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The impact of cultural differences on the success of elite labor migration—Evidence from professional soccer

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Abstract

The literature finds that cultural differences have a negative impact on the success of international labor migration. However, modeling cultural effects requires a variety of individual-level, firm-level and country-level data that are not sufficiently considered in the literature. Precisely, previous migration experiences are not taken into account and the culture effect is not isolated from adaptation effects that occur with any change of employer. We find that an identified culture effect is biased if such data are not considered. To take these aspects into account, we utilize soccer data with its abundance of single player information and leverage the approaches established in Operations Research to model soccer player performance. To this end, we extend a prominent mixed-effects model to fit the case of international migration and find contrary results compared to the literature: cultural differences positively affect employee value in the long term and we identify a distinct and positive culture effect in the short run for switches between industry-leading firms. Finally, we show that our results are not driven by peculiarities of soccer player data by using a reduced model without isolating general adaptation difficulties from cultural differences. In this (too) simple model, in accordance with the literature, the biased negative culture effect emerges.

Keywords Cultural distance · Culture effect · Employee evaluation · International migration · Mixed-effects model

JEL Classification F22 · J61 · Z22

1 Introduction

International migration is an ongoing theme in labor economics (Hatton, 2014) and human resource management (Latukha et al., 2022; Healy & Oikelome, 2007) research. Besides the effects of migration on the countries of origin and destination, the effects of international

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migration on the moving workers' valuation are particularly interesting for the application and hiring decisions of workers and employers.¹

The literature predominantly identifies negative effects of international migration on moving employees' valuation (Hatton, 2014). These effects are attributed to cultural and linguistic differences (Peeters et al., 2021; Åslund et al., 2014; Kónya, 2007), the need to adapt education and labor experience to the destination country (Weiss et al., 2003; Friedberg, 2000), and ethnic discrimination (as observed in Carruthers and Wanamaker (2017), Heywood and Parent (2012)). The literature focusing on asymmetric effects of international migration is an exception to these negative effects: employees moving from "poor" to "rich" countries tend to increase their value because they can better realize their potential in a stronger economy (Yashiv, 2021; Becker & Ferrara, 2019; Hatton, 2014).

Therefore, a prevalent explanation in the literature (Peeters et al., 2021; Åslund et al., 2014; Kónya, 2007) and the public perception (Alesina et al., 2022) attributes the negative effects to workers difficulties to adapt to the culture of the destination country. But it turns out that the literature does not fully isolate the culture effect and lacks consideration of individual-level and firm-level information. First, international migration often involves a change of employer and job, which affects the employee's valuation because he or she must adapt to the new employer or job. Therefore, the culture effect analyzed in the literature is not isolated from other adaptation effects and is biased by effects that can be observed due to any employer change, even if it occurs within the same country or firm. Second, the effects likely vary depending on previous migration experiences. For instance, culture effects differ between employees who frequently migrate or return to a country they already worked in and employees who never migrated before. Third, the literature tends to analyze average effects over time. However, cultural adaptations occur gradually with varying effects depending on the time elapsed since migration. Fourth, considering prior job performance is indispensable because employees with extraordinary job performance records tend to change employers internationally. Contrarily, employees with stable jobs and unexceptional performance records tend to remain in the (domestic) cultural group. Therefore, by neglecting past job performance in the analysis, we would measure a biased culture effect because of mixed culture change and job performance effects.² In this context, the literature considers as employee characteristics at best work experience at the time of migration, educational level and survey-based subjective performance assessments. Fifth, we must consider the asymmetric effects of international migration. To this end, we control with a metric for the difference in the "strength" of the respective labor markets to capture the effects of (in strength) asymmetric job changes.

Our aim is to model the culture effect in such a way that we can consider the aforementioned aspects. We refer to the resulting culture effects as isolated culture effects. To this end, our empirical analysis is based on observations of migrations of professional soccer players between 67 countries.³ We utilize the large body of literature in Operations Research and Sports Economics that model soccer player performance evaluations and extend the prominent mixed effects model of Müller et al. (2017) by cultural effects. Additionally, while

¹ With employee value we refer to the monetary value the labor market is willing to pay for employees. The cited literature mostly utilizes employees' wages. For more details on how we measure the value in the present study, see Sect. 5.

² We especially account for potential effects of selective migration (such as with H-1B visas, see (Peri et al., 2015)). In this context, cultural differences between employee and employer, and performance are highly correlated. Without extensive performance measures, the value development can not be attributed to culture effects.

³ Therefore, our data represents voluntary migration on an elite level.

asymmetric migration effects in the form of moving to more competitive leagues may be present in the data, we analyze symmetric migration effects in Sect. 5.4 by considering only the most competitive leagues with similar strength.

With this approach, we cannot confirm the negative culture effect found in the literature. Contrarily, we generally identify significant positive long-term effects of cultural differences on valuation. Furthermore, a distinct and significant positive effect of culture in the short term is observed when considering only industry-leading companies. This may be due to fewer cultural adjustment difficulties while switching between industry-leading companies because of their enhanced support in overcoming cultural differences (e.g., translators and help in bureaucratic matters). Younger employees are significantly more affected than older employees both in the short and long term. Furthermore, the culture effects are more distinct for internationally unexperienced players who do not return to a country they already worked in. When neglecting some of the aforementioned influences that distort the culture effect, namely usual adaptation effects and past migrations experiences, we identify consistent with the literature a negative short-term overall effect that includes not only cultural influences but usual adaption difficulties of job and position changes. This result confirms that the overall effect measured in the literature is attributable to the lack of individual-level and firm-level information.

Furthermore, companies and employees are interested in the results obtained by considering an isolated culture effect instead of an overall employer change effect. Our findings suggest that neither employees nor companies should restrain from moving and hiring beyond their cultural bubble, because changing an employee's culture promises to increase value. It is particularly relevant because the results in the literature are based on a biased culture effect and incorrectly suggest that cultural differences negatively impact employee value.

The remainder of this article is organized as follows. Section 2 provides an overview of the related literature. Section 3 describes in detail the measurement of cultural differences between two countries. The research hypotheses regarding adaptation effects of job changes and isolated culture effects on the value of employees are derived in Sect. 4. Section 5 presents the empirical study including the description of the dataset and the results. At the end of the section, we contrast the results with the situation in which adaption and culture effects are not isolated, as in the literature. Besides, some robustness analyses supplement this study. Finally, Sect. 6 summarizes the results and presents implications for employees and firms.

2 Related literature

This article is connected with four additional literature strands besides the topic of international migration covered in Sect. 1.

First, the present article is associated with literature analyzing the effect of intercultural sensitivity on employee performance. Intercultural sensitivity is “an individual's ability to develop a positive emotion towards understanding and appreciating cultural differences that promotes appropriate and effective behavior in intercultural communication” (Chen & Starosta, 2000, p. 409) and the “sensitivity to the importance of cultural difference and to the points of view of people in other cultures” (Bhawuk & Brislin, 1992, p. 414). Literature frequently identifies a significant positive impact of intercultural sensitivity on employee performance. Sizoo et al. (2005) use a survey to find that employees who work in cross-cultural service encounters and have high intercultural sensitivity contribute significantly more to the revenue than employees with low intercultural sensitivity. Mol et al. (2005) conduct a meta-

analysis to predict expatriate job performance based on de Cueto (2004), Schneider (1997), Stierle et al. (2002) and Volmer and Staufenbiel (2003), who analyzed the cultural sensitivity dimension in detail. Besides the so called big five predictors—extraversion, emotional stability, agreeableness, conscientiousness and openness—they conclude that intercultural sensitivity “in particular showed a relatively strong and positive relationship with job performance” (p. 613). Furthermore, Matkin and Barbuto (2012) identify that leaders with a high level of intercultural sensitivity are rated significantly higher by followers in terms of the leader-follower relationship.

Basically, it should be noted that this strand of literature examines the impact of a positive intercultural attitude on employee performance, where intercultural attitudes are determined by self-assessment through surveys. Thus, respondents must have diverse attitudes towards foreign cultures without necessarily being from different cultures. Contrarily, the present study addresses how genuine cultural differences between the employer’s country and employee’s country of origin affect employee evaluation, measured using an objective value indicator.

A second strand of literature focuses on the effect of changing culture on employee happiness over time. This approach goes back to Lysgaard (1955) who analyzes the happiness of students during a student exchange program. In this study, he identifies a “happiness U-Curve”: At the beginning of the exchange program, happiness is high, which is called the honeymoon effect. Subsequently, happiness decreases due to a culture shock and increases after the students adapt to the new culture. However, Ward et al. (1998) can not empirically confirm the effect and instead conclude that the need for adaptation is strongest at the beginning and shrinking afterwards. Further, Boswell et al. (2005, 2009) argue that satisfaction after a job change depends on moderating factors, such as satisfaction with the previous job and the reasons for changing it.

Since satisfaction or happiness and adaptation difficulties can be relevant characteristics of employee performance, these studies demonstrate that cultural differences can have both short-term and long-term effects on employee performance. This is considered in the present empirical study. In particular, we can measure in which phase a performance-enhancing honeymoon effect dominates as well as when performance-lowering adjustment difficulties prevail.

The third strand of literature deals with approaches to measure features of national culture. In this context, the frequently cited cultural model of Hofstede (1980) is based on six characteristics of national culture and is relatively stable over time (Beugelsdijk et al., 2015). Therefore, the model is the most commonly used cultural model in the literature to analyze the impact of diverse cultural characteristics. It is particularly important for economic issues. For example, it can be shown that the cultural dimensions of the model explain “more than half of the cross-country variance in economic growth” (Franke et al., 1991, p. 165). The relevance is supported by a study of Pizam et al. (1997), who conclude that the national culture of a hotel manager in the sense of Hofstede has a greater effect on his or her behavior than the culture of the hotel industry.

For example, Chui et al. (2010) find that the so-called “individualism dimension” asserted by the Hofstede model⁴ is associated with trading volume and volatility in momentum strategies. Moreover, on the basis of the individualism dimension, Hartinger et al. (2021) show that migrants from countries with highly individualistic cultures perform better on the job market compared to migrants of cultures with low individualism. However, the authors do not control for the education level, which is highly correlated with the individualism of the culture.

⁴ Section 3 details the various dimensions of the Hofstede model.

Based on the “power distance dimension” of the Hofstede model, Wang and Guan (2018) argue that employees perform better under authoritarian leadership. However, these studies focus on individual dimensions of culture and their effects. The present study’s objective is to examine the impact of a different cultural background (in its entirety) on the performance of an internationally migrated employee.

All six culture dimensions⁵ are considered in Peeters et al. (2021) to show the negative impact of cultural distance between a football manager’s home country culture and the culture of the host country on the ability to transfer managerial knowledge. As previously stated concerning the honeymoon effect, both short-term and long-term effects should be relevant. However, the measured effect can be regarded as an average effect because the authors did not consider these differences. The managers’ age was also not considered. In this context, it can be assumed that younger managers are confronted with fewer cultural adaptation difficulties than older managers. Finally, the authors do not consider that domestic club changes can also lead to adjustment difficulties, because such changes are not represented in the model. Against this background, the present study aims to isolate the short- and long-term effects and to account for age effects and for any firm changes.

The last literature strand discusses the effect of cultural diversity on firm or team performance. Kahane et al. (2013) and Parshakov et al. (2018) find that culturally diverse teams perform better. Lazear (1999) argues that cultural differences are associated with a cost in global firms, but that this cost is overcome by other advantages that are present in diverse teams. One of these advantages can be knowledge that is not shared between cultures. Békés and Gianmarco (2022) find homophily based on culture (i.e., culturally close employees work better together). Since homophily leads to suboptimal working patterns, this should negatively affect team performance. Especially for an employee who belongs to a cultural minority, it might be difficult to integrate into the team.

It is comprehensible that a company may profit from a culturally diverse work force. The willingness and financial and organizational ability to employ across country barriers is a distinct competitive advantage for firms. But Lazear (1999) shows in his study that culture effects are complex in nature and need to be modeled thoroughly to avoid contamination by correlated effects. Furthermore, the competitive advantages for a culturally diverse firm are not easily transferred to the individual. For example, the internationally moving employee may be especially affected by homophily based on culture. Therefore, it is important to consider the individual perspective separately from team success. Additionally, it is essential to appropriately model the adaptation process due to international job change and to consider short- and long-term effects.

In summary, the present study’s objective is to empirically analyze the impact of cultural differences between the employer’s and the employee’s country of origin on employee evaluation. Thus, a meaningful and explicitly measurable monetary indicator is to be used as the basis for evaluating employees. Cultural differences will be measured holistically based on Hofstede’s six dimensions of culture. The effects of cultural differences will be divided into short- and long-term effects while considering the age differences of employees and isolating culture effects from employer and position change effects.

⁵ Further, the study of Dikova and Sahib (2013) is also based on a holistic view of culture. The authors utilize the so-called GLOBE project culture measures as an alternative to Hofstede’s model and find a positive effect of cultural distance between the acquiring and the acquired company on the success of a cross-border acquisition success. Consequently, the focus is on the cultural differences between the trading company and the trading object which implies a different research question than the one in the present study.

