendency to believe they have more control over the external environment than others" (p. 1058).

3. Over the years, psychologists have developed numerous typologies for characterizing people's personalities. One of the most frequently studied is the Big Five (Five Factor) model of personality traits—that is, extraversion, agreeableness, conscientiousness, neuroticism (the opposite of emotional stability), and openness to experience—which is meant to represent personality at the broadest level of abstraction (see John and Srivastava 2001). Locus of control is a separate personality construct. It is most closely related to the Big Five trait of neuroticism (Bono and Judge 2003). Meta-analysis demonstrates that locus of control is comparable to the Big Five in predicting work outcomes (Ng, Sorensen, and Eby 2006).

training wages. This suggests that workers are forming different subjective expectations—that depend on their locus of control—about the same underlying post-general-training wage distribution. Interestingly, locus of control is unrelated to realized wages and expectations about future wage increases in the case of specific training.

We make a substantial advance on the literature by formally incorporating locus of control into an economic model of work-related education and training, carefully accounting for the nature of training itself, as well as for the role of firms and workers in the training decision. This allows us to analyze the channel through which locus of control operates and generate empirical predictions that can then be tested. We take a broad perspective on work-related education and training, considering both training that is offered by employers during work hours (that is, on-the-job) and education taking place in external institutions outside work hours (off-the-job). This broad-brush approach demands that we consider the perspectives of both firms and workers in the training decision, which adds complexity to our theoretical framework. At the same time, it also adds richness to the empirical analysis, allowing us to assess the robustness of our results to alternative notions of general versus specific training.

Our research identifies a fundamental distinction—as yet unrecognized in the literature—in the role of locus of control in general versus specific training. Becker (1962) was the first to highlight the role of skill transferability in the allocation of training costs, arguing that, in competitive markets, firms are unwilling to pay for training that is completely transferable ("perfectly general"), while workers are unwilling to pay for training that is completely nontransferable ("perfectly specific"). Subsequent research demonstrates that this sharp bifurcation is blurred in the face of labor market rigidities, noncompetitive market structures, and training that is both general and specific (see Acemoglu and Pischke 1999a; Asplund 2005; Frazis and Loewenstein 2006, for reviews). Nonetheless, the conceptual link between skill transferability and the distribution of net training returns across workers and firms remains fundamental to understanding the incentives for training to occur. It is this conceptual link that is also at the heart of our finding that workers' perceptions of control will have a more profound effect on training investments if training is relatively transferable (general) than if it is not (specific). In short, workers' differential responsiveness to investment returns matters more if they can capture those returns than if they cannot. Crucially, this result does not depend on our simplifying assumption that markets are perfectly competitive. Instead, it is easily generalized to a variety of noncompetitive environments in which greater skill transferability increases workers' ability to benefit from the training they receive (see Section II.C).

The remainder of the paper is structured as follows. We develop our model of training in Section II and describe the data in Section III. In Section IV, we provide empirical evidence for the testable implications of our theoretical model. Section V presents our conclusions and suggestions for future research.

II. Theoretical Framework

A. Modeling the Training Investment Decision

We begin with a conceptual framework in which both workers and firms participate in the decision to invest in work-related training. Workers have an incentive to participate in training if that investment yields positive future returns. Although the returns to training can be conceptualized as positive effects on labor market outcomes in general, for example, wages, performance, promotions, occupational status, etc., we focus specifically on wage returns in our model. Firms' decisions to invest in worker training rest on whether or not the investment results in increased productivity, measured in value added per worker.

We make a number of simplifying assumptions. Firms and workers are assumed to be risk-neutral, to face no liquidity constraints, and to maximize expected discounted profit and income streams, respectively. Both the labor market and product market are perfectly competitive, and output prices are normalized to one. In the first period ($t=0$), the wage of worker i, w_{i0}, corresponds to their marginal revenue product (mP_L), which is the same in all firms. Training investments are joint decisions of worker i and firm f; they take place if the net present value of the training is nonnegative for both the worker and the firm and if it is positive for at least one of them.

Let K capture the increase in productivity associated with training. The degree of generality of the training is given by γ, which takes a value between zero and one. When $\gamma=0$, training increases the productivity of worker i only at the current firm f. Following Becker (1962), we refer to this as "perfectly specific" training. If training is "perfectly general," $\gamma=1$, and the human capital embodied in the training is fully transferable to other firms—that is, the productivity of trained workers increases by K in all firms. We account for firms' asymmetric information with respect to production process and industry conditions by assuming that the firm has perfect information about the training's productivity returns (K) and degree of generality (γ). In contrast, workers form expectations about their own returns to training, which is given by the product of these two parameters (see Section II.B).

The cost of training C is constant across workers.[4] Training costs are known to both workers and firms in period $t=0$. The worker and the firm share training costs C in proportion to α, which is exogenously given. In particular, the firm offers to pay $(1-\alpha)C$, while the worker is left to pay αC.

In period $t=0$, the worker and the firm decide whether or not to invest in training that has a given degree of generality γ. Let T_i take the value 1 if training occurs and 0 otherwise. Worker productivity in period $t=1$ is given by $mP_L + KT_i$ in firm f and by $mP_L + K\gamma T_i$ in every other firm. Worker i stays at the current firm f in period $t=1$ if their wage is equal to or greater than the potential wage offer at outside firms. Because the labor market is assumed to be perfectly competitive, there are no labor market frictions (for example, imperfect information, job changing costs, etc.), and workers can change employers without cost. In period $t=1$, the worker will receive a wage offer of $mP_L + K\gamma T_i$, which corresponds to their marginal revenue product at outside firms. The current firm f will pay this competitive market wage. This implies that the returns to the training investment are $K\gamma T_i$ for the worker and $K(1-\gamma)T_i$ for the firm.

Thus, as in Becker (1962), the worker is the residual claimant—and bears the full cost of training ($\alpha=1$)—when training is perfectly general. If training is perfectly specific, on the other hand, the firm receives all returns from training and pays all training costs ($\alpha=0$). In reality, however, training is unlikely to be either perfectly specific or perfectly

4. We consider the scenario in which training costs include a stochastic component that is related to workers' characteristics, in particular their locus of control, in Section II.C.

general. Work-related training typically includes some components that may be specific to the current employer, as well as other components that increase productivity both inside and outside the current firm.[5] In what follows, we incorporate locus of control into the training investment decision, allowing the degree of training generality to vary.

B. The Role of Locus Control in the Investment Decision

We have assumed that the firm knows both the relationship between the investment in training and the resulting increase in productivity, K, as well as the degree to which the training can be utilized by outside firms, γ. These seem to us to be reasonable assumptions given that firms are in a position to know much more than workers about both their own production technology and the aggregate economic conditions in the wider industry. Together, these assumptions imply that the firm has perfect information about the worker's productivity in period $t=1$, $K\gamma T_i$, if they undertake training in period $t=0$.

In contrast, workers do not have perfect information about the relationship between training investments and subsequent wage increases. We adopt a behavioral perspective on expectation formation by allowing workers' subjective beliefs about the return to training, $(K\gamma)^*$, to depend on their locus of control.[6] The concept of locus of control emerged out of social learning theory more than 50 years ago. In his seminal work, Rotter (1954) proposed a theory of learning in which reinforcing (that is, rewarding or punishing) a behavior leads expectations of future reinforcement to be stronger when individuals believe reinforcement is causally related to their own behavior than when they do not. Because the history of reinforcement varies, Rotter argued that individuals will differ in the extent to which they generally attribute what happens to them to their own actions (Rotter 1954). Individuals with an external locus of control do not perceive a strong link between their own behavior and future outcomes. Consequently, we argue that they are unlikely to believe that any training investments undertaken today will affect their productivity—and hence wages—tomorrow. Those with an internal locus of control, in contrast, see a direct causal link between their own choices (for example, investment in training) and future outcomes (wages). Thus, although the true impact of training on future productivity and wages is assumed to be constant, more internal workers expect a higher wage return to their training investments.

We capture this dichotomy in our model by adopting the following multiplicative specification for the relationship between locus of control and subjective beliefs about investment returns:

$$(1) \quad (K\gamma)^* = K\gamma * f(loc)$$

where loc denotes locus of control, $f(loc)$ is both positive and increasing in internal locus of control, and $\frac{\partial (K\gamma)^*}{\partial loc} > 0$.

5. Lazear (2009) in fact argues that firm-specific training does not exist. Instead, he views all skills as general, implying that it is only the skill mix and the weights attached to particular skills that are specific to each employer.

6. Due to the multiplicative form of the returns to training, the predictions of our theoretical model are the same if we instead allow only K or only γ to depend on locus of control. With the data at hand, we cannot separately identify workers' expectations regarding K and γ, making these models empirically equivalent.

Firms and workers have an incentive to undertake training whenever that training is expected to yield benefits that exceed the costs. Thus, a training investment occurs if the expected net present value of training is positive for either the firm and/or the worker and is nonnegative for both. The value function of the firm depends on the true increase in firm-specific productivity, while the value function of the worker depends on their subjective beliefs about the returns to the training. We can write the expected net present values of the training for the worker $V_i(T)$ and the firm $V_f(T)$ as follows:

(2) $$V_i(T) = \gamma f(loc)K - (1+\rho)\alpha C$$

(3) $$V_f(T) = (1-\gamma)K - (1+\rho)\,(1-\alpha)C$$

where ρ is the discount rate.

Our model predicts that when training is at least partially transferable to outside firms, workers with an internal locus of control have a higher expected net present value from training and, consequently, are more likely to participate in training.