3 Measuring differences in national culture

In order to analyze culture effects, we first define a measure to calculate cultural differences between two countries. To this end, we define the relevant cultural characteristics, the extent of which must be determined for the different countries. We measure the cultural characteristics using the approach proposed in Hofstede (1980) as several previous economic studies have implemented it (e.g. in Chui et al. (2010) and Wang and Guan (2018)). Each country is assigned a value between 0 and 100 for an initial set of four cultural dimensions based on surveys conducted between 1967 and 1973 with 88,000 IBM employees in 72 countries. These were supplemented by Hofstede and Bond (1988) and Hofstede et al. (2010). The resulting dataset comprises six dimensions, which can be described as follows (e.g. Beugelsdijk and Welzel (2018))⁶:

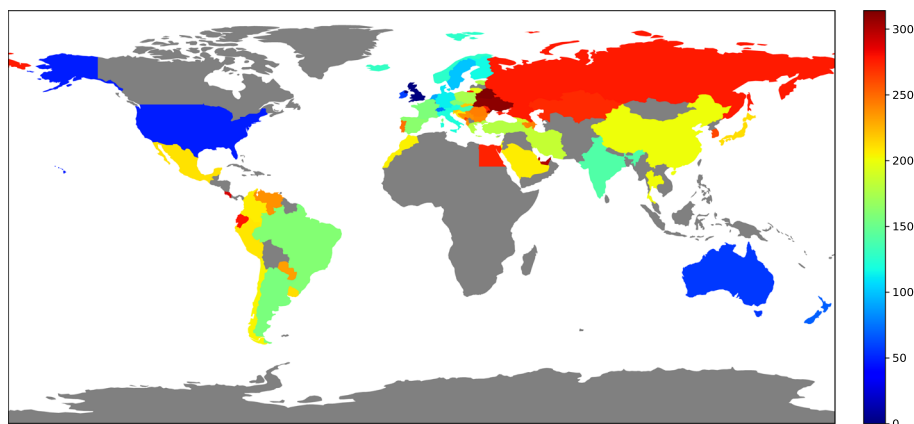
- The *Power Distance Index (PDI)* measures the extent people accept unequal power distribution in a country. A high value indicates the acceptance of strict hierarchical order and a low value characterizes societies desiring flat hierarchies.
- The *Uncertainty Avoidance Index (UAI)* reflects the need for organized and predictable circumstances. A high value indicates low tolerance for uncertainty and a desire to limit it using strict rules and regulations. Cultures with low UAI are more relaxed toward uncertainty, applying fewer strict rules and regulations.
- *Individualism (INV)* represents the extent to which an individual's goals depend on social groups. Individuals in cultures with high INV are weakly bound to social groups, essentially pursuing their own goals. Cultures with low INV display collectivism, which prioritizes group goals.
- *Masculinity (MAS)* characterizes society's attitude toward values, achievement, and success. Cultures with high MAS prefer assertiveness and focus on material achievements and (monetary) wealth. Contrarily, cultures with low MAS (so-called femininity cultures) aim at modesty, care, and quality of life.
- *Long-Term Orientation (LTO)* measures how society perceives its time horizon. High-value societies are foresighted, promoting long-term investments and modern education to become future-ready. Low LTO societies are past- and present-oriented, valuing time-honored traditions and social obligations as they are suspicious of societal change.
- *Indulgence (IND)* characterizes the extent to which individuals try to realize their desires and impulses based on societal expectations. Cultures with a high IND allow individuals to fulfill their needs without social constraints, whereas those with a low IND have regulations and social norms that suppress the fulfillment of needs.

To determine the cultural differences between two countries, let $\mathbf{CD}_c = (\mathbf{CD}_{1c}, \dots, \mathbf{CD}_{6c})$ denote the vector of the six cultural characteristics of a country $c \in C$, where C stands for the set of considered countries. Based on the 1-norm, the cultural difference between two countries $c_1, c_2 \in C$ can be defined as⁷

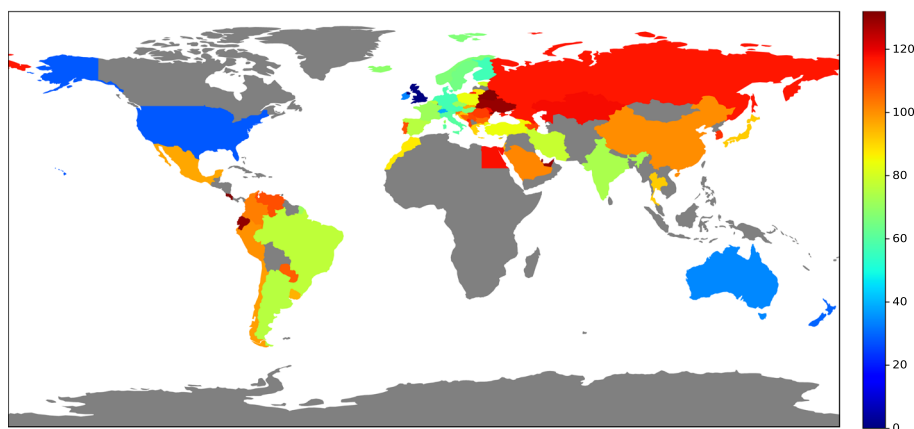
$$|\Delta \text{Culture}_{c_1 c_2}| := \|\mathbf{CD}_{c_1} - \mathbf{CD}_{c_2}\|_1 = \sum_{i=1}^6 |\mathbf{CD}_{i c_1} - \mathbf{CD}_{i c_2}|. \quad (1)$$

⁶ Beugelsdijk et al. (2015) argue that the dimensions are “generally stable” over time relative to other countries.

⁷ Different measures for cultural distance are utilized in the literature including the 1-Norm (Jarjabka et al., 2024) and approaches that utilize the 2-Norm (Peeters et al., 2021). We implemented both approaches and found no differences that were significant with respect to our hypotheses. A visual comparison of both approaches can be found in Fig. 1.



(a) Absolute cultural differences based on the 1-Norm.



(b) Cultural differences based on the 2-Norm.

Fig. 1 Displayed are the cultural differences between the United Kingdom and every other country in the data. **a** depicts cultural differences based on the 1-Norm as explained in Sect. 3. **b** shows cultural differences based on the 2-Norm

We depict the cultural differences between the United Kingdom and all other countries in our data in Fig. 1. In Fig. 1a absolute differences based on the 1-Norm and Eq. (1) are shown. Additionally, we illustrate cultural differences based on the 2-Norm $\|CD_{c_1} - CD_{c_2}\|_2$ in Fig. 1b. On the one hand, we find in both figures a high cultural similarity between the United Kingdom, the United States and Australia. This is expected because of their linguistic similarities and membership in the Commonwealth.⁸ On the other hand, we observe high cultural differences between the United Kingdom and Russia and Eastern Europe. Especially Russia and the United Kingdom or the United States respectively are “traditionally... thought to differ along the allocentric-idiocentric dimension” (Lynch et al., 2009, p. 290).

⁸ The relationship between culture and language has been studied, for example, by Jiang (2000) and plays an important role in Grinblatt and Keloharju (2001).

4 Hypotheses

Based on our measure for cultural difference between countries, we present here the hypotheses we test in our empirical Sect. 5. We focus on how cultural differences between the employer's and the employee's country of origin affect employee value development after a job change. With value we refer to the monetary value the labor market is willing to pay for employees.⁹ We expect two primary reasons to cause adaptation difficulties in this scenario: First is the challenge of adapting to the new job with a different employer, potentially a different position, new coworkers and an unfamiliar social environment while second is a new culture. Therefore, the total effect of an international job change consists of the effect of the job and position change itself besides the culture effect. We differentiate between these two effects for our hypotheses.

We begin with the effect of the employment change. The change makes an employee adapt to a new social environment, new coworkers and another firm's philosophy and work culture. Initially, the employees must adapt to these altered circumstances. We expect this to impact their work performance, hence, the value. A job change should not change the employee's value (on average) once the adaptation is complete. Similar reasoning applies to position changes because the employees first have to adapt to their new job requirements:

H1: *Employment and position changes decrease the value of an employee in the short term, but have no long-term impact.*

The loss of their former social environments may specifically impact young employees. It is supported by Jennings and Stoker (2004), who show that stability of social trust is higher in late compared to early adolescence. Social trust is to expect that another person or institution behaves in a consistent and competent way (the definition is loosely based on Verducci and Schröer (2010)). Therefore, social trust in the firm and coworkers is likely more affected for younger employees as a consequence of a job change in comparison to older employees. Kuroki (2011) finds that social trust impacts the well-being of an individual (which in turn impacts performance and value). Therefore, young employees may especially be affected by job changes. However, no impact is expected after adapting to the new firm:

H2: *In the short term, the values of young employees decrease more than those of older employees after a job change.*

We expect the same for a job change across national borders. However, culture effects require consideration. Based on the employer and position effects, isolated culture effects may positively affect employee value. For example, exposure to different cultures may increase intercultural sensitivity, which can improve job performance (Sizoo et al., 2005).

H3: *Besides the general effect of a job change (H1–H2), an international job change increases the employee value in the long term with the degree of cultural difference between the countries of the old and new employers.*

Arnett (2000) argues that the phase between ages 18 and 25 is distinct for personality development. McAdams and Olson (2010) emphasize the importance of culture in this phase. Therefore, we expect that exposure to diverse cultures will influence younger employees more than older ones, as the former are developing their personality and have a more flexible value system.

⁹ For more details on how we measure the value, see Sect. 5.

H4: *Besides the general effect of a job change (H1–H2), an international job change increases the long-term values of young employees more than those of older employees with the degree of cultural difference between the countries of the new and old employers.*

Ward et al. (1998) find short-term adaptation needs specific to international migration which oppose the positive honeymoon effect on happiness according to Lysgaard (1955). Therefore, we expect the short-run honeymoon effect to predominate if the need for adaptation is low. The adaptation need should be less while observing industry-leading firms because these firms likely have mitigation methods to reduce adaptation needs:

H5: *Besides the general effect of a job change (H1–H2), a job change across national borders between industry-leading firms increases the employee's value in the short term.*

Furthermore, we expect culture effects to depend on past migration experiences. First, the culture effect should be lower for employees who internationally migrated several times in the past, since for them the added value of a culture change in international migration has already been internalized:

H6: *The culture effects in (H3)–(H4) decrease with the number of different countries in which an employee worked before the international job change.*

Second, an employee that returns to a country he already worked in should experience no or a reduced culture effect:

H7: *The culture effects in (H3)–(H4) decrease when an employee internationally migrates to a country he or she already worked in the past.*

5 The empirical study

5.1 The data

In the empirical section, we test our hypotheses by analyzing the short- and long-term effects of an (international) employer change on an employee's value. In particular, we examine the influence of cultural differences on value by isolating the effect from general effects associated with employer and position changes. Therefore, the dataset must satisfy four key requirements.

- (a) We need a reliable database of worker values over time to measure value changes when workers switch employers or stay with them.
- (b) The dataset must include a sufficient number of domestic and international employer changes in different directions to be able to infer the impact of cultural differences with statistical significance.
- (c) Several performance variables must be included to prevent other effects from superimposing the culture effect and avoiding an omitted-variable bias. For example, high-performing employees may receive more (international) job offers from prestigious firms.
- (d) We need information about the migration history of each employee to consider their international experience and whether they return to a country they already worked in.

We use a dataset of international professional soccer players to satisfy these requirements. The advantage of sports data is the availability of various long-term individual-level performance data and extensive career information. Using sports data to study economic issues is not

new. Sports data are frequently used to study economic relationships (Krumer et al., 2022; Graczyk et al., 2021; Peeters et al., 2021; Iqbal & Krumer, 2019; Krause & Szymanski, 2019; Geyer-Klingenberg et al., 2018; Lichter et al., 2017) and literature has extensively covered the applicability of sports data to labor market issues (Kahn, 2000). Palacios-Huerta (2023) provides an overview of studies that test economic hypotheses with sports data. In addition, sports data are commonly utilized in Operations Research (Csató et al., 2024; Badiella et al., 2022; Ficcadenti et al., 2022; Goller & Krumer, 2020; Kharrat et al., 2020; Müller et al., 2017).

First, it is necessary to determine which measure we should use as the value of a player (employee). Specifically, we adopt a market-based approach that establishes the player's value as the monetary value that the soccer player market is willing to pay for that player. Unfortunately, the required market assessments of player values are not continuously available. Therefore, the literature employs alternative value measures: salaries and transfer fees. Bryson et al. (2013) and He et al. (2015) show that these measures are highly correlated. However, transfer fees and salaries are not useful value measures for the present study because transfer fees are not realized until the completion of the transfer and salaries are updated only on signing a new contract. Consequently, neither measure reflects changes in market valuation during the contract period. Furthermore, contracts containing all price-relevant clauses are usually not publicly available in full, resulting in partially reported transfer sums and salaries. Moreover, the transfer fee is not suitable for players who have never sought a transfer in their careers. Consequently, both transfer fees and wages introduce a sample selection bias that is not present when utilizing crowd-sourced market values since they are updated each round.

Coates and Parshakov (2022) argue that while the correlation between transfer fees and crowd-sourced market values is high, that the latter overestimate transfer fees. When we exclude free transfers from our dataset (those are due to expiring contracts and do not represent a fair market value), we observe a correlation coefficient of 0.81 and the crowd-sourced market values underestimate transfer fees by about 4%. Due to the high correlation, the small differences between crowd-sourced market values and transfer fees and the avoidance of a sample selection bias when using the crowd-sourced market values, these market values appear reasonable. Contrarily, expert estimated player values are also available during contract periods, but only for selected players. Thus, using crowd-sourced market values represents an alternative, whereby these values are highly correlated with expert estimates (Franck & Nüesch, 2012), are updated regularly and are available for almost all professional soccer players. Consequently, the most popular measure of player value in the recent literature is crowd-sourced market value. Therefore, we use crowd-sourced market values to measure soccer players' value. Specifically, we use market value data from *transfermarkt.com* because it is frequently used in the literature on soccer player valuation. In the following, we will refer to the crowd-sourced market values as market or player values.