(4) $$\frac{\partial V_i(T)}{\partial loc} = \gamma f'(loc)K > 0$$

(5) $$\frac{\partial V_f(T)}{\partial loc} = 0$$

In contrast, firms' incentives to invest in training are unrelated to workers' locus of control.

Moreover, the effect of workers' locus of control on their incentives to invest in training depends on the degree of training generality. Specifically, an increase in the extent to which workers' have an internal locus of control results in a larger increase in their willingness to invest in training if that training is highly transferable (mainly general) than when it is not (mainly specific).

(6) $$\frac{\partial^2 V_i(T)}{\partial loc \partial \gamma} = f'(loc)K > 0$$

The intuition is straightforward. The more general the training, the larger the share of the training benefits that workers will be able to capture in the form of future wage increases. Thus, the more important are their expectations about those future benefits in driving their behavior. When training is largely firm specific, workers will capture a much smaller share of the rents generated by training, and their expectations regarding the benefits of training are less important.

In the limit, when training is perfectly specific ($\gamma = 0$), it is not transferable to outside firms, and only the current firm benefits from the future increase in worker productivity. Therefore, as in Becker (1962), the firm will pay the full cost C of training the worker. The firm invests in training if the expected net present value of training to the firm is positive, that is, if the discounted productivity gain in period $t = 1$ exceeds the training costs incurred in the first period $t = 0$. Given this, our model results in the prediction that investments in perfectly specific training will be independent of workers' locus of control. The decision to invest in perfectly specific training is driven solely by firms that have perfect information about the costs and benefits of worker training. On the other hand, when training is perfectly general ($\gamma = 1$), workers receive the full value of the productivity increase associated with training in the form of higher wages. Therefore, firms will be unwilling to share the costs of general training, and workers will have to pay all training costs C. In this case, the investment decision effectively lies in the hands of workers. Specifically, participation in training will depend on whether workers expect their post-training productivity (and hence wage) to increase in present value by more than the cost of training. This, in turn, depends on workers' locus of control.

Taken together, our model results in several empirical predictions. First, unless training is perfectly specific and cannot be transferred at all to outside firms, workers with an internal locus of control will be more likely to participate in training. This differential in the training propensities of internal versus external workers increases with the degree of training generality. Moreover, we have assumed that locus of control influences worker expectations about the returns to training. We therefore expect a positive relationship between workers' internal locus of control and their expectations about future post-training wage increases. This relationship is predicted to be stronger for more general as opposed to more specific training (see Equation 6). At the same time, because we have assumed that locus of control is unrelated to productivity, workers' actual post-training wages are predicted to be independent of their locus of control.

C. Model Extensions

In what follows, we consider whether our empirical predictions continue to hold if the key assumptions of our baseline model are relaxed.

1. Risk aversion and biased beliefs

It is important to note that our predictions do not depend on workers being risk-neutral. Risk aversion would result in workers choosing not to invest in some training despite it delivering positive expected benefits. This underinvestment in risky training is expected to be more extensive the more general training is because workers' exposure to the costs and benefits of training increase the greater the degree of training generality. Expected wage gains are discounted because expected utility is lower as a result of the uncertainty (Stevens 1999). Nonetheless, we still expect internal workers to be more likely to invest in general training than their external coworkers because they are more responsive to the potential benefits of training when they exist.

It is also interesting to consider the implications of our model for training investments when the true productivity payoff to training differs from workers' subjective beliefs about those payoffs. Specifically, workers may believe the returns to training are below the true returns; that is, that $(K\gamma)^* < K\gamma$. In this case, our model implies that there will be underinvestment in training. Moreover, the degree of underinvestment is more severe the more general is the training because workers' beliefs weigh more heavily in the investment decision. Workers' beliefs thus constitute a form of asymmetric information that can result in less investment than is optimal. Chang and Wang (1996) reach similar conclusions when modeling the asymmetry in information between the current and outside employers regarding the productivity of training.[7] At the same time, workers may instead be overly optimistic regarding the value of training, leading to an overinvestment in training. As before, our model predicts that the degree of inefficiency will be greater the more transferable is the training.

We know very little about whether people's cognitive biases are related to their locus of control. Those with an internal locus of control may, in fact, suffer from an "illusion of control," which psychologists define as an unjustified belief in the ability to control events that cannot be influenced in reality (see Langer 1975). Consistent with this, Pinger, Schäfer, and Schumacher (2018) find that internally controlled people are more likely to search for patterns in random data and make inefficient investment choices by acting when doing nothing is the better option. An illusion of control could result in people being overly optimistic about the transferability of training, for example. Similarly, internal households invest in more risky assets in part because they perceive the risks of doing so to be lower (Salamanca et al. 2020). Whether locus of control is also related to the miscalibration of investment returns through either overconfidence (underestimation of the variance) or optimism (overestimation of the mean) remains an open question that would benefit from future research.

2. *Cost sharing rules, labor market frictions, and market structure*

Becker's key insight regarding the role of skill transferability in driving the allocation of training benefits fundamentally relies on markets being perfectly competitive (Becker 1962). Imperfect competition breaks the strict correspondence between wages and productivity, allowing firms to earn rents by paying wages that are lower than worker productivity. If the productivity–wage gap increases with the level of skills, a situation that Acemoglu and Pischke (1999a,b) refer to as a "compressed wage structure," firms may find it profitable to pay for training even if it is general. Thus, in theory, a firm may pay for general training in a wide range of circumstances, including if (i) it has monopsony or monopoly power (for example, Stevens 1994b; Acemoglu and Pischke 1999a), (ii) matching and search frictions exist (for example, Acemoglu 1997; Acemoglu and Pischke 1999b; Stevens 1994a), (iii) information is asymmetric (for example, Katz and Ziderman 1990; Acemoglu and Pischke 1998); (iv) general and specific training are complementary (for example, Stevens 1994b; Franz and Soskice 1995; Acemoglu and Pischke 1999a,b; Kessler and Lülfesmann 2006), or (v) worker productivity depends on coworker skill levels (Booth and Zoega 2000).[8] In line with these model extensions, a number of empirical studies provide evidence that employers pay at least partly for general training (see, for example, Leuven and Osterbeek 1999; Booth and Bryan 2007). At the same time, Hashimoto (1981) develops a model in which firms and workers share the costs and benefits of specific training as a form of long-term commitment device to prevent costly job separations.

In our model, this implies that the proportion of training costs paid by workers (α) will depend—among other things—on the degree of skill transferability (γ). It is important to note, however, that although we assume α to be exogenous, the predictions from our

7. See Bassanini and Ok (2005), who review a number of training and capital market imperfections and coordination failures that also may give rise to underinvestment in training.
8. See Gersbach and Schmutzler (2012) for references on information asymmetries and complementarities.

baseline model are not dependent on a specific sharing rule for the costs. Irrespective of the cost-sharing rule, we expect there to be a positive relationship between internal locus of control and participating in training because the expected returns from training increase the more internal workers are, making it more likely that the benefits of training outweigh the costs (see Equation 4).

Labor market frictions and market imperfections drive a wedge between worker productivity and wages, implying that wages will be less than marginal revenue product. The key insights of our theoretical model remain unchanged in the face of noncompetitive markets, however, so long as wages continue to depend positively on worker productivity. In this case, human capital investments that raise productivity will also result in higher wages—although potentially to a lesser degree than when markets are perfectly competitive. Workers with a more internal locus of control will continue to have higher expected returns to their training investments than will their coworkers who are more external, leading them to be more willing to participate in training. Similarly, we expect the differential between internal and external workers to be apparent when we consider future wage expectations (consistent with our key model assumption), but not when we examine realized wage outcomes.

3. Training costs, productivity, and locus of control

Our model assumes that training costs (C) are constant. In reality, however, there are many reasons to believe that training costs might differ across workers in ways that may be related to their locus of control. Suppose training costs are given by the following: $C_i = c + \varepsilon_i$, where ε_i captures some element of the training cost that is relevant only to workers' training decisions. Well-known barriers to financing human capital investments, for example, may lead some workers to be credit constrained, resulting in suboptimal levels of training (Acemoglu and Pischke 1999a). Credit constraints are likely to be less binding, and hence the cost of financing training lower, for those with an internal locus of control because these individuals tend to have higher earnings (for example, Anger and Heineck 2010; Semykina and Linz 2007; Groves 2005), as well as more savings and greater wealth (Cobb-Clark, Kassenboehmer, and Sinning 2016). If training costs are negatively related to locus of control, then it remains the case that we would expect workers with an internal locus of control to be more likely to invest in general training, but no more likely than their external coworkers to invest in specific training. Conditional on investing in training, expected and realized wage gains will be unrelated to locus of control because the increase in worker productivity is unrelated to locus of control.

We have also assumed that workers' locus of control affects their expectations about the returns to training rather than the returns themselves. However, there is evidence that internal workers have higher job turnover (Ahn 2015). This shortens the period over which firms are able to recoup their training costs and reduces the discounted present value of training investments for internal workers. While employers may not directly observe workers' locus of control, there is empirical evidence that they do form expectations about workers' chances of remaining in the job when making training decisions (see Royalty 1996). Similarly, workers' beliefs about their future job separations will influence their expected returns to training. Those with an internal locus of control may be more likely to separate as a result of increased job search and higher migration propensities, raising the value of general relative to specific training (Caliendo, Cobb-Clark, and Uhlendorff 2015b; Caliendo et al. 2015a). Those with an internal locus of control are also more assertive during negotiations (Volkema and Fleck 2012), implying that internal workers may be able to raise their own returns to training by negotiating lower training costs or higher post-training wages. Similarly, there is ample evidence that internal workers enjoy more labor market success (see Cobb-Clark 2015; Heywood, Jirjahn, and Struewing 2017). This raises the possibility that locus of control is a form of "ability," which results in the productivity gains being larger for internal workers undertaking training. Taken together, these mechanisms imply that the relationship between training productivity and locus of control is theoretically ambiguous.