We have already argued that performance indicators must be considered to measure the influence of the culture component on the players' market value. For this purpose, we collected data on soccer games played between the 2015/2016 and 2020/2021 seasons, considering all players who played in the first division of one of the following ten countries in any of the aforementioned seasons: England, Spain, Italy, Germany, France, Portugal, Netherlands, Austria, Russia and Switzerland. Hereinafter these leagues are referred to as top leagues. Since the players of these top leagues also played in other leagues (hereinafter, minor leagues), their performances in these minor leagues must be considered, resulting in the consideration of competitions in 99 countries. Players performance statistics and corresponding match information were gathered from Wyscout. Wyscout offers a scouting platform for clubs,

scouts and players. It is widely used by over 800 professional clubs including well-known teams such as FC Barcelona, Bayern München, Paris Saint-Germain and Arsenal FC.¹⁰ We collected for every match and every player that fulfills the aforementioned requirements performance statistics on match level for every game in the competitions that are available on Wyscout. In summary, our dataset contains 431 competitions in 99 countries including domestic league and cup games, friendlies, and international competitions. Since we define each observation as one player and one match, the total dataset consists of 1,365,062 game-player combinations and 11,098 players. Initially, we restrict our data to national leagues, corresponding to 148 competitions in 67 countries. The advantage of national league games is that every player participates in a national league system. Thus, the resulting dataset consists of 1,008,961 game-player combinations and 11,098 players.

Further, explaining how a player transfer is accounted for in the dataset is critical because of its decisive relevance in measuring cultural impact. Therefore, we prepare the resulting dataset based on the transfer periods. Players can be transferred during these periods. We divide the season into two halves (first and second round) to identify the transfer periods. At the beginning of the rounds there are time windows for transfers. To measure the impact of a transfer on player performance, only active players who played at least 90 min in each of the two consecutive rounds are considered. For such a player and a given round, the value development until the following round can be measured. Additionally, we exclude goalkeepers from the sample, as the relevant performance indicators differ from those of outfield players. Finally, we should closely examine the performance data of a player who switched from club A to club B during the transfer period of a round. For this player, only the performance data of club B for the respective round is considered and the performance data of club A during the (short) transfer period is neglected. This is necessary so that a clear impact of a club change between the previous round and the transfer round can be measured. The final dataset comprises 63,983 observations and 9,391 players. One observation refers to one player in one round.

In addition to the performance statistics we gathered transfer and market value information for each player over their whole career from transfermarkt.com. For all players, the data includes all the teams they played for and the corresponding transfer fees and market values.

We follow Müller et al. (2017) for variable selection because of the considerable amount of information in the Wyscout dataset. The authors analyze the performance indicators of soccer player market value, selecting their variables based on the results of 19 studies, including Brandes and Franck (2012), Franck and Nüesch (2012), and Bryson et al. (2013). Importantly, the studies not only utilize the performance statistics to analyze the actual performance but are also able to determine players' talent. Therefore, by correcting for the actual performance, in addition to the inclusion of player fixed effects, we correct for future performance expectations. Specifically, the authors consider¹¹ *Age*, *Height* and the ability to shoot with both feet equally well (*Footedness* = 1) or not (*Footedness* = 0) as the player characteristics. Furthermore, the relevant seasonal performance variables are *Minutes played*, *Goals*, *Assists*, *Yellow cards* and *Red cards*. The considered variables measured per game are *Passes*, share of *Successful passes*, *Dribbles*, share of *Successful dribbles*, *Aerial duels*, share of *Successful aerial duels*, *Tackles*, share of *Successful tackles*, *Interceptions*, *Clearances* and *Fouls*. Since the variables indicating the contribution to a successful attack are primarily limited to goals, assists, dribbles and passes, we also include *Second assists* (defined as the pass to a player

¹⁰ This is based on a self-disclosure from Wyscout, which can be found here: wyscout.com/customers.

¹¹ Basically, we assume that the following variable names are self-explanatory. For the exact definition see dataglossary.wyscout.com/.

who made the assist) and *Progressive runs* (defined as a player's continuous run with the ball ending significantly closer to the opponents' goal) to consider the contribution of more players in a successful attack.

In addition to the performance indicators in the national leagues, we include information about international club games. Since one observation includes the performance of one player in one round of a season, we add additional performance variables for each considered competition. Those are the largest international club competitions on four continents and the two largest European competitions since they are over-represented in our data. Specifically, these include the European UEFA Champions League and the UEFA Europa League, the South American Copa Libertadores, the African CAF Champions League, the Asian AFC Champions League and the North American CONCACAF Champions Cup. Primarily, we focus on the played minutes in those competitions since it is a good measure for success in knock-out competitions. On the European subsample, we consider additional performance measures with large effect sizes.

We can now explain how we measure culture effects in our model. Based on Hofstede's cultural dimension approach described in Sect. 3 we consider cultural differences between the country of the league in the current round and the country of the league in the following round. If player i is transferred from a club in the domestic league in country c_1 to a club in the domestic league in country c_2 at the beginning of the next round, then the cultural difference is measured using Eq. (1):¹²

$$|\Delta \text{Culture}_{i,r}| := |\Delta \text{Culture}_{c_1,c_2}| = \|\mathbf{CD}_{c_1} - \mathbf{CD}_{c_2}\|_1 \quad (2)$$

\mathbf{CD}_{c_1} and \mathbf{CD}_{c_2} refer to Hofstede's cultural dimension vector of countries c_1 and c_2 and r refers to the considered round.

We can derive culture effects by including the discussed variables as independent variables in an appropriate empirical model (as described in Sect. 5.2). The derived culture effect is the effect of a job change based on the degree of cultural difference between the concerned countries. But in addition, since the effects caused by position or employer changes skew the culture effect, we want to isolate it from them. And we want to consider different migration experiences since the culture effect likely depends on international experience and whether they have already worked in the country. Therefore, we include a dummy variable *Position change* equal to one if the current round's position differs from that in the following round. To identify a transfer, we consider the dummy variable *Transfer*, which indicates whether a player has been transferred (domestically or internationally) at the beginning of the next round (*Transfer* = 1) or not (*Transfer* = 0). To determine the international experience of the moving player, we define a variable *International experience* that indicates the number of countries a player was employed in prior to the move. In addition, we introduce a variable *Return* that indicates whether the player migrates to a country where he already played.

We are interested in the influence of all variables (in particular culture, job and position change, the *International experience* and the *Return* variables) on the player's market value in the short and long term. Against this background, we choose the market value increase between the future round and current rounds as the dependent variable, but it requires a decision on using absolute or relative market value increase. The absolute market value increases display an approximately normal distribution except for a slight overrepresentation of no value changes (see Fig. 3d in the appendix), whereas relative increases exhibit a skewed distribution (see Fig. 3c). Therefore, absolute market value increases fulfill desired distribution assumptions. Moreover, the relationship between relative market value increases and current

¹² The data is available at <https://www.hofstede-insights.com/country-comparison-tool>.

market value is rather extreme, with very low market values accompanied by extremely high market value increases (see Fig. 3a). Contrarily, absolute market value increases and current market values display a linear relationship (see Fig. 3b). Thus, considering the current market value (represented as *Value*) as an additional independent variable appears promising for modelling absolute market value increases (as a dependent variable) using a simple linear relationship. Summarized, we choose absolute market value change as the dependent variable because of its superior modeling properties.

To reflect the short- and long-term effects, we consider five time periods (1–5 rounds) for the dependent variable. Therefore, the five dependent variables are as follows:

$$\Delta \text{Value}_j := \text{Value}_{r_j} - \text{Value}_{r_0}, \quad (3)$$

where Value_{r_0} is the current market value (of round r_0) and Value_{r_j} is the market value of the j th round following the current round ($j = 1, \dots, 5$). If players retire, the market value for subsequent rounds is set to zero.¹³ We collected time-series data on the players' market values up to March 2022. Therefore, a higher number j of the considered time periods leads to a reduced number of observations ΔValue_j such that the latter can still be calculated. Table 1 presents the descriptive statistics. Unless specified otherwise, the performance variables always refer to the national leagues. Here, the performance variables are presented as the total number in the observed round for easier interpretation. To reduce the correlation, the performance variables are standardized in subsequent regressions (except for *Minutes played* and the shares of successful actions) to 90 played minutes in a round.

The players in our dataset have a median age of approximately 25 years and a median market value of 1 million euros. The median height and weight are 1.82 m and 75 kg. As an example of the other performance variables, the median number of passes are 306 per round. The most passes for a player in a round are 2165. The median value of the share of successful passes is 80%. A pass is considered successful if it reaches its destination. A large number of minutes played in a single round (2891 min) is also noteworthy. It is because extra time does not cap the played minutes at 90 per game. Therefore, we regularly have games lasting at least 95 min and some beyond 100 min. The league rhythm of predominantly northern leagues is another cause as games are primarily played in warmer months due to bad weather conditions during some winter months. We aggregate our data by considering transfer periods rather than dividing each league's season into two equal halves. Therefore, it causes an extreme case of up to 29 games in a single round. We do not consider this a problem, because we standardize the performance variables per 90 played minutes in our regression while adding league and round random effects.¹⁴

Table 7 records that correlations between the variables are generally low with some comprehensible exceptions. We observe a high positive correlation between the weight and height of a player (to be precise, the correlation is 0.78). Additionally, the number of passes per game is correlated with the share of successful passes (0.62) and we observe a positive correlation between the number of dribblings and progressive runs per game (0.61). Players participating in UEFA Champions League games have a higher market value (0.51). Most of the weaker correlations can be explained with positional differences. For example, a striker will generally score more goals but is less involved in defensive actions.

¹³ We have also chosen alternatives (such as exclusion of the respective players) to treat retirement and achieve similar results. In our case, a market value of zero seems appropriate, since retired players do not represent any value for the former club.

¹⁴ If we only consider top leagues (see the robustness checks in Sect. 5.4), the maximum played minutes per round are 2129 in the Italian first division, which corresponds to 21 games out of 38 games in a season.

Table 1 Descriptive statistics of the data with 63,983 observations (unless specified otherwise)

Variable	Mean	St. Dev.	Min	25%-Pctl	Median	75%-Pctl	Max
<i>Player characteristics</i>							
Age	25.52	4.31	15.51	22.14	25.15	28.54	43.17
Footedness	0.05	0.22	0	0	0	0	1
Height	1.81	0.06	1.60	1.77	1.82	1.86	2.03
International experience	2.01	1.27	1	1	2	3	11
Weight	75.51	6.62	53.00	71.00	75.00	80.00	104.00
<i>Performance variables</i>							
Aerial duels	39.90	37.26	0	15	30	53	638
Successful aerial duels	0.43	0.18	0.00	0.32	0.44	0.56	1.00
Assists	0.82	1.27	0	0	0	1	15
Dribbles	28.08	29.80	0	7	18	39	404
Successful dribbles	0.52	0.21	0.00	0.43	0.52	0.62	1.00
Fouls	12.70	8.92	0	6	11	18	88
Goals	1.42	2.24	0	0	1	2	25
Interceptions	39.79	32.02	0	14	31	58	246
Minutes played	883.29	487.42	91	477	860	1,257	2891
Minutes played (AFC CL)	1.45	27.24	0	0	0	0	893
Minutes played (CAF CL)	0.03	3.48	0	0	0	0	657
Minutes played (CONCACAF CC)	0.34	10.80	0	0	0	0	731
Minutes played (Libertadores)	1.97	31.32	0	0	0	0	1,341
Minutes played (UEFA CL)	17.74	80.33	0	0	0	0	730
Minutes played (UEFA EL)	20.82	86.10	0	0	0	0	854
Passes	357.75	253.91	4	154	306	513	2,165

Table 1 continued

Variable	Mean	St. Dev.	Min	25%-Pctl	Median	75%-Pctl	Max
Successful passes	0.79	0.08	0.26	0.74	0.80	0.85	1.00
Progressive runs	10.75	11.00	0	3	7	15	123
Red cards	0.09	0.31	0	0	0	0	3
Second assists	0.44	0.78	0	0	0	1	9
Sliding tackles	4.85	5.45	0	1	3	7	68
Successful sliding tackles	0.37	0.32	0.00	0.00	0.38	0.57	1.00
Yellow cards	1.82	1.69	0	0	1	3	13
<i>Change and value variables</i>							
ΔCulture	13.32	42.20	0	0	0	0	323
ΔValue_1	0.26	2.87	−60.00	−0.10	0.00	0.15	85.00
ΔValue_2	0.42	4.69	−90.00	−0.30	0.00	0.40	115.00
ΔValue_3 (58,837 obs.)	0.52	6.09	−100.00	−0.50	0.00	0.50	165.00
ΔValue_4 (53,072 obs.)	0.56	7.18	−110.00	−0.55	0.00	0.50	190.00
ΔValue_5 (46,818 obs.)	0.53	7.88	−132.00	−0.70	−0.05	0.50	198.50
Position change	0.34	0.47	0	0	0	1	1
Return	0.04	0.20	0	0	0	0	1
Transfer	0.25	0.43	0	0	0	0	1
Value	4.32	10.21	0.00	0.40	1.00	3.50	200.00

All performance variables refer to the national leagues (unless specified otherwise) and are measured as an absolute number in the observed round with the exception of *Successful aerial duels*, *Successful dribbles*, *Successful passes* and *Successful sliding tackles*. Those are measured as a share of successful actions (for example passes that were received by a teammate) out of all actions (for example all passes) in a particular round. The market values and market value increases are given in million euros, *Weight* in kilogram, *Height* in meters and *Age* in years. *Position change* and *Transfer* are dummy variables indicating different positions in the current and following round and a transfer at the beginning of the following round. *International experience* specifies the number of countries in which a player was employed in the past. *Return* denotes an international transfer back to a country a player was already employed in and *Footedness* indicates whether a player can shoot with both feet equally well. To reduce the correlation, the performance variables are standardized to 90 played minutes in the following regressions (except *Minutes played*)

5.2 The empirical model

The next step includes choosing an appropriate empirical model to measure the unbiased isolated culture effect. We observe that the dataset has longitudinal and hierarchical data (a player works for a team registered in a national league) spanning multiple rounds. The residuals of a linear regression model are not expected to be independent because of these characteristics. Therefore, we need to control for unobserved effects, which in our case are time dependent. For example, the market value development of players may differ based on innate talent. The variation in market value development for a single player across rounds is likely smaller than that between different players. Furthermore, the possibility of translating talent into value depends on their team. A talented offensive player might excel at an offensive team, but stagnate in a team with a defensive philosophy. Consequently, the variation in market value growth for a player in the same team across rounds might be smaller than that for the same player in different teams. Therefore, we expect that the influence of a player's talent on market value growth also depends on the player's team. Moreover, we expect the following variables to impact market value growth: league, position, round, team in the current round and team in the following round. All these characteristics are time-dependent as the player might switch teams and positions over time. Therefore, a simple transformation of the empirical model does not eliminate them. Instead, we employ a hierarchical linear model as proposed by Müller et al. (2017) in the context of soccer player performance evaluations, also known as a multilevel or mixed-effects model.