Nonetheless, we can investigate the plausibility of these alternative explanations by considering the way that training participation, expectations about future wage increases, and realized wages depend on locus of control. Specifically, if the firm's returns to training are lower when training internal workers, perhaps because of increased job turnover, then we would expect those workers with an internal locus of control to be less likely to engage in training. On the other hand, if having an internal locus of control conveys a productivity advantage to workers, we would expect a positive relationship between the incidence of training and internal locus of control. Higher subjective returns and higher actual returns are observationally equivalent with respect to training rates. However, we expect to see a link between locus of control and subjective returns reflected in expectations regarding future wage increases, while a link between locus of control and actual returns would be reflected in realized wage outcomes conditional on training.

4. *Summary*

The predictions of our baseline model continue to hold in the face of a range of model extensions. In effect, the link between skill transferability and the distribution of net training returns produces a positive interaction between workers' degree of internal control and the extent to which training is transferable. Internal workers will be more likely than their external coworkers to invest in training when it is transferable to other firms; internal and external workers will make similar training investments when it is not. We will now test these predictions against our data.

III. Data

A. Estimation Sample

The data come from the German Socio-Economic Panel (SOEP), which is an annual representative household panel survey. The SOEP collects household- and individual-level information on topics such as demographic events, education, labor market behavior, earnings and economic preferences (for example, risk, time, and social preferences). The first wave of the survey took place in 1984 with a sample size of approximately 6,000 households and 12,000 individuals. Over the subsequent 30 years, the SOEP sampling frame has been extended to the former German Democratic Republic and top-up samples

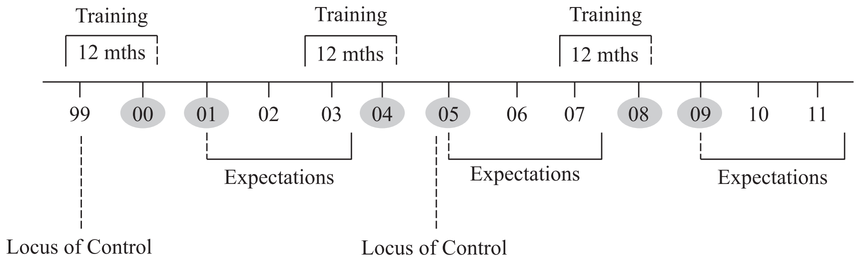

Figure 1
Description of the Data Structure

Source: Own illustration.

Notes: The figure gives an overview of the variables used from the data waves in the present analysis. We use the data waves from the years 2000, 2004, and 2008 in our analysis, as they contain information about the characteristics of training. The variable measuring the participation in *training* refers to the three years prior to the interview date. However, we defined individuals as training participants if they report participation in training within the 12 months prior to the date of interview. Information about locus of control and wage expectations were not observed in our three data waves and therefore had to be imputed from other years. Information about locus of control are available in the years 1999 and 2005. Locus of control observed in the year 1999 was imputed in the data waves of the years 2000 and 2004, and we use the locus of control measured in 2005 in our last data wave. Wage expectations referring to the next following years are observed one year after each data wave and had to be backward imputed.

of high-income and guest-worker households. The SOEP sample in 2013 comprised approximately 12,000 households and 22,000 individuals.

The SOEP data are perfectly suited for our purposes because in 2000, 2004, and 2008 the survey included detailed questions about training activities, and locus of control was measured in 1999 and 2005. Moreover, in each subsequent year (2001, 2005, and 2009), the data contain information about individuals' subjective expectations regarding the likelihood of a future wage increase. Information about expected future wage increase conditional on training participation is helpful in assessing whether the link between locus of control and training participation operates through expected returns or productivity differentials. Figure 1 provides an overview of the data structure.

We restrict our sample to the working-aged population between the ages of 25 and 60. As we are interested in work-related training and not in training during phases of unemployment, we restrict our analysis to individuals who were employed at the time of training. We also exclude individuals who were self-employed at the time of interview. Finally, the sample is reduced by item nonresponse in the locus of control and other explanatory variables, resulting in a sample of 12,203 (7,411) person–year (unique individual) observations. Of these, 4,120 individuals are observed once, while 1,790 and 1,501 individuals are observed two and three times, respectively.

B. Training Measures

In 2000, 2004, and 2008, respondents under the age of 65 were asked about their engagement in further education over the three-year period prior to the interview. In particular, self-reports about the number of professionally oriented courses undertaken along with detailed information (for example, course duration, starting date, costs, etc.) about the three most recent courses are available. We define individuals to be training participants if they undertook at least one course within the 12 months prior to the respective SOEP interview.

Our theoretical framework highlights the importance of distinguishing between general training that is transferrable to other firms and training that is firm specific. We do this using responses to the following question: "To what extent could you use the newly acquired skills if you got a new job in a different company?" This allows us to construct a measure of general versus specific training that parallels the notion of skill transferability inherent in Becker (1962). Specifically, we categorize response categories "For the most part" and "Completely" as general training and response categories "Not at all" and "Only to a limited extent" as specific training. In 2004 and 2008, we have this information for up to three different courses, while in 2000 the skill-transferability question did not target a specific course. Consequently, we assume that in 2000 responses to this question pertain to the most recent training course undertaken. Using this definition, we identify 1,925 general-only training events, 1,081 specific-only training events, and 159 events in which both types of training occurred within the preceding 12 months. Each of these training events corresponds to a person–year observation in our data. For the remaining 9,038 person–year observations, neither general nor specific training is reported.[9]

Information about the nature of general versus specific training is reported in Table 1. The results in Panel A highlight the high degree of skill transferability embedded in the training that workers undertake. Respondents rate 42 percent of general training courses as being completely transferable to jobs in different companies, while identifying 58 percent as mostly transferable. In 73 percent of cases, respondents undertaking specific training believe that this training would have at least some limited transferability beyond their current employer. Only 27 percent view their newly acquired skills as applicable only to their current firm and not at all useful in other companies.[10] At the same time, specific training is more likely to be convened by the employer, to be shorter, and to take place during work hours (see Panel B). Consistent with the previous literature (for example, Booth and Bryan 2007), we also find that the vast majority of employers do provide financial support for general training. At the same time, workers undertaking general training are significantly less likely to receive any financial assistance and pay significantly more for their training than do their coworkers undertaking specific training.

C. Locus of Control

Locus of control is measured in 1999 and 2005 using a series of self-reported items from the Rotter (1966) scale. Item responses in 1999 are reported on a four-point Likert scale ranging from "Totally agree" (1) to "Totally disagree" (4), while in 2005 a seven-point Likert scale ranging from "Totally disagree" (1) to "Totally agree" (7) is used. We begin

9. Descriptive statistics for our dependent and independent variables are reported by training status in Online Appendix Table A.1.

10. We consider the robustness of our results to alternative definitions of general training as well as to the exclusion of the year 2000 in Section IV.D.

Table 1
Course Characteristics

	General Training (1)	Specific Training (2)
Observations[a]	1,925	1,081
Panel A: Transferability of Skills		
To what extent could you use the newly acquired skills if you got a new job in a different company?		
Not at all	0.00	0.27
Limited	0.00	0.73
To a large extent	0.58	0.00
Completely	0.42	0.00
Panel B: Further Course Characteristics		
Total course duration (weeks)[b]	4.21	1.70***
Hours of Instruction every week	16.42	16.11
Correspondence course	0.04	0.04
What was the purpose of this instruction?		
Retraining for a different profession or job	0.01	0.00
Introduction to a new job	0.05	0.04
Qualification for professional advancement	0.25	0.14***
Adjustment to new demands in current job	0.76	0.79**
Other	0.10	0.13***
Did the course take place during working hours		
During working time	0.66	0.76***
Some of both	0.12	0.11
Outside working time	0.21	0.13***
Did you receive a participation certificate?	0.80	0.64***
Who held the course:		
Employer	0.43	0.61***
Private institute	0.20	0.10***
Did you receive financial support from your employer?		
Yes, from the employer	0.73	0.77*
Yes, from another source	0.07	0.06
Dummy for no own costs	0.84	0.89***
Own costs	577.95	220.56***
Looking back, was this further education worth it for you professionally?		
Very much	0.44	0.19***
A little	0.38	0.55***
Not at all	0.07	0.16***
Do not know yet	0.10	0.10

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: *$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.
[a]The number of observations of the presented survey question vary slightly due to item nonresponse. The 159 individuals who participated in both general and specific training within one cross-section have been excluded. In case individuals participated in more than one course (of the same type) within one cross-section, we took the information available of the most recent course.
[b]Own calculation, based on information of the length (days, weeks, months) of each course.