We differentiate between fixed and random effects in a hierarchical linear model. Fixed effects are used to test our hypotheses and control for player performance, characteristics and market value. Specifically, we consider as fixed effects player characteristics $PIChar$, player performance variables for the current round $PIPerf$, and change and value variables $PIChgeVal$.¹⁵ Furthermore, we include the interaction terms $Transfer \times Age$, $Transfer \times Minutes$ and $|\Delta Culture| \times Age$. Additionally, to consider the effects of the variables *International experience* and *Return* on $|\Delta Culture|$, we add the interaction effects $|\Delta Culture| \times International\ experience$, $|\Delta Culture| \times Return$, $|\Delta Culture| \times International\ experience \times Age$ and $|\Delta Culture| \times Return \times Age$. The three-way interaction effects are necessary as we expect the culture effect to depend on age. The transfer interaction terms are appropriate because we expect a transfer to be affected by the player's age (as argued in Sect. 4) and the minutes played in the round preceding the transfer. The latter's primary cause are saturation effects: A player with limited playing time before the transfer can only increase it at a new club (or stagnate). A player who played every game can only decrease this time (or stagnate). We aggregate all the variables into a single variable vector $X = (X_{i,r})_{i,r}$ for all players i and all rounds r :

$$X_{i,r} = (PIChar_{i,r}, PIPerf_{i,r}, PIChgeVal_{i,r}, (Trf\ interact.)_{i,r}, (|\Delta Cult| \ interact.)_{i,r})'. \quad (4)$$

Thus, fixed effects are represented by $\beta_0 + \beta' X_{i,r}$, i.e. by an intercept β_0 and a coefficient vector β . However, we use a random intercept model as a special hierarchical model to counteract the possible dependence of market value growth on observations of players of a specific subgroup. Specifically, we consider cluster-specific intercepts (random effects) for six possibilities of partitioning the dataset: We include all subsets (1) for given player-team-league combinations ($I(T(L))$), (2) for given team-league combinations ($T(L)$), (3) for given leagues (L), (4) for given positions (P), (5) for given rounds (R), and (6) for the club

¹⁵ Player characteristics, player performance variables as well as change and value variables are listed in Table 1.

in the next round (N). Through the random effects, we capture the dependence of market value growth on the corresponding subsets of observations. To estimate unbiased fixed effect coefficients, the random intercept model returns random effects u with a mean of zero. It results in the following equation of the regression model with the dependent variable Y for all players i and all rounds r :

$$Y_{i,r} = \beta_0 + \beta' X_{i,r} + u_{i,t(i,r),l(i,r)}^{I(T(L))} + u_{t(i,r),l(i,r)}^{T(L)} + u_{l(i,r)}^L + u_{p(i,r)}^P + u_{r(i,r)}^R + u_{n(i,r)}^N + \varepsilon_{i,r}, \quad (5)$$

where $\varepsilon_{i,r}$ stands for the residual.

5.3 Empirical results

To test our hypotheses on the isolated culture and job change effects we employ five random intercept regressions on our dataset, which differ only in the chosen dependent variable. Model (j) includes the market value change between the end of the current round and after j rounds ($j = 1, 2, \dots, 5$). Initially, we analyzed the entire dataset including all employment relationships and all cultural changes. Notably, the dataset only includes players who have played in a top league since the 2015/2016 season.¹⁶ Thus, transfers from a minor to a top league may cause particular adaptation difficulties for the transferred players or induce effects related to the large discrepancy in strength of minor and top leagues. We address this issue by performing robustness checks in Sect. 5.4. The goodness-of-fit of the regressions is compared using marginal and conditional R^2 for mixed-effects models based on Nakagawa et al. (2017). The marginal R^2 measures the proportion of explained variance by the independent variables $X_{i,r}$ of the total variance. The conditional R^2 considers not only the independent variables but additionally the variance explained by the random effects. We observe that both types of R^2 increase as the number of considered rounds increases. It suggests increased noise during a short-term view. However, noise is reduced during long term developments.

Table 2 presents the regression results for the entire dataset. Notably, the market value observations are only up to March 2022. Thus, to measure the effects over the remaining three, four, and five rounds, the number of observations of models (3), (4), and (5) must be reduced (compared to models (1) and (2)). However, the number of observations is sufficiently high to achieve statistical significance in all models. Furthermore, by controlling for random effects of the rounds we ensure the comparability of the results. Concerning the effects, we observe that more valuable players have significantly smaller increases in market value than less valuable players. This can be explained by the *ceteris paribus* nature of the value effect. If two players have the same characteristics and performance properties but unequal values, then the player with the higher value is fundamentally overvalued compared to the other. Assuming that the player market notices this mispricing, the market values of the two players will eventually equalize, causing an overall negative correlation between current and future market value changes.

The relationship between market value change and age can be analyzed based on the effects of *Age* and *Age*². Figure 2 in the appendix illustrates the interpretation of the squared age effect and the impact of age in the five models. Accordingly, increasing age reduces market value in all models, with the effect being larger in the long term than in the short term. Regarding the player characteristic *Height*, we observe a significant positive effect in all models. The variable *Weight* has a positive effect only in model (5). This may be due to

¹⁶ Since the time period includes Covid, we tested the following regression on a dataset that omits all games played after the first round of 2019/2020. There were no significant changes relevant to our hypotheses. Additionally, we add round random effects to capture a value effect due to Covid.

Table 2 Regression results based on the unrestricted dataset. Standard errors are given in parentheses

	<i>Dependent variable:</i>				
	$\Delta\text{Value_1}$ (1)	$\Delta\text{Value_2}$ (2)	$\Delta\text{Value_3}$ (3)	$\Delta\text{Value_4}$ (4)	$\Delta\text{Value_5}$ (5)
Constant	6.061*** (0.644)	9.136*** (1.154)	8.256*** (1.707)	2.151 (2.240)	−3.795 (2.716)
Value	−0.051*** (0.002)	−0.226*** (0.003)	−0.506*** (0.004)	−0.850*** (0.005)	−1.090*** (0.005)
Age	−0.568*** (0.031)	−0.937*** (0.055)	−0.928*** (0.081)	−0.447*** (0.104)	0.134 (0.124)
Age ²	0.008*** (0.001)	0.012*** (0.001)	0.010*** (0.002)	−0.002 (0.002)	−0.014*** (0.002)
Height	0.878** (0.323)	2.314*** (0.592)	3.018*** (0.900)	3.570** (1.226)	3.389* (1.549)
Weight	−0.002 (0.003)	−0.003 (0.005)	0.007 (0.008)	0.018 (0.011)	0.032* (0.015)
Footedness	−0.016 (0.054)	0.003 (0.100)	0.013 (0.154)	0.061 (0.212)	0.125 (0.272)
Minutes played	0.001*** (0.00003)	0.001*** (0.00005)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)
Goals	0.941*** (0.064)	1.343*** (0.101)	1.467*** (0.128)	1.366*** (0.142)	0.983*** (0.140)
Assists	0.641*** (0.090)	1.075*** (0.139)	1.022*** (0.173)	0.956*** (0.186)	0.890*** (0.182)
Second assists	0.360** (0.126)	0.723*** (0.194)	1.319*** (0.238)	1.445*** (0.257)	1.522*** (0.251)
Passes	0.003* (0.001)	0.011*** (0.002)	0.019*** (0.003)	0.022*** (0.004)	0.016*** (0.004)
Successful passes	0.714*** (0.212)	1.100** (0.350)	1.587*** (0.464)	1.490** (0.537)	0.879 (0.546)
Progressive runs	0.082*** (0.018)	0.086** (0.029)	0.043 (0.038)	−0.007 (0.043)	−0.057 (0.044)
Dribbles	0.038*** (0.008)	0.096*** (0.012)	0.169*** (0.016)	0.221*** (0.019)	0.212*** (0.020)
Successful dribbles	−0.019 (0.054)	0.002 (0.084)	0.032 (0.104)	0.040 (0.113)	0.080 (0.111)

Table 2 continued

	<i>Dependent variable:</i>				
	$\Delta\text{Value_1}$ (1)	$\Delta\text{Value_2}$ (2)	$\Delta\text{Value_3}$ (3)	$\Delta\text{Value_4}$ (4)	$\Delta\text{Value_5}$ (5)
Aerial duels	0.013* (0.006)	0.020* (0.009)	0.022+ (0.013)	0.018 (0.015)	0.007 (0.015)
Successful aerial duels	0.222** (0.077)	0.287* (0.121)	0.268+ (0.154)	0.027 (0.171)	0.132 (0.171)
Sliding tackles	-0.016 (0.026)	-0.052 (0.042)	-0.062 (0.054)	-0.041 (0.061)	-0.037 (0.061)
Successful sliding tackles	-0.050 (0.036)	-0.045 (0.056)	-0.033 (0.069)	0.017 (0.074)	0.028 (0.073)
Interceptions	0.028*** (0.009)	0.019 (0.014)	0.004 (0.018)	0.001 (0.020)	-0.018 (0.020)
Fouls	0.015 (0.018)	-0.003 (0.029)	-0.054 (0.038)	-0.055 (0.043)	-0.068 (0.043)
Yellow cards	-0.011 (0.064)	-0.054 (0.100)	-0.127 (0.126)	-0.222 (0.138)	-0.151 (0.136)
Red cards	0.134 (0.236)	0.226 (0.364)	0.576 (0.460)	0.807 (0.508)	0.845+ (0.499)
Minutes played (UEFA CL)	0.001*** (0.0002)	0.002*** (0.0003)	0.003*** (0.0003)	0.002*** (0.0003)	0.002*** (0.0003)
Minutes played (UEFA EL)	0.001*** (0.0001)	0.0004+ (0.0002)	0.001* (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)
Minutes played (Libertadores)	0.001*** (0.0004)	0.002*** (0.001)	0.002*** (0.001)	0.002* (0.001)	0.001* (0.001)
Minutes played (AFC CL)	0.00000 (0.0004)	-0.0004 (0.001)	-0.001+ (0.001)	-0.001 (0.001)	-0.001 (0.001)
Minutes played (CAF CL)	-0.003 (0.003)	-0.004 (0.005)	-0.006 (0.007)	-0.006 (0.010)	-0.009 (0.013)
Minutes played (CONCACAF CC)	0.002 (0.001)	0.002 (0.002)	0.001 (0.002)	-0.002 (0.002)	-0.001 (0.002)
International experience	-0.004 (0.011)	0.029 (0.020)	0.091** (0.031)	0.136** (0.041)	0.185*** (0.052)
Transfer	-0.744*** (0.186)	-1.454*** (0.289)	-1.228*** (0.357)	-0.578 (0.399)	0.507 (0.385)
Transfer \times Age	0.037*** (0.007)	0.075*** (0.011)	0.067*** (0.014)	0.039* (0.016)	-0.008 (0.015)
Transfer \times Minutes played	-0.0002*** (0.0001)	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.0003** (0.0001)	0.00004 (0.0001)

Table 2 continued

	Dependent variable:				
	ΔValue_1 (1)	ΔValue_2 (2)	ΔValue_3 (3)	ΔValue_4 (4)	ΔValue_5 (5)
$ \Delta\text{Culture} $	0.008* (0.004)	0.013* (0.006)	0.023** (0.007)	0.034*** (0.008)	0.049*** (0.008)
$ \Delta\text{Culture} \times \text{Age}$	−0.0003* (0.0001)	−0.001* (0.0002)	−0.001** (0.0003)	−0.001*** (0.0003)	−0.002*** (0.0003)
$ \Delta\text{Culture} \times \text{International experience}$	−0.002 (0.001)	−0.003 (0.002)	−0.006* (0.003)	−0.010** (0.003)	−0.014*** (0.003)
$ \Delta\text{Culture} \times \text{International experience} \times \text{Age}$	0.0001 (0.00005)	0.0001 (0.0001)	0.0002* (0.0001)	0.0003** (0.0001)	0.0005*** (0.0001)
$ \Delta\text{Culture} \times \text{Return}$	−0.003 (0.004)	−0.010+ (0.006)	−0.018* (0.007)	−0.014+ (0.008)	−0.016* (0.008)
$ \Delta\text{Culture} \times \text{Return} \times \text{Age}$	0.0001 (0.0001)	0.0004+ (0.0002)	0.001* (0.0003)	0.001+ (0.0003)	0.001* (0.0003)
Position change	−0.055* (0.025)	−0.017 (0.040)	0.029 (0.048)	−0.014 (0.052)	−0.010 (0.051)
Observations	63,983	63,983	58,837	53,072	46,818
Marg./cond. R^2	0.08/0.16	0.23/0.45	0.42/0.72	0.55/0.88	0.57/0.93
Random effects:					
σ (player/team/league)	0.5921	2.1265	3.9729	5.9428	7.5077
σ (team/league)	0.0001	0.0004	0.7971	2.0270	2.9420
σ (league)	0.2752	0.5245	0.8965	1.4189	1.7893
σ (team next round)	0.3920	0.9742	1.3757	1.1588	0.6820
σ (position)	0.0599	0.1018	0.1684	0.3536	0.2493
σ (round)	0.3046	0.5487	0.7019	0.6110	0.4650
σ (residual)	2.6730	3.8219	4.1900	3.9639	3.5333

+ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

the high correlation between *Height* and *Weight*. Additionally, this may be explained by the fact that a more muscular player is less susceptible to injuries.