Table 2
Locus of Control Items 1999 and 2005

	Wave	
Variable	1999[a]	2005[b]
Observations	7,047	5,156
Components of locus of control (Mean, 1999 Scale: 1–4, 2005 Scale: 1–7)		
I1: How my life goes depends on me (I)	3.30	5.54
I2: Compared to other people, I have not achieved what I deserve (E)	2.08	3.12
I3: What a person achieves in life is above all a question of fate or luck (E)	2.19	3.39
I5: I frequently have the experience that other people have a controlling influence over my life (E)	1.99	3.04
I6: One has to work hard in order to succeed (I)	3.46	6.02
I7: If I run up against difficulties in life, I often doubt my abilities (E)	2.02	3.29
I8: The opportunities that I have in life are determined by the social conditions (E)	2.68	4.47
I10: I have little control over the things that happen in my life (E)	1.77	2.51

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: In both years, Item 4 "If a person is socially or politically active, he/she can have an effect on social conditions" and 9 "Inborn abilities are more important than any efforts one can make" are not included in the prediction of the latent factor. Items marked with (I)/(E) refer to internal/external items. External items are reversed prior to factor analysis in order to indicate an internal locus of control for high values.
[a]In 1999 the locus of control was surveyed on a four-point Likert scale from 1 for "Totally Disagree" to 4 for "Totally Agree". The scale was reversed in the data preparation in order to indicate agreement for high values as it is also the case in the other wave of 2005. For later harmonization, the scale was stretched to the length of a seven-point Likert scale.
[b]In 2005 the locus of control was surveyed on a seven-point Likert scale from 1 for "Disagree Completely" to 7 for "Agree Completely."

by harmonizing our 1999 and 2005 locus of control measures by both recoding and stretching the 1999 response scale so that the response scales correspond in both years.[11] A description of each item and its corresponding mean can be found in Table 2 for both 1999 and 2005.

Following the literature (Piatek and Pinger 2016; Cobb-Clark, Kassenboehmer, and Schurer 2014), we construct our measure of locus of control using a two-step process. First, factor analysis identifies two underlying latent variables (factors) interpretable as internal and external locus of control, respectively. This process isolates six items that

11. Specifically, the original 1999 response scale is recoded as follows: 1 to 7; 2 to 5; 3 to 3; and 4 to 1.

load onto external locus of control and two items that load onto internal locus of control (see Online Appendix Figure A.1, Panels A and B). Second, we reverse the coding of the response scale for the six external items so that higher values denote higher levels of disagreement. We then use all eight items to conduct a factor analysis, separately by year, in which a single latent factor is extracted. This process allows us to identify separate loadings (weights) for each item, which are then applied in constructing a continuous index that is increasing in internal locus of control. To facilitate the interpretation of our results, we use a standardized index (mean = 0; standard deviation = 1) in our estimation models. The distribution of our continuous, standardized locus of control measure is shown in Online Appendix Figure A.1, Panel C for the year 1999 and in Online Appendix Figure A.1, Panel D for the year 2005.

We minimize concerns about reverse causality by relying on a predetermined measure of locus of control in all of our analyses. When multiple measures are available, we choose the most recent since it provides the most accurate information on individuals' locus of control at the time training decisions are made. That is, we use 1999 measures of locus of control when analyzing the training outcomes reported in 2000 and 2004, while we use the 2005 locus of control measure in analyzing 2008 training outcomes.[12]

D. Expected Wage Increases, Realized Wages, and Control Variables

In the survey waves immediately following the training module (that is, in 2001, 2005, and 2009), the SOEP collected data on respondents' expectations regarding their future wage increases. Specifically, respondents were asked, "How likely is it that you personally receive a pay raise above the rate negotiated by the union or staff in general in the next two years?" Responses are recorded in deciles, that is, 0, 10, 20, …, 100 percent. Those individuals who participated in general training in the previous wave have on average a higher expected probability of wage growth (22.4 percent) compared to their coworkers engaged in specific training (15.4 percent) or not participating in training at all (14.7 percent, see Online Appendix Table A.1). Moreover, those undertaking general training are more likely to expect at least some wage growth in the future. In Section IV.C, we analyze the relationship between training and subjective expectations about the likelihood of future wage increases for those respondents with an internal versus external locus of control in order to assess the potential for locus of control to influence training decisions through expectations about the returns to training. We also analyze the way that locus of control and training participation are related to realized gross wages in $t+1$ in Section IV.C. General training participants earn on average more per hour (18.7€) than participants in specific training (17.7€) and nonparticipants (14.9€) (see Online Appendix Table A.1).

Our analysis also includes an extensive set of controls for (i) socioeconomic characteristics (age, gender, marital status, number of children, disability, educational attainment, household income and both employment and unemployment experience), (ii) personality traits (that is, the Big Five), (iii) regional conditions (regional indicators, local unemployment rates, regional GDP, etc.), (iv) job-specific characteristics (for example, occupation, tenure, contract type, trade union/association membership, etc.), and (v)

12. We consider the sensitivity of our results to alternative measures of locus of control in Section IV.D.

firm-specific characteristics (firm size and industry). Most of our control variables are measured at the same time as training participation (2000, 2004, 2008). However, data on trade union/association membership and Big Five personality information were not collected in these years, requiring them to be imputed. Specifically, Big Five personality traits are imputed from 2005, while trade union/association membership data are imputed from 2001, 2003, and 2007.[13]

Many of these controls have been previously identified in the literature as important correlates of the decision to engage in training. The probability of receiving training increases with workers' educational level (Leuven and Oosterbeek 1999; Oosterbeek 1996; Bassanini et al. 2007; Lynch 1992; Lynch and Black 1998; Arulampalam and Booth 1997). Older workers are less likely to participate in training compared to their younger coworkers (Maximiano 2012; Oosterbeek 1996, 1998). The evidence for a gender differential in the uptake of training is more mixed. Lynch (1992) finds that women are less likely to participate in training, while Maximiano (2012) and Oosterbeek (1996) find no gender difference, and Lynch and Black (1998) find that women are more likely to participate in training. Unsurprisingly, training is also related to both job and firm characteristics. Maximiano (2012) and Oosterbeek (1996) find that workers with a permanent contract are more likely to receive training. Leuven and Oosterbeek (1999) instead find no significant differences of the type of working contract on training incidence, though contract type is associated with training intensity. Finally, workers in smaller companies have a lower probability of receiving training (see Maximiano 2012; Lynch and Black 1998; Oosterbeek 1996).

Online Appendix Table A.1 presents descriptive statistics—by training status—for all of the conditioning variables in our empirical analysis. Standard *t*-tests indicate that individuals engaging in either specific or general training are significantly different in many respects relative to their coworkers who do not participate in either form of training. In particular, training recipients are on average more educated, are less likely to be a blue-collar worker, and have fewer years of unemployment experience.

IV. Results

A. Estimation Strategy

Our objective is to estimate the relationship between workers' locus of control and their participation in general or specific training. Our theoretical model predicts that workers with an internal locus of control will engage in general training more frequently than their external coworkers because their expected subjective investment returns are higher. In contrast, we expect little relationship between specific training and locus of control because training returns largely accrue to firms rather than workers.

In what follows, we conduct three separate empirical analyses. We first estimate the relationship between training participation and locus of control (see Section IV.B). We then examine whether the evidence indicates that locus of control affects the training decision by influencing workers' expectations about future wage increases. Finally, we

13. Details about the construction of these variables are available from the authors upon request.

assess whether realized wages after training differ with respect to the locus of control (see Section IV.C). In Section IV.D, we report the results of a number of robustness tests.

We specify the probability of participating in training (T_{it}^{j}) as a logit model:

$$(7)\quad P(T_{it}^{j}) = \frac{\exp(\alpha_0 + \alpha_1 LoC_{i0} + \mathbf{X'}_{\mathbf{it}}\boldsymbol{\alpha}_2)}{1 + \exp(\alpha_0 + \alpha_1 LoC_{i0} + \mathbf{X'}_{\mathbf{it}}\boldsymbol{\alpha}_2)}$$

where i indexes individuals, t indexes time, and $j = (A, G, S)$ indexes training type (that is, any, general, and specific training, respectively). Each model pools observations from the waves 2000, 2004, and 2008 and controls for internal locus of control (LoC), as well as a vector ($\boldsymbol{X_{it}}$) of detailed measures of (i) socioeconomic characteristics, (ii) personality traits, (iii) regional conditions, (iv) job-specific characteristics, and (v) firm-specific characteristics (firm size and industry) (see Section III.D). Recall that our measure of locus of control is predetermined at the time training occurs, minimizing concerns about reverse causality, while we account for a detailed set of controls in order to reduce the potential for unobserved heterogeneity to confound our estimates. The parameter of interest is α_1, which captures the impact of locus of control on the probability of participating in different types of training.

In addition, we model expectations regarding future wage increases (EWI_{it+1}) and observed hourly wages (W_{it+1}) in $t+1$ as functions of training status, that is, general training (T_{it}^{G}) or specific training (T_{it}^{S}) versus the base case of no training, and the interaction of training status with locus of control. Our estimating equations are given by the following linear regressions:

$$(8)\quad EWI_{it+1} = \beta_0 + \beta_1 LoC_{i0} + \beta_2 T_{it}^{G} + \beta_3 T_{it}^{S} + \beta_4 LoC_{i0} \cdot T_{it}^{G} + \beta_5 LoC_{i0} \cdot T_{it}^{S} + \mathbf{X'_{it}}\boldsymbol{\beta}_6 + \epsilon_{it}$$

$$(9)\quad \ln W_{it+1} = \gamma_0 + \gamma_1 LoC_{i0} + \gamma_2 T_{it}^{G} + \gamma_3 T_{it}^{S} + \gamma_4 LoC_{i0} \cdot T_{it}^{G} + \gamma_5 LoC_{i0} \cdot T_{it}^{S} + \mathbf{X'_{it}}\gamma_6 + e_{it}$$

We control for the same set of observed characteristics $\mathbf{X}_{\boldsymbol{it}}$ as in Equation 7. Here β_4 and β_5 reflect the relationship between the locus of control and expected returns to different types of training, while γ_4 and γ_5 capture potential differences in hourly wages depending on the locus of control after general and specific training; ϵ_{it} and e_{it} are the i.i.d. error terms.