The performance variables including *Minutes played*, *Goals*, *Assists*, *Second assists*, *Passes* and *Dribbles* record a significant positive effect on the market value increase across all models. Of course, it is plausible that the performance variables have a positive influence on the current market value. However, the question arises why the future development of market value is also positively influenced. A player currently displaying high values in the performance variables will continue receiving ample “working time” in the future, enabling potential for further improvement. Individuals with fewer future working hours do not have these opportunities. Another explanation is that a strong performance in a single round influences the crowd, the clubs and consequently the valuation in future rounds.

Some variables including *Progressive runs*, *Aerial duels*, *Successful aerial duels* and *Interceptions* show a significant effect only in the short term. The significant short term effects are comprehensible. The reason why no significant positive long term effects can be observed might be due to a specific injury risk (*Progressive runs*) or missing consistent reproducibility across multiple seasons (*Interceptions*).

In addition, the international experience of a player significantly increases his value after three or more rounds. The effect increases over time, becoming significant at the 0.1% level after five rounds. This indicates that international experience is a characteristic that players benefit from, e.g. by overcoming intercultural barriers in international teams. This might increase a teams’ success and in turn increases value.

Concerning transfer (i.e., changing a player’s employer), a significant negative effect on the market value at the 0.1% level is found for the three rounds following a transfer. Thus, the player’s adaptation period while switching teams is quite long, but decreases over time as expected. The significant positive interaction effect of *Transfer* \times *Age* and the significant negative interaction effect of *Transfer* \times *Minutes played* indicate that the negative transfer effect is significantly more distinct for younger players and for players with higher playing time at the previous club. The first effect can be attributed to young players’ dependence on a stable social network, as mentioned in Sect. 4. The second interaction effect results from the possibility for players with lower playing time at their previous club to increase it at the new club. Contrarily, the playing time of individuals who played frequently at their previous team tends to decrease. The determined negative transfer effect confirms hypothesis (H1), which states that an employer change reduces employee value in the short run, without having an effect in the long run. The interaction effect *Transfer* \times *Age* supports hypothesis (H2), according to which the transfer effect particularly affects younger employees.

Participation and success in international club competitions has a significant positive effect across all models. This can be observed for the UEFA Champions League, the UEFA Europa League and the Copa Libertadores. The *Minutes played* in these competitions show a significant positive effect on the market value. For a comparison of the long-term effect of a *Minute played* in these competitions on the market value, we calculate the relative differences between the regression coefficients in model (5). Unsurprisingly, we observe that a *Minute played* in the UEFA Champions League has ceteris paribus an 85% larger effect on the market value than a *Minute played* in the UEFA Europa League and a 71% larger effect than a *Minute played* in the Copa Libertadores. Interestingly, a *Minute played* in the Copa Libertadores has an 8.1% larger effect than a *Minute played* in the UEFA Europa League. For the remaining competitions we observe no significant effects. This may be either due to the competitions being less prestigious or the fact that they are less represented in our data.

Concerning the transfer effect, it is noteworthy that the aforementioned adaptation difficulties are not due to position changes, which are also frequently accompanied by a team

change. To consider the adaptation difficulties of a position change, we consider the dummy variable *Position change*, which has a significant negative effect in the short run and no significant effect in the long run.

The isolated culture effect presents interesting aspects relevant to this study. The effect of $|\Delta Culture|$ on the market value of players is significant at the 5% level already after one round. The culture effect increases with the number of rounds passed since the change and becomes significant at the 0.1% level after four and five rounds after the change. Two properties of culture effects can explain the reduced short-term effect. First, culture effects are not expected to have an immediate effect but they tend to have an effect over time. Second, a cultural change creates additional adaptation problems beyond the adaptation difficulties of a transfer within the cultural area. The previously mentioned honeymoon effect counters it and the sum of both effects leads to a reduced culture change effect. In the long run, adaptation difficulties cease to exist and the cultural diversity bundled in the individual leads to an added value that affects market valuation positively. Due to the significantly negative interaction effect $|\Delta Culture| \times Age$, the positive culture effect is less pronounced for older players. Both identified effects support hypotheses (H3) and (H4) which state that the market value of a worker increases with increasing cultural difference in the long run, with this increase being more pronounced for young players because of the more flexible value system. To analyze the joint interaction effect of *International experience*, *Return* and $|\Delta Culture|$, we also have to consider the three-way interaction effects with *Age* because $|\Delta Culture|$ likely depends on *Age*. We observe that *International experience* significantly reduces the culture effect in the long term and the $|\Delta Culture|$ and *Age* interaction effect. Similarly, *Return* reduces the culture effect and the $|\Delta Culture|$ and *Age* interaction effect. This supports hypotheses (H6) and (H7) which state that the culture effect is reduced if players are internationally experienced or do return to a country they already worked in.

Finally, we compare isolated culture effects under consideration of adaptation effects (due to job and position changes) and migration experiences with total culture effects without controlling for additional adaptation effects and without considering migration experiences, as they are analyzed in the literature. We refer to the latter as total migration effects and not culture effects. Therefore, the total migration effects include (besides culture effects) job and position change effects that accompany international employer change. Table 3 presents the regression results. All variables except the culture variables show similar results. The total migration effect is significantly negative in the short term (rounds one and two). However, short-term isolated culture effects are not significant and negative at the 5% level in our previous model. The different results can mostly be explained by the consideration or absence of employer and position change effects since the short-term negative transfer effect is included in the biased total culture effect. Our results indicate that the short-term negative effects of international migration originate from adaptation effects due to employer and position changes, not cultural differences. Therefore, it is crucial to isolate culture effects from employer and position change effects and consider the time elapsed since the employer changes.

5.4 Robustness checks

Previously, we included all players in our data to represent as many transfers and cultural changes as possible. However, we are unaware whether the transfers from minor to top leagues (or vice versa) and their large discrepancy in strength drive the positive results on isolated culture effects. To rule out this possibility, we only consider observations of players with at

Table 3 Regression results with total culture effects based on the unrestricted dataset

	<i>Dependent variable:</i>				
	ΔValue_1 (1)	ΔValue_2 (2)	ΔValue_3 (3)	ΔValue_4 (4)	ΔValue_5 (5)
Constant	5.867*** (0.637)	8.651*** (1.145)	7.782*** (1.703)	1.722 (2.234)	− 4.427 (2.704)
Value	− 0.050*** (0.002)	− 0.223*** (0.003)	− 0.507*** (0.004)	− 0.851*** (0.005)	− 1.090*** (0.005)
Age	− 0.560*** (0.030)	− 0.913*** (0.054)	− 0.898*** (0.080)	− 0.419*** (0.103)	0.182 (0.122)
Age ²	0.008*** (0.001)	0.012*** (0.001)	0.009*** (0.002)	− 0.002 (0.002)	− 0.015*** (0.002)
Height	0.889** (0.323)	2.328*** (0.591)	3.037*** (0.902)	3.618** (1.227)	3.490* (1.548)
Weight	− 0.002 (0.003)	− 0.002 (0.005)	0.008 (0.008)	0.019+ (0.011)	0.034* (0.014)
Footedness	− 0.020 (0.054)	0.005 (0.100)	0.030 (0.155)	0.094 (0.212)	0.171 (0.272)
Minutes played	0.001*** (0.00003)	0.001*** (0.00004)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)
Goals	0.931*** (0.064)	1.329*** (0.101)	1.456*** (0.128)	1.360*** (0.142)	0.972*** (0.140)
Assists	0.640*** (0.090)	1.071*** (0.139)	1.007*** (0.173)	0.941*** (0.186)	0.878*** (0.182)
Second assists	0.364** (0.126)	0.739*** (0.194)	1.327*** (0.238)	1.436*** (0.257)	1.496*** (0.252)
Passes	0.003* (0.001)	0.012*** (0.002)	0.018*** (0.003)	0.022*** (0.004)	0.016*** (0.004)
Successful passes	0.716*** (0.211)	1.178*** (0.349)	1.662*** (0.464)	1.532** (0.537)	0.899 (0.547)
Progressive runs	0.082*** (0.018)	0.086** (0.029)	0.044 (0.038)	− 0.007 (0.043)	− 0.056 (0.044)
Dribbles	0.036*** (0.007)	0.095*** (0.012)	0.171*** (0.016)	0.225*** (0.019)	0.217*** (0.020)
Successful dribbles	− 0.024 (0.054)	− 0.008 (0.084)	0.021 (0.104)	0.034 (0.113)	0.077 (0.111)
Aerial duels	0.014* (0.005)	0.021* (0.009)	0.023+ (0.013)	0.020 (0.015)	0.008 (0.015)
Successful aerial duels	0.222** (0.077)	0.283* (0.121)	0.256+ (0.154)	0.016 (0.171)	0.121 (0.171)
Sliding tackles	− 0.015 (0.026)	− 0.051 (0.042)	− 0.063 (0.054)	− 0.046 (0.061)	− 0.041 (0.061)
Successful sliding tackles	− 0.051 (0.036)	− 0.049 (0.056)	− 0.038 (0.069)	0.015 (0.074)	0.026 (0.073)
Interceptions	0.028** (0.008)	0.016 (0.014)	0.001 (0.018)	− 0.001 (0.020)	− 0.021 (0.020)

Table 3 continued

	Dependent variable:				
	ΔValue_1 (1)	ΔValue_2 (2)	ΔValue_3 (3)	ΔValue_4 (4)	ΔValue_5 (5)
Fouls	0.015 (0.018)	0.002 (0.029)	-0.047 (0.038)	-0.050 (0.043)	-0.067 (0.043)
Yellow cards	-0.014 (0.064)	-0.061 (0.100)	-0.132 (0.126)	-0.226 (0.138)	-0.155 (0.137)
Red cards	0.124 (0.236)	0.213 (0.364)	0.585 (0.460)	0.825 (0.508)	0.876 ⁺ (0.500)
Minutes played (UEFA CL)	0.001*** (0.0002)	0.002*** (0.0003)	0.003*** (0.0003)	0.002*** (0.0003)	0.002*** (0.0003)
Minutes played (UEFA EL)	0.001*** (0.0001)	0.0005* (0.0002)	0.001* (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)
Minutes played (Libertadores)	0.001*** (0.0004)	0.002*** (0.001)	0.002*** (0.001)	0.002* (0.001)	0.001* (0.001)
Minutes played (AFC CL)	0.00001 (0.0004)	-0.0003 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Minutes played (CAF CL)	-0.003 (0.003)	-0.004 (0.005)	-0.006 (0.007)	-0.006 (0.010)	-0.009 (0.013)
Minutes played (CONCACAF CC)	0.002 ⁺ (0.001)	0.002 (0.002)	0.001 (0.002)	-0.003 (0.002)	-0.001 (0.002)
$\Delta\text{Culture}$	-0.003* (0.002)	-0.008** (0.003)	-0.004 (0.003)	0.004 (0.004)	0.015*** (0.004)
$\Delta\text{Culture}$ \times Age	0.0001 ⁺ (0.0001)	0.0003** (0.0001)	0.0002 (0.0001)	-0.0001 (0.0001)	-0.001*** (0.0001)
Observations	63,983	63,983	58,837	53,072	46,818
Marg./cond. R^2	0.08/0.16	0.22/0.45	0.42/0.73	0.55/0.88	0.57/0.93
Random effects:					
σ (player/team/league)	0.5914	2.1251	3.9885	5.9491	7.4989
σ (team/league)	0.0001	0.0649	0.8821	2.0555	2.9220
σ (league)	0.2835	0.5570	0.9460	1.4398	1.7822
σ (team next round)	0.3782	0.9323	1.2949	1.1226	0.7231
σ (position)	0.0553	0.0983	0.1726	0.3564	0.2530
σ (round)	0.3026	0.5494	0.7048	0.6117	0.4466
σ (residual)	2.6752	3.8275	4.1881	3.9643	3.5384

Standard errors are given in parentheses

⁺ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

least 90 min of playing time in a top league in the current and the following round.¹⁷ Thus, we only consider player transfers between top league clubs. The resulting restricted dataset has 28,865 observations.

An additional advantage of the restricted dataset is the existence of strength measures since the leagues all participate in the European international competitions. The previous analysis only considered league strength as a random effect for the current round. However, in the case of international transfers, differences in league strength can also contribute to players' positive market value development. Players moving from a weaker to a stronger league may benefit from the transfer in the long run because they learn from stronger players, and their performance receives increased attention. Thus, it is conceivable that differences in league strength are correlated with cultural differences, which may bias the measured culture effects. Therefore, an explicit method to control for differences in league strength is required besides the league random effects. In our first approach, we utilize the Union of European Football Associations (UEFA) league coefficient that are employed to determine the league strength of top European leagues.¹⁸ UEFA uses these coefficients to determine the number of teams eligible to participate in international competitions for each league. A league's UEFA coefficient is based on the average points scored in international competitions by participating league teams over the last 5 years. We calculate the difference in league strength between two leagues as the difference in the respective UEFA coefficients. If player i plays in league l_1 in the current round r and in league l_2 in the following round, the difference in the UEFA coefficient is defined as follows:

$$\Delta \text{UEFA_coefficient} := \text{Coefficient}_{l_2,r} - \text{Coefficient}_{l_1,r} \quad (6)$$

$\text{Coefficient}_{l_1,r}$ and $\text{Coefficient}_{l_2,r}$ are the UEFA coefficients of leagues l_1 and l_2 in round r , respectively. A positive value of $\Delta \text{UEFA_coefficient}$ implies a player moving to a stronger league at the beginning of the next round. $\Delta \text{UEFA_coefficient}$ and $|\Delta \text{Culture}|$ exhibit a low correlation of 0.12. $\Delta \text{UEFA_coefficient}$ is added as a control variable to regressions (R1)–(R5) to avoid a potential bias affecting the measured culture effects. Table 4 presents the results. Compared to the results in Sect. 5.3, we generally observe similar effects of a player's *Value* and characteristics, namely *Age*, *Height*, *Weight* and *International experience* on market value development ΔValue_i . The only minor exceptions are *Height* and *Weight* in models (R3)–(R5). Some of the significant effects of *Height* and *Weight* in models (3)–(5) are only weakly significant or not significant in models (R3)–(R5). *Weight* is no longer significant at the 5% level in any of the models. We argued in the previous section that *Weight* has a long-term impact due to the lower injury risk of more muscular players. In top leagues, the medical staff is more professional and we observe a higher share of players with an exceptional physique, which likely mitigates the previous *Weight* effect. Similarly, *Height* is significant only in four of the five models.

The performance variables, namely, *Minutes played*, *Goals*, *Assists*, *Second assists*, and *Dribbles* remain significant across all rounds. Similar to the regression results in the previous section, *Progressive runs* is significant and positive in the short run only. Contrarily, *Passes* is significant at a 5% level only in the first three models (R1)–(R3), whereas *Passes* is significant in all models (1)–(5). It could be because *Passes* is an inclusive term, encompassing crucial

¹⁷ Consequently, the data is restricted to 10 leagues. It is necessary to keep enough countries in the data to deduce culture effects. But we additionally employed the following regressions on a dataset with only England, Spain, Italy, France and Germany. The only relevant change is the non-significance of the position change dummy. This may be due to the low amount of relevant position changes in the sample or due to more players that are proficient in multiple positions.

¹⁸ The data is from uefa.com/nationalassociations/uefarankings/country.

Table 4 Regression results that only include the top leagues

	<i>Dependent variable</i>				
	$\Delta\text{Value_1}$ (R1)	$\Delta\text{Value_2}$ (R2)	$\Delta\text{Value_3}$ (R3)	$\Delta\text{Value_4}$ (R4)	$\Delta\text{Value_5}$ (R5)
Constant	13.060*** (1.352)	18.990*** (2.496)	16.999*** (3.821)	6.708 (4.942)	4.448 (5.850)
Value	-0.062*** (0.003)	-0.256*** (0.005)	-0.559*** (0.006)	-0.902*** (0.007)	-1.124*** (0.007)
Age	-1.114*** (0.066)	-1.691*** (0.119)	-1.369*** (0.179)	-0.464* (0.223)	-0.151 (0.256)
Age ²	0.016*** (0.001)	0.022*** (0.002)	0.012*** (0.003)	-0.008+ (0.004)	-0.016*** (0.005)
Height	1.278+ (0.659)	3.506** (1.254)	3.942* (1.982)	4.793+ (2.657)	5.350 (3.276)
Weight	-0.002 (0.006)	-0.001 (0.011)	0.014 (0.018)	0.025 (0.025)	0.038 (0.031)
Footedness	0.105 (0.118)	0.278 (0.227)	0.418 (0.362)	0.668 (0.490)	1.023+ (0.614)
Minutes played	0.001*** (0.0001)	0.002*** (0.0001)	0.002*** (0.0001)	0.002*** (0.0001)	0.001*** (0.0001)
Goals	1.965*** (0.144)	2.701*** (0.226)	2.585*** (0.286)	2.122*** (0.301)	1.452*** (0.294)
Assists	1.190*** (0.191)	2.002*** (0.290)	1.493*** (0.356)	1.153** (0.368)	1.018** (0.354)
Second assists	0.702** (0.269)	1.651*** (0.405)	3.059*** (0.494)	3.118*** (0.508)	2.839*** (0.492)
Passes	0.009** (0.003)	0.018*** (0.005)	0.018** (0.006)	0.013+ (0.007)	0.006 (0.007)
Successful passes	1.122* (0.446)	1.623* (0.750)	1.644 (1.006)	2.097+ (1.116)	0.897 (1.119)
Progressive runs	0.102** (0.038)	0.059 (0.060)	-0.062 (0.079)	-0.134 (0.087)	-0.300*** (0.087)
Dribbles	0.046** (0.016)	0.136*** (0.027)	0.238*** (0.036)	0.329*** (0.040)	0.330*** (0.040)
Successful dribbles	-0.094 (0.110)	-0.057 (0.166)	0.052 (0.205)	0.048 (0.213)	0.107 (0.207)
Aerial duels	0.025* (0.011)	0.041* (0.020)	0.044 (0.027)	0.052+ (0.031)	0.034 (0.032)
Successful aerial duels	0.518** (0.163)	0.545* (0.252)	0.584+ (0.320)	-0.130 (0.340)	-0.192 (0.334)
Sliding tackles	-0.008 (0.052)	-0.064 (0.085)	-0.102 (0.110)	-0.005 (0.118)	-0.032 (0.117)

Table 4 continued

	Dependent variable				
	Δ Value_1 (R1)	Δ Value_2 (R2)	Δ Value_3 (R3)	Δ Value_4 (R4)	Δ Value_5 (R5)
Successful sliding tackles	− 0.121 (0.074)	− 0.059 (0.112)	0.003 (0.137)	− 0.043 (0.142)	− 0.074 (0.139)
Interceptions	0.072*** (0.017)	0.059* (0.027)	0.016 (0.036)	0.010 (0.040)	− 0.027 (0.039)
Fouls	0.052 (0.040)	0.019 (0.064)	− 0.030 (0.083)	− 0.106 (0.089)	− 0.122 (0.088)
Yellow cards	− 0.109 (0.137)	− 0.226 (0.209)	− 0.418 (0.262)	− 0.570* (0.276)	− 0.279 (0.270)
Red cards	0.262 (0.493)	0.466 (0.742)	1.401 (0.946)	1.726+ (1.001)	2.255* (0.968)
Minutes played (UEFA CL)	0.001** (0.0003)	0.001+ (0.0004)	0.001 (0.001)	− 0.0002 (0.001)	− 0.0002 (0.001)
Goals (UEFA CL)	22.101 (18.183)	131.848*** (27.273)	209.022*** (34.184)	204.835*** (34.958)	173.768*** (34.363)
Dribbles (UEFA CL)	6.953*** (1.835)	17.958*** (2.928)	19.788*** (3.640)	25.068*** (3.771)	28.976*** (3.693)
Minutes played (UEFA EL)	0.001* (0.0003)	0.0004 (0.0004)	0.001 (0.0005)	0.001+ (0.0005)	0.001* (0.0004)
Goals (UEFA EL)	14.883 (13.840)	15.269 (20.759)	32.978 (25.977)	21.714 (27.279)	− 4.144 (30.855)
Dribbles (UEFA EL)	2.624 (1.782)	− 2.448 (2.727)	− 7.178* (3.304)	0.210 (3.456)	3.921 (3.368)
International experience	− 0.035 (0.022)	− 0.017 (0.041)	0.076 (0.065)	0.162+ (0.087)	0.263* (0.108)
Transfer	− 1.658** (0.578)	− 2.153* (0.878)	− 1.147 (1.061)	0.167 (1.152)	1.466 (1.079)
Transfer × Age	0.063** (0.022)	0.106** (0.033)	0.070+ (0.040)	0.018 (0.043)	− 0.037 (0.040)
Transfer × Minutes played	− 0.0002 (0.0001)	− 0.001*** (0.0002)	− 0.001*** (0.0003)	− 0.0005+ (0.0003)	− 0.00001 (0.0003)
Δ Culture	0.042** (0.014)	0.023 (0.021)	0.042+ (0.025)	0.068* (0.027)	0.106*** (0.026)
Δ Culture × Age	− 0.002** (0.001)	− 0.001 (0.001)	− 0.002+ (0.001)	− 0.003** (0.001)	− 0.004*** (0.001)
Δ Culture × International experience	− 0.005 (0.005)	0.010 (0.007)	0.008 (0.009)	− 0.001 (0.010)	− 0.011 (0.009)

Table 4 continued

	Dependent variable				
	ΔValue_1 (R1)	ΔValue_2 (R2)	ΔValue_3 (R3)	ΔValue_4 (R4)	ΔValue_5 (R5)
$\Delta \text{Culture} \times \text{International experience} \times \text{Age}$	0.0002 (0.0002)	−0.0004 (0.0003)	−0.0003 (0.0003)	0.00002 (0.0004)	0.0004 (0.0003)
$\Delta \text{Culture} \times \text{Return}$	−0.005 (0.013)	−0.039* (0.020)	−0.058* (0.024)	−0.041 (0.027)	−0.065** (0.025)
$\Delta \text{Culture} \times \text{Return} \times \text{Age}$	0.0003 (0.0005)	0.002* (0.001)	0.002* (0.001)	0.002+ (0.001)	0.003** (0.001)
Position change	−0.085+ (0.051)	−0.006 (0.079)	0.073 (0.094)	0.011 (0.098)	0.008 (0.095)
$\Delta \text{UEFA_coefficient}$	−0.007+ (0.004)	−0.007 (0.007)	0.002 (0.009)	0.018* (0.009)	0.015* (0.007)
Observations	28,865	28,865	25,863	23,484	20,643
Marg./cond. R^2	0.10/0.18	0.24/0.50	0.43/0.77	0.54/0.90	0.55/0.95
Random effects:					
σ (player/team/league)	0.7583	2.9936	5.6711	8.2954	10.1420
σ (team/league)	0.1364	0.5024	2.0455	4.4639	6.1144
σ (league)	0.3867	0.8953	1.7322	2.7141	3.1431
σ (team next round)	0.4830	1.4334	1.9390	1.4090	0.6675
σ (position)	0.0001	0.0984	0.2309	0.5752	0.4204
σ (round)	0.6349	1.1234	1.3357	1.0676	0.7780
σ (residual)	3.6710	5.1205	5.5194	5.1251	4.5486

Standard errors are given in parentheses
+ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

key passes leading directly to a goal-scoring opportunity (and are highly valued), as well as back and cross passes that constitute the majority of passes. While passing accuracy in minor leagues can lead to high playing time and positive market value development, it will lead to long-term higher market assessment in top leagues for key passes only. The *Passes* effect is significant only in the medium-term due to ample back and cross passes.

Furthermore, *Interceptions* is significantly positive in the models (R1) and (R2). The effect of $\Delta\text{UEFA_coefficient}$ is significantly positive for rounds 4 and 5, i.e., we observe the expected significant positive effects of a transfer from a weaker to a stronger league in the long run. For the international competitions, largely the *Goals* and *Dribbles* in the UEFA Champions League are assessed positively.

Apart from these minor differences, the results are similar in terms of player characteristics, performance, and *Value*. Crucial for the studies objective are the transfer and culture effect.

The negative transfer effect decreases more rapidly than in the previous regressions. No significant transfer effect can be observed after three or more rounds. It could be because top league teams have more similar playing styles and facilities than lower league teams. Furthermore, top leagues teams have support possibilities (such as language courses and housing) to help new players adapt to the team and environment. All these measures reduce the adaptation period. Similar to the regressions in the previous section, the effect is significantly higher for younger players and those having a high number of playing minutes in the current round. It confirms hypotheses (H1) and (H2). Since we additionally control for the variable *Position change*, which (as in the original model) has a short-term negative effect on market value, we find that position change does not cause the transfer effect.