B. Participation in Training

We begin by using a binomial logit model to estimate the relationship between internal locus of control and participation in training. Table 3 reports the results—that is, marginal effects and standard errors—for three alternative training outcomes: (i) any training irrespective of type (Panel A), (ii) general training (Panel B), and (iii) specific training (Panel C). Individuals who participate in both types of training in the same year are included as participants in all three estimations.[14] In each case, we estimate a series of models increasing in controls. Column 1 reports the unconditional effect of locus of control on training participation, while Column 5 reports the effect of locus of

14. We test the robustness of our results to the exclusion of individuals who participate in both types of training in the same year in Section IV.D.

Table 3
Logit Estimation Results: Participation in Training on Locus of Control (std.) (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)
Panel A: Training (Mean = 0.26)					
Locus of control (std.)	0.044***	0.043***	0.024***	0.015***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Panel B: General Training (Mean = 0.17)					
Locus of control (std.)	0.041***	0.040***	0.028***	0.020***	0.017***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Panel C: Specific Training (Mean = 0.10)					
Locus of control (std.)	0.008***	0.007***	0.000	–0.002	–0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Control variables					
Locus of control	✓	✓	✓	✓	✓
Year, regional		✓	✓	✓	✓
Sociodemographics			✓	✓	✓
Job, firm				✓	✓
Big five					✓
Observations	12,203	12,203	12,203	12,203	12,203

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: The locus of control measure is standardized with a mean of zero and a variance of one. Full estimation results (including all control variables) are available in Online Appendix Table A.2. Standard errors are in parentheses and clustered on the person level. $*p \leq 0.1$, $**p \leq 0.05$, $***p \leq 0.01$.

control on training conditioning on our full set of controls (see Section IV.A).[15] Given the construction of our locus of control measure, the results can be interpreted as the percentage point change in training incidence associated with a one standard deviation change in internal locus of control.

Workers with an internal locus of control are more likely to engage in work-related education and training. Our unconditional estimate implies that each standard deviation increase in internal locus of control is associated with a 4.4 percentage point increase in the chances that a worker undertakes some form of training. Although the estimated marginal effect of locus of control on the incidence of training falls as we increasingly control for detailed individual-, regional-, job-, and firm-level characteristics, it remains statistically significant and economically meaningful. Specifically, in our full specification, we find that a one standard deviation increase in locus of control increases the probability of training taking place by 1.4 percentage points, which corresponds to an

15. Full estimation results are available in Online Appendix Table A.2.

effect of almost 5.4 percent. This is consistent with previous evidence that having an internal locus of control is associated with both an increased willingness to engage in training (Fourage, Schils, and De Grip 2013) and higher rates of training (Offerhaus 2013).

As expected, there is a particularly strong relationship between locus of control and the incidence of general training. Unconditionally, workers are estimated to be 4.1 percentage points more likely to engage in general training with each standard deviation increase in their internal locus of control. This effect is reduced by half to 2.0 percentage points once we control for year and regional fixed effects, sociodemographic characteristics, and detailed job and firm characteristics (Column 4). Controlling for individuals' Big Five personality traits results in a further reduction in effect size of approximately 15 percent (Column 5). The resulting estimated effect (1.7 percentage points) corresponds to an effect size of roughly 10 percent—nearly double that associated with training overall. In contrast, the relationship between locus of control and specific training is both economically unimportant and statistically insignificant once we control for sociodemographic characteristics. Failing to distinguish between alternative types of training masks this crucial distinction in the role of locus of control.

While we observe a substantial decrease in the estimated effect on participation in general training from Column 1 to Column 5, it is important to note that our data contain a very rich set of control variables, including detailed information about job and firm characteristics, as well as individual characteristics that are often not observed, like the Big Five personality traits. The evolution of the estimated effect from Column 3 to Column 5 can be interpreted as evidence that the relationship between locus of control and participation in general training is likely not driven by unobserved firm and individual characteristics. However, in Section IV.D we will analyze the sensitivity of our results with respect to omitted variables, following Oster (2019).

Taken together, these findings are consistent with the predictions of our theoretical model. A greater degree of internal control results in individuals being more likely to invest in training when it is transferable to other firms and having similar levels of investment when it is not.

C. Expected Wage Increases and Realized Wages

We turn now to investigating whether there is evidence that locus of control affects training decisions by influencing workers' subjective beliefs about training returns. Unfortunately, we do not have direct information about the a priori wage returns that workers would expect in the event they were and were not to undertake training. Instead we have data on workers' expectations about the probability that they will receive a pay raise above the rate negotiated by the union or staff in general. We argue that these expectations regarding future wage increases post-training are an indirect measure of the returns that workers expect from training. Consequently, we estimate a series of models of the likelihood that individuals expect future wage increases conditional on locus of control, participation in general or specific training, and other control variables. The results are summarized in Table 4, while complete results are presented in Online Appendix Table A.3.

Workers who participated in general training in the previous wave are significantly more likely to expect a pay raise above the negotiated rate, whereas there is no relationship

Table 4
OLS Estimation Results: Pay Raise Expectations on Locus of Control (std.)

	(1)	(2)	(3)	(4)	(5)
Locus of control (std.)	1.094***	1.112***	0.227	0.011	–0.183
	(0.273)	(0.274)	(0.263)	(0.258)	(0.268)
General training	6.787***	6.812***	4.166***	3.299***	3.158***
	(0.703)	(0.700)	(0.677)	(0.660)	(0.658)
Specific training	0.425	0.922	–0.500	0.247	0.163
	(0.803)	(0.794)	(0.776)	(0.760)	(0.757)
General training × Locus of control (std.)	2.456***	2.166***	2.344***	2.196***	2.154***
	(0.786)	(0.775)	(0.726)	(0.696)	(0.694)
Specific training × Locus of control (std.)	0.213	0.074	0.192	0.327	0.252
	(0.850)	(0.839)	(0.808)	(0.797)	(0.795)
Control variables					
Locus of control	✓	✓	✓	✓	✓
Year, regional		✓	✓	✓	✓
Sociodemographics			✓	✓	✓
Job, firm				✓	✓
Big five					✓
Observations	12,203	12,203	12,203	12,203	12,203
$\bar{R}^2$	0.017	0.036	0.124	0.169	0.173

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: The locus of control measure is standardized with a mean of zero and a variance of one. The dependent variable is the expectation about the probability that workers will receive a pay raise above the rate negotiated by the union or staff in general. Full estimation results (including all control variables) are available in Online Appendix Table A.3. Standard errors are in parentheses and clustered on the person level. *$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

between specific training and expected pay raises. These findings are not particularly surprising in light of the Becker (1962) argument that trainees largely capture the returns to general training, while the returns to specific training are captured predominately by firms. Expectations regarding future pay raises are also related to the extent to which workers believe that what happens in life is under their control. The estimated effect of locus of control varies widely with model specification, however. In our preferred (full) specification, an internal locus of control is associated with a small and insignificant decrease in the chances of expecting a future pay raise, everything else equal.

We are particularly interested in the relationship between locus of control and expectations about future wage increases conditional on workers' previous training decisions. This effect is captured in the estimated interaction between locus of control and both general and specific training. Specifically, we find that there is a significant positive interaction between an internal locus of control and general training. That is, among those receiving general training, the probability of expecting a pay raise increases

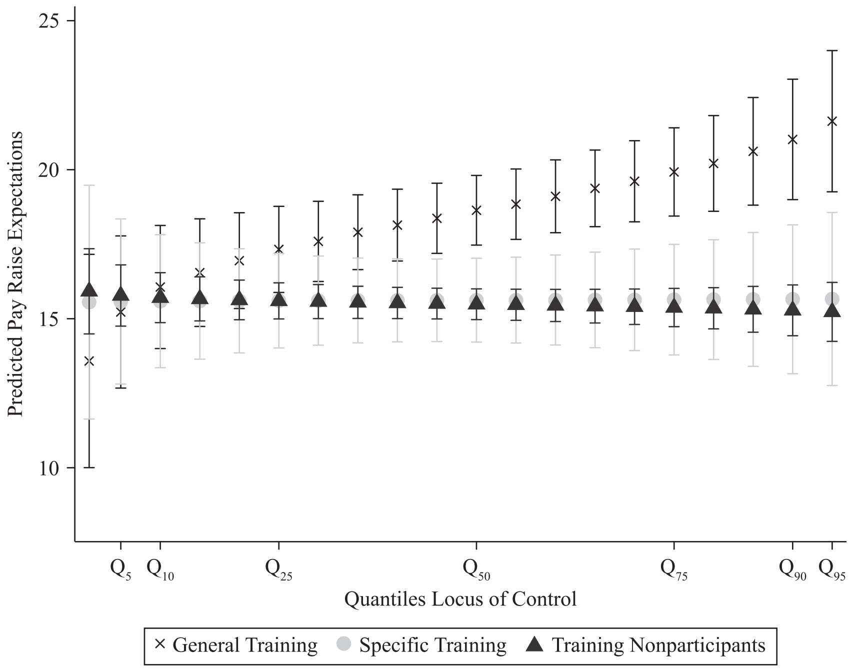

Figure 2

Predicted Pay Raise Expectations by Locus of Control

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi: 10.5684/soep.v33, own illustration.