The long-term effects of $|\Delta\text{Culture}|$ are also similar. We observe a significant positive effect of $|\Delta\text{Culture}|$ after four and five rounds, which is significantly smaller for older players. However, since the top leagues are all European and culturally similar, the culture effect is not as pronounced in the restricted dataset. This is reflected in the lack of significance of the positive effect of $|\Delta\text{Culture}|$ after two rounds. Nevertheless, our results also confirm hypotheses (H3) and (H4) when considering only top league transfers. We observe again that the long-term positive culture effect is less pronounced for players returning to a country they already worked in, supporting hypothesis (H7). Surprisingly, we observe a negative interaction effect of *Return* and $|\Delta\text{Culture}|$ even in models (R2) and (R3), where the culture effect is not significant. The reason can be that players may have viewed their home country with rose-colored glasses while playing abroad and experienced a “culture shock” in their own home country when they return.

Interestingly, the interaction effect of *International experience* and $|\Delta\text{Culture}|$ is not significant in any model. In the previous unrestricted regressions, internationally experienced players show a smaller culture effect. One possible reason for this difference compared to the restricted data is that players in the top leagues already have high cultural experience through international matches and internationally composed teams.¹⁹

However, in the short run and in contrast to the previous regression results (1), a significant effect of $|\Delta\text{Culture}|$ at the 1% level can be observed in model (R1) after one round, which is significantly weaker for older players. While the positive honeymoon effect persists, the reduced cultural adjustment difficulties in transfers between top league teams can explain the larger short-term effect. The reduced cultural adjustment difficulties result from the sophisticated systems provided by clubs in top leagues to mitigate cultural adjustment effects. These

¹⁹ Generally, teams in the top leagues are more internationally composed. For example, two thirds of the players in the English first division are foreigners. Contrarily, only one third in the fourth English division are foreigners. And non-European leagues such as the first flight in China, Egypt or Brazil have at most a share of foreigners of 20% (all statistics are as of April 2024).

include translators, support in bureaucratic matters, and experienced managers to assist players with their day-to-day needs. The minor league teams usually lack the financial resources and experience to provide appropriate support. It explains why the honeymoon effect significantly outweighs the adjustment effect for transfers between clubs from top leagues in the short run. Overall, our results support hypothesis (H5).

Our second approach to measure differences in league strength involves the utilization of Elo ratings. The use of Elo ratings is suggested by Csató (2024). The utilized Elo ratings are determined on club level.²⁰ We calculate the average Elo ratings of all clubs in a league on a given date to get a strength measure for a league. Our approach is identical to the previous regression, but instead of the UEFA coefficients we utilize the appropriate Elo ratings. The results are shown in Table 5. We observe similar results compared to our previous approach.

Summarized, we validated all hypotheses on the dataset that is restricted to top leagues except for (H6). For (H6) we find strong support only on the unrestricted dataset. (H6) states that the culture effect is reduced if players are already internationally experienced. The exception is comprehensible since players in top leagues tend to be more internationally experienced through international competitions and internationally composed teams and we likely observe a saturation effect.

Table 6 gives an overview over all findings related to the hypotheses. All regression results support hypothesis (H1), according to which employment changes reduce the market value of a worker in the short but not in the long term. Furthermore, we show that the younger employees have a significantly stronger negative change effect, confirming hypothesis (H2). Since this effect disappears faster in top leagues, it is also shown that the negative effect of an employer change can be mitigated, such as by taking measures to reduce adaptation difficulties.

Regarding the cultural hypotheses, all regression models record a significant positive long-term effect of $|\Delta\text{Culture}|$, which is significantly stronger for younger employees. Consequently, we confirm hypotheses (H3) and (H4). The lower cultural adjustment requirements in the top-league segment also help isolate the honeymoon effect. We observe a significant honeymoon effect for transfers between industry-leading firms (the top league teams). Thus, hypothesis (H5) is supported, which states that a significant positive short-term effect of $|\Delta\text{Culture}|$ prevails (the honeymoon effect) if the need for adjustment is low. Finally, (H7) is confirmed on both datasets, which means that returning to a country reduces the culture effect. Consequently, all hypotheses except (H6) are confirmed. For hypothesis (H6) we find strong support on the unrestricted dataset. As already argued, the non-significance on the restricted dataset is comprehensible since players in top leagues are more internationally experienced.

²⁰ The Elo ratings we use can be found here: clubelo.com.

Table 5 Regression results that only include the top leagues

	Dependent variable				
	ΔValue_1 (R1)	ΔValue_2 (R2)	ΔValue_3 (R3)	ΔValue_4 (R4)	ΔValue_5 (R5)
Constant	13.060*** (1.352)	18.995*** (2.498)	16.989*** (2.498)	6.732 (4.944)	4.488 (5.851)
Value	−0.062*** (0.003)	−0.256*** (0.005)	−0.559*** (0.005)	−0.902*** (0.007)	−1.124*** (0.007)
Age	−1.114*** (0.066)	−1.691*** (0.119)	−1.368*** (0.119)	−0.466* (0.223)	−0.155 (0.256)
Age ²	0.016*** (0.001)	0.023*** (0.002)	0.012*** (0.002)	−0.008+ (0.004)	−0.016*** (0.005)
Height	1.281+ (0.660)	3.506** (1.254)	3.946* (1.254)	4.802+ (2.657)	5.367 (3.276)
Weight	−0.002 (0.006)	−0.001 (0.011)	0.014 (0.011)	0.025 (0.025)	0.038 (0.031)
Footedness	0.105 (0.118)	0.277 (0.227)	0.417 (0.227)	0.669 (0.490)	1.023+ (0.614)
Minutes played	0.001*** (0.0001)	0.002*** (0.0001)	0.002*** (0.0001)	0.002*** (0.0001)	0.001*** (0.0001)
Goals	1.960*** (0.144)	2.697*** (0.226)	2.580*** (0.226)	2.119*** (0.301)	1.451*** (0.294)
Assists	1.188*** (0.191)	2.001*** (0.290)	1.491*** (0.290)	1.149*** (0.356)	1.015*** (0.354)
Second assists	0.697** (0.269)	1.646*** (0.405)	3.057*** (0.405)	3.122*** (0.508)	2.845*** (0.492)
Passes	0.009** (0.003)	0.018*** (0.005)	0.018** (0.005)	0.012+ (0.006)	0.006 (0.007)
Successful passes	1.116* (0.446)	1.613* (0.750)	1.629 (0.750)	2.092+ (1.116)	0.893 (1.119)
Progressive runs	0.102*** (0.038)	0.059 (0.060)	−0.062 (0.060)	−0.133 (0.087)	−0.299*** (0.087)
Dribbles	0.046** (0.016)	0.136*** (0.027)	0.238*** (0.027)	0.328*** (0.040)	0.329*** (0.040)
Successful dribbles	−0.094 (0.110)	−0.057 (0.166)	0.052 (0.166)	0.047 (0.213)	0.107 (0.207)
Aerial duels	0.025* (0.011)	0.041* (0.020)	0.043 (0.020)	0.052+ (0.031)	0.033 (0.032)

Table 5 continued

	Dependent variable				
	ΔValue_1 (R1)	ΔValue_2 (R2)	ΔValue_3 (R3)	ΔValue_4 (R4)	ΔValue_5 (R5)
Successful aerial duels	0.515** (0.163)	0.542* (0.252)	0.580+ (0.320)	-0.133 (0.340)	-0.193 (0.334)
Sliding tackles	-0.007 (0.052)	-0.063 (0.085)	-0.102 (0.110)	-0.006 (0.118)	-0.032 (0.117)
Successful sliding tackles	-0.121 (0.074)	-0.059 (0.112)	0.004 (0.137)	-0.043 (0.142)	-0.074 (0.139)
Interceptions	0.073*** (0.017)	0.059* (0.027)	0.016 (0.036)	0.010 (0.040)	-0.027 (0.039)
Fouls	0.052 (0.040)	0.019 (0.064)	-0.030 (0.083)	-0.106 (0.089)	-0.123 (0.088)
Yellow cards	-0.110 (0.137)	-0.227 (0.209)	-0.418 (0.262)	-0.570* (0.275)	-0.280 (0.270)
Red cards	0.267 (0.493)	0.468 (0.742)	1.400 (0.946)	1.718+ (1.001)	2.244* (0.968)
Minutes played (UEFA CL)	0.001** (0.0003)	0.001+ (0.0004)	0.001 (0.001)	-0.0002 (0.001)	-0.0002 (0.001)
Goals (UEFA CL)	21.748 (18.183)	131.514*** (27.274)	209.043*** (34.181)	205.139*** (34.954)	174.189*** (34.359)
Dribbles (UEFA CL)	6.941*** (1.836)	17.943*** (2.929)	19.733*** (3.640)	25.031*** (3.771)	28.970*** (3.692)
Minutes played (UEFA EL)	0.0005* (0.0003)	0.0004 (0.0004)	0.001 (0.0005)	0.001+ (0.0005)	0.001* (0.0004)
Goals (UEFA EL)	14.834 (13.841)	15.243 (20.759)	33.053 (25.975)	21.632 (27.277)	-4.387 (30.853)
Dribbles (UEFA EL)	2.600 (1.782)	-2.469 (2.727)	-7.211* (3.303)	0.197 (3.455)	3.913 (3.368)
International experience	-0.035 (0.022)	-0.016 (0.041)	0.076 (0.065)	0.162+ (0.087)	0.263* (0.108)
Transfer	-1.669** (0.578)	-2.163* (0.878)	-1.157 (1.061)	0.177 (1.151)	1.489 (1.079)
Transfer \times Age	0.064** (0.022)	0.107** (0.033)	0.071+ (0.040)	0.019 (0.043)	-0.036 (0.040)
Transfer \times Minutes played	-0.0002 (0.0001)	-0.001*** (0.0002)	-0.001*** (0.0003)	-0.001+ (0.0003)	-0.0001 (0.0003)
$ \Delta\text{Culture} $	0.041** (0.014)	0.021 (0.021)	0.039 (0.025)	0.063* (0.027)	0.102*** (0.026)
$ \Delta\text{Culture} \times \text{Age}$	-0.002** (0.001)	-0.001 (0.001)	-0.002+ (0.001)	-0.003* (0.001)	-0.004*** (0.001)
$ \Delta\text{Culture} \times \text{International experience}$	-0.005 (0.005)	0.010 (0.007)	0.008 (0.009)	0.00004 (0.010)	-0.010 (0.009)
$ \Delta\text{Culture} \times \text{International experience} \times \text{Age}$	0.0002 (0.0002)	-0.0004 (0.0003)	-0.0003 (0.0003)	-0.00001 (0.0004)	0.0003 (0.0003)

Table 5 continued

	Dependent variable				
	$\Delta \text{Value_1}$ (R1)	$\Delta \text{Value_2}$ (R2)	$\Delta \text{Value_3}$ (R3)	$\Delta \text{Value_4}$ (R4)	$\Delta \text{Value_5}$ (R5)
ΔCulture × Return	−0.004 (0.013)	−0.039 ⁺ (0.020)	−0.057 [*] (0.024)	−0.042 (0.027)	−0.065 ^{**} (0.025)
ΔCulture × Return × Age	0.0003 (0.0005)	0.002 [*] (0.001)	0.002 [*] (0.001)	0.002 ⁺ (0.001)	0.003 ^{**} (0.001)
Position change	−0.086 ⁺ (0.051)	−0.006 (0.079)	0.073 (0.094)	0.011 (0.098)	0.007 (0.095)
ΔElo_league	−0.0005 (0.001)	−0.0004 (0.001)	0.002 (0.002)	0.006 ^{**} (0.002)	0.005 ^{**} (0.002)
Observations	28,865	28,865	25,863	23,484	20,643
Marg./cond. R^2	0.10/0.18	0.24/0.50	0.43/0.77	0.54/0.90	0.56/0.95
Random effects:					
σ (player/team/league)	0.7584	2.9938	5.6732	8.2950	10.1416
σ (team/league)	0.1363	0.5040	2.0637	4.4685	6.1095
σ (league)	0.4023	0.9341	1.7961	2.7459	3.1560
σ (team next round)	0.4851	1.4321	1.9166	1.4003	0.6714
σ (position)	0.0001	0.0990	0.2312	0.5756	0.4218
σ (round)	0.6350	1.1231	1.3354	1.0671	0.7781
σ (residual)	3.6710	5.1206	5.5186	5.1242	4.5481

The difference in Elo rating is employed to determine differences in league strength in the context of international transfers. Standard errors are given in parentheses
⁺ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 6 The table summarizes the regression results.