Notes: The figure shows different locus of control quantiles plotted against the predicted expectations about the probability that workers will receive a pay raise above the rate negotiated by the union or staff in general (based on the estimation in Column 5 of Table 4). We show these expectations for nontraining participants (dark gray, triangle), only general training participants (black, cross), and only specific training participants (light gray, circle). The triangles / crosses / circles in the middle of the vertical bars show the predicted mean expectations for the respective training outcome. The horizontal ending points of the vertical bars denote the lower and upper end of the 95 percent confidence interval.

significantly with internal locus of control. In contrast, the subjective pay raise expectations of workers receiving specific training are independent of their locus of control. These results continue to hold in models with detailed controls for year and regional controls (Column 2), sociodemographic characteristics (Column 3), job and firm characteristics (Column 4), and Big Five Personality traits (Column 5).

The relationship between locus of control, training participation, and expected pay raises is shown graphically in Figure 2 (based on the full specification in Column 5). Specifically, we plot predicted expectations regarding future pay raises (y-axis) at different quantiles of the locus of control distribution (x-axis), for general (black, crosses), specific (light gray, circles), and nontraining participants (dark gray, triangles). The crosses, circles, and triangles in the middle of the vertical bars indicate the predicted means, while the horizontal lines indicate 95 percent confidence intervals. The more

Table 5
OLS Estimation Results: Gross Log Hourly Wage (t+1)

	(1)	(2)	(3)	(4)	(5)
Locus of control (std.)	0.061***	0.062***	0.024***	0.013***	0.013***
	(0.006)	(0.006)	(0.005)	(0.004)	(0.004)
General training	0.207***	0.205***	0.117***	0.045***	0.045***
	(0.012)	(0.012)	(0.010)	(0.009)	(0.009)
Specific training	0.186***	0.200***	0.104***	0.036***	0.036***
	(0.013)	(0.013)	(0.011)	(0.010)	(0.010)
General training *	0.014	0.002	–0.004	–0.003	–0.003
Locus of control (std.)	(0.013)	(0.013)	(0.011)	(0.009)	(0.009)
Specific training *	–0.015	–0.022	–0.007	–0.012	–0.013
Locus of control (std.)	(0.015)	(0.014)	(0.012)	(0.010)	(0.010)
Control variables					
Locus of control	✓	✓	✓	✓	✓
Year, regional		✓	✓	✓	✓
Sociodemographics			✓	✓	✓
Job, firm				✓	✓
Big five					✓
Observations	11,355	11,355	11,355	11,355	11,355
$\bar{R}^2$	0.060	0.134	0.409	0.539	0.540

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: The locus of control measure is standardized with a mean of zero and a variance of one. Full estimation results (including all control variables) are available in Online Appendix Table A.4. Standard errors are in parentheses and clustered on the person level. *$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

internal general training participants are, the higher is the likelihood that they expect a future pay raise, ranging from a probability of about 13.6 percent on average in the lowest quintile to more than 21.6 percent in the highest quintile. In contrast, those undertaking specific training have constant expectations regarding future pay raises throughout the locus of control distribution, while the expected likelihood of receiving a future pay raise falls slightly as training nonparticipants become more internal.

These results strongly suggest that locus of control is linked to training decisions through workers' expectations regarding the likely returns. In particular, there is a strong positive relationship between locus of control and expected future pay raises for those workers who are most likely to capture the returns from training (that is, those participating in general training) and either no relationship or a negative relationship for those who are not (that is, those participating in specific training or no training, respectively).

Finally, we analyze the association of locus of control and training participation with realized wages in $t+1$. Estimation results are summarized in Table 5; complete results are available in Online Appendix Table A.4. We assume that the decision to participate in training takes place in period t (which can be either in 2000, 2004, or 2008), and we estimate the relationship between training status in t and wages realized in period $t+1$. We lose approximately 848 employed individuals from our sample due to missing wage or working hours information in $t+1$. Column 1 in Table 5 shows the unconditional effect of locus of control and training participation on hourly gross wage in $t+1$.

We find that being internal is significantly positively related to wages. Moreover, participation in either general or specific training is associated with significantly higher wages. Consistent with our model, the wage return to general participation is larger than the wage return to specific training, though empirically the differences are small and insignificant. This suggests that, in practice, work-related training may involve the development of both specific and general skills (see Lazear 2009). There is an insignificant interaction between training (general or specific) and locus of control in determining realized wages that is robust as we increasingly add controls. In short, the post-training wages of training participants do not depend on their locus of control, suggesting that the return to training participation is independent of locus of control (see also Figure 3, which graphically depicts the relationship between locus of control, training participation, and realized wages in $t+1$). This is inconsistent with the idea that workers with an internal locus of control engage in more training because they are more productive in training, that is, because they receive larger productivity gains as a result.[16]

D. Robustness Analysis

We conduct a number of robustness checks in order to assess the sensitivity of our conclusions to sample choice, model specification, the parameterization of our key variables of interest, and potential omitted variable bias (see Tables 6 and 7). Results for our model of training participation are reported in Panel A, while results for our models of expected wage increases and realized wages in $t+1$ are reported in Panels B and C, respectively. To facilitate comparisons, Column 1 reproduces the training results (logit marginal effects), expected pay raise results (ordinary least squares [OLS] coefficients) and realized wage results (OLS coefficients) from our preferred specifications (Column 5) in Tables 3, 4, and 5, respectively.

1. Sample choice

Unlike the case in 2004 and 2008, the SOEP skill-transferability question in 2000 cannot be linked to a specific training course, requiring us to assume that individuals' responses refer to the latest course undertaken (see Section III.B). In Column 2 of Table 6, we report results from a restricted estimation sample in which we drop the data from year 2000. In addition, a small number of respondents ($n=159$) participate in both general and specific training within a 12-month period. Column 3 reports the results we obtain when these individuals are excluded from the sample. In both cases, we find that our results are substantively the same, indicating that our conclusions are robust to these two sampling choices.

16. If training has only a long-run, but no short-run impact on productivity—which workers correctly anticipate—it is possible that the observed effect of locus of control on training propensities stems from disparities in actual training returns, rather than subjective beliefs about training returns. In this special case, our analysis would not completely rule out the possibility that having an internal locus of control conveys a productivity advantage in the longer run.

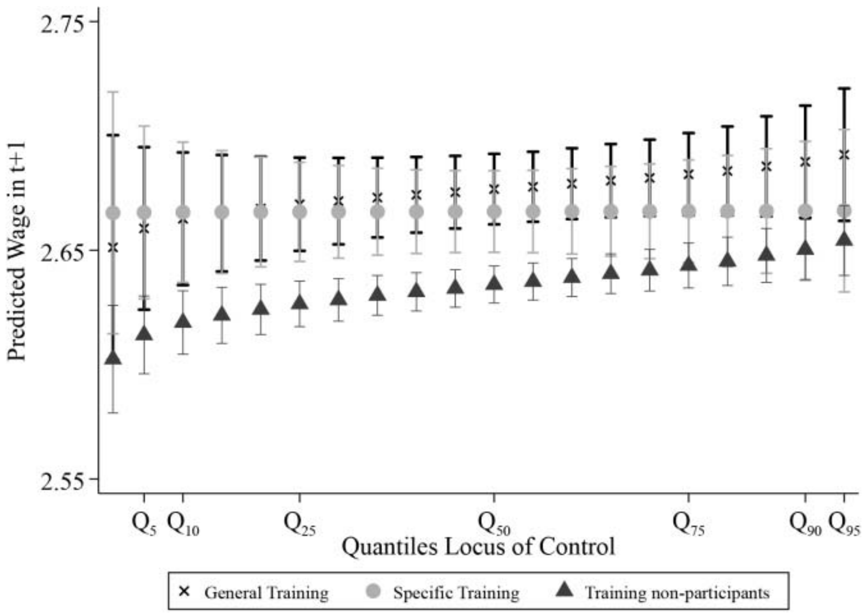

Figure 3

Predicted Gross Log Hourly Wage (t + 1) by Locus of Control

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi: 10.5684/soep.v33, own illustration.

Notes: The figure shows different locus of control quantiles plotted against the predicted wage in $t+1$ (based on the estimation in Column 5 of Table 5) for nontraining participants (dark gray, triangles), only general training participants (black, crosses), and only specific training participants (light gray, circles). The symbols in the middle of the vertical bars show the predicted mean expectations for the respective training outcome. The horizontal ending points of the vertical bars denote the lower and upper end of the 95 percent confidence interval.

2. Definition of general and specific training

We also consider the robustness of our results to the distinction we make between general versus specific training. Specifically, we narrow the definition of general training to include only training in which skills are "completely" transferable to another company. All other categories of training are considered to be specific training. We find a somewhat weaker, though still statistically significant, relationship between locus of control and general training, while there continues to be no significant relationship between locus of control and specific training (see Column 4 of Table 6). Thus, the conclusion that locus of control is related to general, but not specific, training continues to hold under this alternative definition. Moreover, the association between specific training and future wage expectations becomes larger and statistically significant, which is unsurprising given that "specific training" now also encompasses training that is "to a large extent"

Table 6

Robustness Analysis for Training Participation, Pay Raise Expectations and Gross Log Hourly Wage (t+1)—Part 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Logit Estimation Results: Participation in Training (Marginal Effects)								
General and Specific Training								
Locus of control (std.)	0.014***	0.015***	0.014***	0.014***	0.015***	0.014***	0.013***	0.013***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Observations	12,203	8,633	12,044	12,203	10,081	11,875	12,203	12,203
General training								
Locus of control (std.)	0.017***	0.018***	0.017***	0.013***	0.015***	0.017***	0.017***	0.016***
	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Observations	12,203	8,633	12,044	12,203	10,081	11,875	12,203	12,203
Specific training								
Locus of control (std.)	–0.001	–0.000	–0.002	0.002	0.001	–0.001	–0.002	–0.001
	(0.003)	(0.004)	(0.003)	(0.004)	(0.002)	(0.003)	(0.003)	(0.003)
Observations	12,203	8,633	12,044	12,203	10,081	11,875	12,203	12,203

(*continued*)

Table 6 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel B: OLS Estimation Results: Pay Raise Expectations								
Locus of control (std.)	–0.183	–0.391	–0.131	–0.181	–0.165	–0.172	–0.166	–0.090
	(0.268)	(0.307)	(0.286)	(0.269)	(0.271)	(0.269)	(0.267)	(0.281)
General training	3.158***	1.695**	3.025***	3.112***	2.975***	3.352***	3.195***	3.155***
	(0.658)	(0.728)	(0.698)	(1.008)	(1.053)	(0.683)	(0.659)	(0.659)
Specific training	0.163	0.060	0.285	1.808***	–0.636	0.404	0.166	0.181
	(0.757)	(0.829)	(0.789)	(0.629)	(1.410)	(0.836)	(0.759)	(0.760)
General training × Locus of control (std.)	2.154***	2.026***	2.045***	3.295***	3.076***	2.140***	2.036***	2.255***
	(0.694)	(0.734)	(0.768)	(1.110)	(1.144)	(0.723)	(0.683)	(0.710)
Specific training × Locus of control (std.)	0.252	–0.299	0.098	0.900	2.312*	0.124	0.319	0.301
	(0.795)	(0.845)	(0.887)	(0.618)	(1.322)	(0.880)	(0.802)	(0.818)
Observations	12,203	8,633	12,044	12,203	10,081	11,875	12,203	12,203
Panel C: OLS Estimation Results: Gross Log Hourly Wage ($t+1$)								
Locus of control (std.)	0.013***	0.013***	0.014***	0.013***	0.011**	0.013***	0.012***	0.013***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
General training	0.045***	0.042***	0.050***	0.044***	0.041***	0.046***	0.045***	0.045***
	(0.009)	(0.010)	(0.009)	(0.013)	(0.014)	(0.009)	(0.009)	(0.009)
Specific training	0.036***	0.030***	0.045***	0.048***	0.038**	0.042***	0.036***	0.036***
	(0.010)	(0.011)	(0.010)	(0.008)	(0.017)	(0.011)	(0.010)	(0.010)

(*continued*)

Table 6 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
General training × Locus of control (std.)	–0.003 (0.009)	–0.005 (0.010)	–0.003 (0.011)	0.000 (0.015)	–0.003 (0.016)	–0.002 (0.010)	–0.003 (0.009)	–0.001 (0.010)
Specific training × Locus of control (std.)	–0.013 (0.010)	–0.008 (0.012)	–0.011 (0.012)	–0.008 (0.008)	–0.004 (0.018)	–0.016 (0.011)	–0.012 (0.010)	–0.015 (0.011)
Observations	11,355	8,008	11,202	11,355	9,331	11,037	11,355	11,355
Control variables								
Locus of control	✓	✓	✓	✓	✓	✓	✓	✓
Year, regional	✓	✓	✓	✓	✓	✓	✓	✓
Sociodemographics	✓	✓	✓	✓	✓	✓	✓	✓
Job, firm	✓	✓	✓	✓	✓	✓	✓	✓
Big five	✓	✓	✓	✓	✓	✓	✓	✓

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: The locus of control measure is standardized with a mean of zero and a variance of one. *$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$. Standard errors are in parentheses and clustered on the person level.
Sensitivity tests are presented in the different columns, we tested the following specifications:
(1) Main results from Column 5 in Tables 3, 4, and 5, respectively
(2) Excluding year 2000
(3) Excluding individuals participating in general and specific training within one cross-section
(4) Changing definition of general training (general = completely; specific = for the most part, only to a limited extend, not at all)
(5) Changing definition of general training (general = completely; specific = not at all)
(6) Excluding those who say “training not worth it”
(7) Locus of control index is average of items (all items equally weighted)
(8) Locus of control based on first observation only

Table 7
Robustness Analysis for Training Participation, Pay Raise Expectations, and Gross Log Hourly Wage (t + 1)—Part 2

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Logit Estimation Results: Participation in Training (Marginal Effects)						
General and specific training						
Locus of control (std.)	0.014***	0.014***	0.027***			
	(0.004)	(0.005)	(0.004)			
Observations	12,203	8,620	12,203			
General training						
Locus of control (std.)	0.017***	0.018***	0.027***			
	(0.004)	(0.005)	(0.004)			
Observations	12,203	8,620	12,203			
Specific training						
Locus of control (std.)	–0.001	–0.000	0.003			
	(0.003)	(0.004)	(0.003)			
Observations	12,203	8,620	12,203			
Panel B: OLS Estimation Results: Pay Raise Expectations						
Locus of control (std.)	–0.183	–0.422	0.150	–1.092*	–0.504	–0.640
	(0.268)	(0.307)	(0.273)	(0.591)	(0.543)	(0.610)
General training	3.158***	1.650**	4.691***	5.188***	3.099***	2.973***
	(0.658)	(0.728)	(0.672)	(1.246)	(0.958)	(1.020)

(*continued*)

Table 7 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)
Specific training	0.163	0.049	0.248	–0.910	1.611	1.827
	(0.757)	(0.829)	(0.766)	(1.612)	(1.073)	(1.129)
General training × Locus of control (std.)	2.154***	1.993***	2.159***	3.732***	1.053	1.917*
	(0.694)	(0.735)	(0.726)	(1.304)	(1.011)	(1.074)
Specific training × Locus of control (std.)	0.252	–0.262	0.052	0.966	–0.373	0.511
	(0.795)	(0.846)	(0.815)	(1.787)	(1.114)	(1.173)
Observations	12,203	8,620	12,203	12,203	12,203	4,578
Panel C: OLS Estimation Results: Gross Log Hourly Wage ($t+1$)						
Locus of control (std.)	0.013***	0.013***	0.032***		–0.003	–0.006
	(0.004)	(0.005)	(0.005)		(0.006)	(0.007)
General training	0.045***	0.042***	0.139***		0.019*	0.010
	(0.009)	(0.010)	(0.010)		(0.010)	(0.010)
Specific training	0.036***	0.030***	0.097***		–0.004	–0.002
	(0.010)	(0.011)	(0.011)		(0.012)	(0.012)
General training × Locus of control (std.)	–0.003	–0.005	–0.006		–0.014	–0.011
	(0.009)	(0.010)	(0.011)		(0.010)	(0.010)
Specific training × Locus of control (std.)	–0.013	–0.008	–0.024**		0.011	0.012
	(0.010)	(0.012)	(0.012)		(0.012)	(0.013)
Observations	11,355	7,999	11,355		11,355	4,177

(*continued*)

Table 7 (*continued*)

	(1)	(2)	(3)	(4)	(5)	(6)
Control variables						
Locus of control (std.), training	✓	✓	✓	✓	✓	✓
Year, regional	✓	✓	✓	✓	✓	✓
Sociodemographics	✓	✓	✓*	✓	✓	✓
Job, firm	✓	✓	✓*	✓	✓	✓
Big five	✓	✓	✓	✓	✓	✓

Source: Socio-Economic Panel (SOEP), data for years 1999–2008, version 33, SOEP, 2017, doi:10.5684/soep.v33, own calculations.
Notes: The locus of control measure is standardized with a mean of zero and a variance of one. $^{*}p \leq 0.1$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$. Standard errors are in parentheses and clustered on the person level.
Sensitivity tests are presented in the different columns, we tested the following specifications:
(1) Main results from Column 5 in Tables 3, 4 and 5, respectively
(2) Including general risk attitudes (only available in 2004 and 2008)
(3) Excluding potentially endogenous variables (education, blue/white collar worker, occupational autonomy, manager, ISCO, NACE), remaining Job + Firm control variables are firm size, type of contract, member trade union/ association
(4) Tobit model
(5) Fixed-effects estimation
(6) First-difference estimation

transferable to other firms. In order to sharpen the distinction between general and specific training, we also considered an alternative definition that captures the extremes of the skill-transferability scale. That is, training is general only when it is "completely" transferable and specific only when it is "not at all transferable." All other training events are dropped from the sample. These results are reported in Column 5. All of our results are virtually unchanged, with the exception that the positive interaction between locus of control and specific training in influencing future wage expectations becomes much larger and is now statistically significant at a 10 percent level.

We also consider the possibility that trainees report that the skills they acquired cannot be transferred to another firm because they believe that the training is not useful in general, not because it is firm specific. We investigate this by excluding all individuals who report that "training was not worth it" from the analysis. We find no evidence that our results are being driven by perceptions of the usefulness of training (see Column 6). In line with this, we do not observe any evidence that locus of control is correlated with the statement that the "training was not worth it." This holds for general and for specific training (see Online Appendix Table A.5).

Finally, our analysis assumes that, for any given training event, the self-reported extent to which the acquired skills could be used in other companies is not correlated with locus of control. If this assumption does not hold, and if workers with an internal locus of control are more likely to report that any given training is general, this would lead to an upward bias in the relationship between the locus of control and participation in general training. Unfortunately, there is no direct way to test this assumption with our data.

To shed light on whether our categorization of training as general or specific is correlated with locus of control, we investigate whether the observed characteristics of the two types of training types are correlated with locus of control. If individuals with an internal locus of control are more likely to believe that training is transferable, we would expect systematic differences in the observed characteristics of general training between individuals with a more internal locus of control and those with a more external locus of control. To test this, we regress each of our observed training characteristics on a dummy that is equal to one for individuals who have a locus of control index above the median and zero otherwise, controlling for a set of observed characteristics. The corresponding results are reported in Online Appendix Table A.6. In the vast majority of cases, we do not find significant differences with respect to locus of control. We do observe significant differences for a few characteristics in the case of specific training in Column 2, but none of these differences are statistically significant if we look at general training in Column 1.[17] Overall, this makes us confident that our findings are not driven by internal workers simply being more optimistic about the transferability of any given training.