	Hypotheses (partially shortened)	Variable	Regr	β	(1)	(2)	(3)	(4)	(5)
(H1)	Employment and position changes decrease the value of an employee in the short term, but have no long-term impact.	Transfer	Table 2 Table 4 Table 5 Table 2 Table 4 Table 5 Table 2 Table 4 Table 5	Neg Neg Neg Neg Neg Neg Pos Pos Pos	*** ** ** * + + *** ** **	*** * * n.s n.s n.s *** ** **	*** n.s n.s n.s n.s n.s *** + +	n.s n.s n.s n.s n.s n.s * n.s n.s	n.s n.s n.s n.s n.s n.s n.s n.s n.s
(H2)	In the short term, the values of young employees decrease more than those of older employees after a job change.	Position change	Table 2 Table 4 Table 5 Table 2 Table 4 Table 5	Neg Neg Neg Neg Neg Neg	*** + + *** ** **	*** n.s n.s *** ** **	*** n.s n.s *** ** **	*** n.s n.s *** * n.s	n.s n.s n.s n.s n.s n.s
(H3)	An international job change increases the employee value in the long term with the degree of cultural difference.	Transfer \times Age	Table 2 Table 4 Table 5	Pos Pos Pos	*** ** **	*** ** **	*** + +	*** n.s n.s	n.s n.s n.s
(H4)	An international job change increases the long-term values of young employees more than those of older employees.	$ \Delta \text{Culture} $	Table 2 Table 4 Table 5	Pos Pos Pos	*** ** **	*** n.s n.s	*** + n.s	*** * *	*** *** ***
(H5)	A job change across national borders between industry-leading firms increases the employee's value in the short term.	$ \Delta \text{Culture} \times \text{Age}$	Table 2 Table 4 Table 5	Neg Neg Neg	* ** **	* n.s n.s	* + +	*** ** *	*** *** ***
(H6)	The culture effects decrease with the number of different countries in which an employee already worked in.	$ \Delta \text{Culture} $	Table 4 Table 5	Pos Pos	** **	n.s n.s	+ n.s	* *	*** ***
(H7)	The culture effects decrease when an employee internationally migrates to a country he or she already worked in.	$ \Delta \text{Culture} \times \text{International exp.}$	Table 2 Table 4 Table 5 Table 2 Table 4 Table 5	Neg n.s n.s Neg Neg Neg	n.s n.s n.s n.s n.s n.s	n.s n.s n.s + * +	* n.s n.s * * *	** n.s n.s + n.s n.s	*** n.s n.s * ** **

Table 2 refers to the regression based on the unrestricted dataset. Tables 4 and 5 are based only on the top leagues. Model (1) observes value developments over half a year, model (2) over 1 year and model (5) over 2.5 years

6 Conclusion

Negative effects of international migration on employee valuation are in the literature (Åslund et al., 2014; Kónya, 2007; Peeters et al., 2021) and in the public perception (Alesina et al., 2022) often attributed to adaptation difficulties due to cultural differences. We modeled various aspects that are not considered in the literature by utilizing soccer data and extending a mixed-effects model proposed by Müller et al. (2017) in the context of soccer player performance evaluations. Our results strongly indicate that the primary drivers of the in the literature identified negative culture effect are not cultural differences but general adaptation difficulties resulting from a job or position change accompanying international migration. Additionally, we find that migration experiences such as returning players or internationally experienced players significantly affect the culture effect. When we isolate the culture effect from job and position change effects and measure its impact over time, we cannot observe any negative isolated culture effects. Restricting the data to moves between industry-leading firms (which are expected to have mitigation systems to reduce adaptation difficulties) reveals a distinct and significantly positive culture effect in the short term, which we attribute to the honeymoon effect. In the long term, our results show significantly positive culture effects. These results on isolated culture effects are more pronounced for young, non-returning and internationally inexperienced workers. We deployed robustness checks that confirmed our results when we accounted for varying strength of countries' economies and when we restricted the data to industry-leading firms.

Our results are of particular interest from both an operations research and labor economics perspective. On the one hand, the application of a mixed-effects model allows the analysis of hierarchical data necessary for the identification of an isolated culture effect. On the other hand, the results concern applying and hiring decisions of employees and firms. They should not restrain from moving and hiring beyond their cultural borders because employees benefit from it in the long term and potentially even in the short term. Future research on this topic should focus on possibilities to further analyze the short-term effects of cultural differences. Since we analyzed employee valuation, the data are only available for longer time intervals (in our case, twice a year). By analyzing the performance instead, one might be able to better understand with a finer grained approach the culture effect over time. Since cultural adaptation difficulties are probably strongest immediately after an employer switch, effects occurring less than 6 months after the move should be analyzed in more detail.

A Appendix

See Figures 2 and 3.

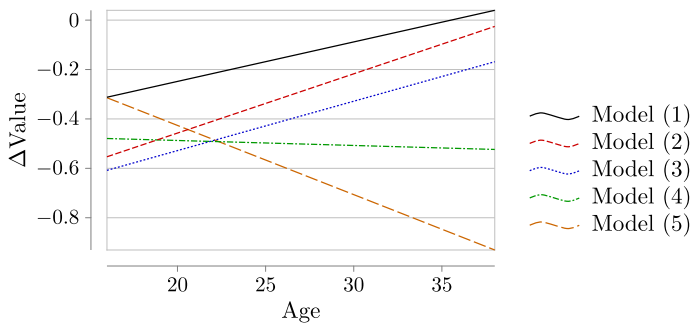
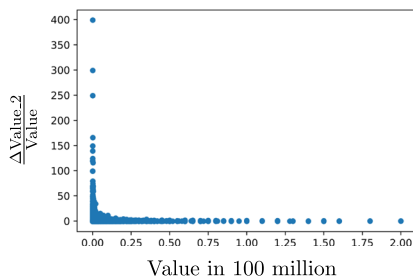
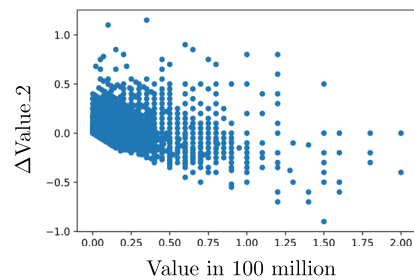


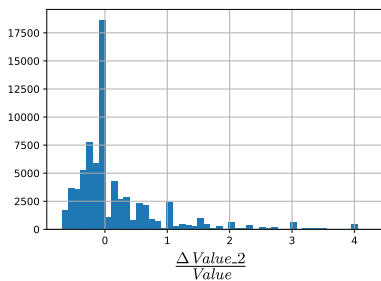
Fig. 2 Marginal effect of age on $\Delta\text{Value}(= \beta_{\text{Age}} + 2 \cdot \beta_{\text{Age}^2} \cdot \text{Age})$ depending on the player's age based on the regression results in Table 2



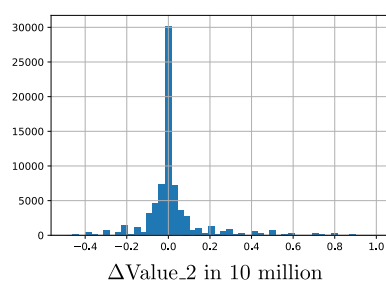
(a) Relationship between the relative value increase and the current market value.



(b) Relationship between the absolute value increase and the current market value.



(c) Distribution of the relative value increase between the 2.5% and 97.5% quantiles.



(d) Distribution of the absolute value increase between the 2.5% and 97.5% quantiles.

Fig. 3 Comparison of the distribution of relative and absolute market value increases. (The plots are for the example of two rounds after the current round, but the results hold true for all rounds)

Correlation matrix

See Table 7.

Table 7 Correlation matrix of the unrestricted dataset as used in Sect. 5.3. Absolute correlations below 0.05 are omitted, above 0.5 are printed in italics and between 0.3 and 0.5 are printed in bolditalics

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1.00																
(2)	1.00	0.05	0.15		0.16	0.15	0.12	0.10	0.19	0.16	0.15	0.08		-0.10		-0.06
(3)	0.05	1.00	0.78		0.14		-0.17	-0.10	0.08	0.08	-0.16	-0.25		0.06	0.13	
(4)	0.15	0.78	1.00		0.05		-0.14	-0.08		0.13	-0.28	<i>-0.36</i>		<i>0.45</i>	<i>0.38</i>	
(5)				1.00						0.10	-0.27	<i>-0.32</i>		<i>0.42</i>	<i>0.33</i>	-0.05
(6)	0.16	0.14	0.05		1.00				0.12	0.09		-0.07	0.13		0.10	
(7)	0.15					1.00	0.19	0.15	-0.32	-0.21	0.10	0.25	-0.08	0.16	-0.23	-0.19
(8)	0.12		-0.17	-0.14		0.19	1.00	0.14		-0.14	0.21	<i>0.30</i>		-0.11	-0.18	-0.08
(9)	0.10		-0.10	-0.08		0.15	0.14	1.00			0.12	0.16		-0.07	-0.11	
(10)	0.19	0.08			0.12	-0.32			1.00	0.62	0.08	-0.24	0.16	-0.32	0.27	0.16
(11)	0.16	0.08	0.13	0.10	0.09	-0.21	-0.14		0.62	1.00	-0.09	-0.35	0.09	-0.20	0.24	0.08
(12)	0.15	-0.16	-0.28	-0.27		0.10	0.21	0.12	0.08	-0.09	1.00	0.61	0.08	-0.29	-0.22	-0.15
(13)	0.08	-0.25	-0.36	-0.32	-0.07	0.25	<i>0.30</i>	0.16	-0.24	-0.35	0.61	1.00		-0.20	-0.40	-0.15
(14)					0.13	-0.08			0.16	0.09	0.08		1.00	-0.08	0.08	
(15)	-0.10	0.06	<i>0.45</i>	<i>0.42</i>		0.16	-0.11	-0.07	-0.32	-0.20	-0.29	-0.20	-0.08	1.00	0.16	

Table 7 continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(16)		0.13	0.38	0.33	-0.05	0.10	-0.23	-0.18	-0.11	0.27	0.24	-0.22	-0.40	0.08	0.16	1.00	0.13
(17)	-0.06						-0.19	-0.08		0.16	0.08	-0.15	-0.15			0.13	1.00
(18)		0.05				0.18	-0.11	-0.06		0.14	0.11	-0.07	-0.12	0.07		0.14	0.28
(19)	-0.09	0.05	0.22	0.16	-0.05	0.12	-0.44	-0.24	-0.14	0.42	0.28	-0.26	-0.46	0.12	-0.05	0.46	0.27
(20)	-0.11	-0.05	0.05	0.05		-0.16	0.07			-0.18	-0.16	-0.07	0.07	-0.06	0.25	-0.06	0.15
(21)	-0.05					-0.08	-0.08	-0.06				-0.07	-0.07			0.08	0.20
(22)						-0.05											0.06
(23)	-0.09	-0.08				-0.15				-0.08	-0.07		0.06			-0.05	
(24)						-0.09											
(25)		-0.10	-0.11	-0.12		-0.08	-0.06			0.06		0.05	0.13		-0.14	-0.08	0.06
(26)						-0.10											
(27)	0.07	0.31	0.07	0.12	0.05		0.10				0.06				0.06		-0.07
(28)																	
(29)																	
(30)																	
(31)																	
(32)	0.51	0.06				0.08	0.05	0.07	0.07	0.22	0.15	0.06					
(33)	0.14					0.05				0.12	0.09				-0.06		

Table 7 continued

	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)
(1)		−0.09	−0.11	−0.05		−0.09				0.07					0.51	0.14
(2)	0.05	0.05	−0.05			−0.08		−0.10		0.31					0.06	
(3)		0.22	0.05					−0.11		0.07						
(4)		0.16	0.05					−0.12		0.12						
(5)		−0.05								0.05						
(6)	0.18	0.12	−0.16	−0.08	−0.05	−0.15	−0.09	−0.08	−0.10						0.08	0.05
(7)	−0.11	− 0.44	0.07	−0.08				−0.06		0.10					0.05	
(8)	−0.06	−0.24		−0.06											0.07	
(9)		−0.14													0.07	
(10)	0.14	0.42	−0.18			−0.08		0.06							0.22	0.12
(11)	0.11	0.28	−0.16			−0.07				0.06					0.15	0.09
(12)	−0.07	−0.26	−0.07	−0.07				0.05								
(13)	−0.12	− 0.46	0.07	−0.07		0.06		0.13							0.06	
(14)	0.07	0.12	−0.06													
(15)		−0.05	0.25					−0.14		0.06					−0.06	
(16)	0.14	0.46	−0.06	0.08		−0.05		−0.08								
(17)	0.28	0.27	0.15	0.20	0.06			0.06		−0.07						
(18)	1.00	0.20	−0.06			−0.05										
(19)	0.20	1.00	−0.11	0.11	0.05	−0.07	−0.06			−0.11						

Table 7 continued

	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)
(20)	-0.06	-0.11	1.00	0.36	0.12	0.05									-0.07	
(21)		0.11	0.36	1.00	0.13											
(22)		0.05	0.12	0.13	1.00											
(23)	-0.05	-0.07	0.05			1.00	0.55	0.12	0.37						-0.09	-0.06
(24)		-0.06				0.55	1.00	0.06	0.56	0.15						
(25)						0.12	0.06	1.00		-0.06						
(26)						0.37	0.56		1.00	0.17						
(27)		-0.11					0.15	-0.06	0.17	1.00	0.05				0.06	0.05
(28)										0.05	1.00					
(29)											1.00					
(30)												1.00				
(31)													1.00			
(32)			-0.07			-0.09				0.06					1.00	-0.05
(33)						-0.06				0.05					-0.05	1.00

(1) Value; (2) Age; (3) Height; (4) Weight; (5) Footedness; (6) Minutes played; (7) Goals per 90; (8) Assists per 90; (9) Second assists per 90; (10) Passes per 90; (11) Successful passes; (12) Progressive runs per 90; (13) Dribbles per 90; (14) Successful dribbles; (15) Aerial duels per 90; (16) Successful aerial duels; (17) Sliding tackles per 90; (18) Sliding tackles successful; (19) Interceptions per 90; (20) Fouls per 90; (21) Yellow cards per 90; (22) Red cards per 90; (23) Transfer; (24) Δ Culture I; (25) Position change; (26) Return; (27) International experience; (28) Minutes played (AFC CL); (29) Minutes played (CAF CL); (30) Minutes played (CONCACAF CL); (31) Minutes played (Libertadores); (32) Minutes played (UEFA CL); (33) Minutes played (UEFA EL)

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Code Availability The programming codes in Python and R are available upon reasonable request.

Declarations

Conflict of interest The authors have no Conflict of interest to declare that are relevant to the content of this article.

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