3. *Definition of locus of control*

Our locus of control index is based on the most recent predetermined survey items, which are aggregated using weights that result from a factor analysis conducted separately by

17. The lack of a correlation between locus of control and specific training also indicates that our results cannot be completely explained by internal workers simply being more optimistic about the transferability of any given training. Were this the case, given the way we have categorized training, we would expect to observe internal workers being more likely to participate in general training and less likely to participate in specific training.

each year. Our results are unchanged if we instead construct an alternative index in which all locus of control items are weighted equally (see Column 7 of Table 6) or if we use the earliest possible (instead of the most recent) locus of control items for each individual (see Column 8).

4. Risk attitudes

In Table 7, we also investigate whether our results are stable when controlling for individuals' reported risk attitudes. As briefly discussed in Section II.B, risk aversion might lead to an underinvestment in general training. If individual risk aversion is unobserved and correlated with locus of control, this might bias our results. In the SOEP we observe individual risk attitudes in the years 2004 and 2008. Column 2 presents estimation results including only the observations from these years and controlling for risk aversion. Our results are virtually the same as the results in Column 2 of Table 6, which are based on the same years of observation without controlling for risk attitudes.

5. Potentially endogenous variables

Next, we consider the sensitivity of our results to our choice of model specification. Specifically, Column 3 of Table 7 presents estimation results from a model that excludes potentially endogenous variables such as education, occupation type (blue or white collar), extent of occupational autonomy, ISCO-occupation, and NACE-sector classification. The inclusion of these variables likely moderates the effect of locus of control. As expected, their exclusion strengthens the effect of locus of control on general training and sharpens the distinction between general and specific training in influencing future wage expectations.

6. Model choice

To account for the large number of individuals reporting that they have no expectation of receiving a future wage increase, we also estimate a Tobit model of expectations regarding future pay raises and find very similar results (see Column 4 of Table 7).

7. Unobserved heterogeneity

Finally, we investigate the potential for omitted variables to bias our results. Our data sample pools three cross-sectional waves of SOEP data (2000, 2004, 2008). In principle, we could estimate fixed-effects models to account for any time-invariant unobserved heterogeneity. However, 55.6 percent of the individuals in our sample are observed only once, ruling them out for any fixed-effects estimation. There is also very limited within-individual variation over time in locus of control, making it difficult to estimate its effect using fixed-effects regression.[18]

18. The average change in our locus of control index across waves for those with multiple locus of control measures is only 0.08 points. Given that our locus of control scale ranges from 1 to 7 and has an average of 5.0, this degree of intraindividual variation is very low.

We can, however, investigate the within-individual variation in training participation by using a fixed-effects model to estimate the interaction between training participation and locus of control for the subsample of respondents with multiple observations. Around one third (31.8 percent) of individuals with multiple observations also report some variation in their training status. Consequently, we have reestimated our expected pay raise and realized wage models using both fixed-effect and first-difference estimation (see Columns 5 and 6 in Table 7). We find that the interaction between locus of control and general training is positive—and significant in the first-difference model—while the interaction between locus of control and specific training is small and clearly insignificant. These results are generally consistent with our theoretical prediction that the disparity in expected pay raises for internal versus external workers is larger for general rather than specific training. The results, however, are rather imprecise, given the small sample size and limited identifying variation, implying that they should be interpreted with caution. We do not find any evidence for significant interaction effects between locus of control and participation in training in the case of realized wages. These results confirm our findings based on pooled cross-section estimation. Again, however, they need to be interpreted with caution due to the limited sample size.

We also investigate the potential for omitted variables to bias our results using the bounding analysis suggested by Oster (2019). Despite our extraordinary rich set of controls, which include detailed job and firm characteristics, sociodemographic characteristics, and the Big Five personality traits, we cannot completely rule out the possibility that some unobserved heterogeneity remains. Oster (2019) provides a method of calculating consistent estimates of biased-adjusted treatment effects given assumptions about (i) the relative degree of selection on observed and unobserved variables (δ) and (ii) the R-squared from a hypothetical regression of the outcome on the treatment and both observed and unobserved controls (R_{max}). $\delta = 1$ implies that observed and unobserved factors are equally important in explaining the outcome; $\delta > 1$ ($\delta < 1$) implies a larger (smaller) impact of unobserved than observed factors. Given the assumed bounds for δ and R_{max}, researchers can then calculate an identified set for the treatment effect of interest. If this set excludes zero, the results from the controlled regressions can be considered robust to omitted variable bias.

Consequently, we focus on our main result—the estimated effect of locus of control on participation in general training—and we reestimate the results reported in Table 3 using OLS and including an indicator for above-median locus of control. Comparing Columns 1 and 5 in Online Appendix Table A.7 reveals that the estimated effect of locus of control on general training decreases from 0.068 in a model with no controls to 0.023 in our full specification. The identified set of coefficients includes zero only if δ exceeds 0.37.[19] This suggests that the estimated coefficient would be significantly positive as long as the degree of selection on unobservables relative to our detailed observed characteristics does not exceed a value of 0.37. For example, if there are unobserved variables that have similarly explanatory power as our large set of explanatory variables ($\delta = 1$), then our results would become insignificant.

19. The estimated effect in our full model is $\tilde{\beta} = 0.0226$, and the corresponding $\tilde{R}^2 = 0.0936$. In a model with no controls, we find that $\dot{\beta} = 0.0683$, with $\tilde{R}^2 = 0.0082$. With $\delta = 1$ the identified coefficient set is $[\tilde{\beta}, \beta*'] = [0.0226, -0.0375]$; with $\delta = 0.37$ it is $[\tilde{\beta}, \beta*'] = [0.0226, 0.0004]$. Full estimation results are available upon request from the authors.

V. Conclusions

Nations face enormous challenges in ensuring that the economic prosperity delivered by globalization and rapid technological change is enjoyed by all members of society. The risk is that many disadvantaged, undereducated, and less-skilled individuals will struggle to remain competitive and may, as a result, fall even further behind. The European Commission has recently called for the integration of work and education "into a single lifelong learning process, open to innovation and open to all" (European Commission 2010, p. 5). Whether this successfully allows marginalized groups to remain economically active and engaged in meaningful employment depends largely on their willingness to take up work-related training opportunities.

This work adopts a behavioral perspective on the tendency for some workers to underinvest in their own training. Specifically, we account for the role of workers and firms in the training decision and allow workers' subjective beliefs about the investment returns to training to be influenced by their sense of control over what happens in life. A greater degree of internal control is predicted to make individuals more likely to invest in training when it is transferable to outside firms, but no more likely to invest in training when it is not. We then provide empirical evidence that, consistent with our theoretical model, having an internal locus of control is associated with higher participation in general but not specific training. Moreover, we argue that our results are consistent with locus of control affecting training investments through its influence on workers' expected investment returns, rather than through training costs or post-training productivity. Specifically, general training is associated with a higher likelihood of expecting a future pay raise for those with an internal rather than external locus of control, even though actual post-general-training wages—and presumably productivity—do not depend on locus of control. There is also no evidence of any link between locus of control and expectations about pay raises or post-training wages in the case of specific training.

Crucially, it is the link between skill transferability and the allocation of training returns across firms and workers that leads workers' perceptions of control to have a more profound effect on their decisions regarding general rather than specific training. We formally demonstrate this using a stylized, two-period investment model with competitive markets and risk-neutral agents. However, this key result is also easily generalized to a variety of noncompetitive market structures and to risk-averse workers so long as increased skill transferability ultimately enhances workers' ability to capture the benefits of the training they receive. When this is true, we expect workers with an internal locus of control to respond to these incentives by investing in training. In contrast, those with an external locus of control are expected to be much less responsive to investment returns even when they exist.

These insights about workers' differential responsiveness to general versus specific training also extend beyond their perceptions of control. Many things—for example, cognitive biases, risk aversion, impatience, etc.—can lead subjective expected investment returns to deviate from objective returns, vary across individuals, and matter for important economic decisions. In these circumstances, we would expect the disparity in workers' responses to objective investment returns to be larger when those returns accrue to them than when they do not.

The relationship between workers' investment decisions and their locus of control suggests that those with a more external sense of control are likely to require more intensive assistance in meeting their training goals. Moreover, as work-related training decisions appear to be linked to beliefs about training returns, there is also the potential for objective information regarding the returns to training to be useful in motivating external workers. Similar information interventions are being explored as a means of increasing disadvantaged students' propensity to attend college (Peter and Zambre 2016) and influencing students' choice of college major (Wiswall and Zafar 2015).

Future research will no doubt be useful in extending these results along several dimensions. There is a particular need for research that models the role of cognitive biases, risk and time preferences, and personality traits in work-related training investments. Training decisions are particularly interesting because, unlike other types of human capital decisions, they are not unilateral—training investments result from a joint decision-making process between workers and firms. This implies that disparity in workers' and firms' expectations regarding training returns is potentially an important explanation for the apparent underinvestment in training that we observe. Developing models that have more realistic behavioral foundations is likely to have large payoffs in explaining why some individuals underinvest in training. In particular, it would be useful to analyze the joint decision process of workers and firms in more detail to shed light on the investment and bargaining strategy of firms facing workers with diverse subjective expectations about the returns to training.

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