

Does the quality of a youth academy impact a football player's market value?

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ABSTRACT

Purpose: Football clubs invest in the implementation of scientific insights that improve the quality of youth academies. In the long run, clubs expect their youth academy investments to result in better trained players. The purpose of this paper is to quantify the impact of the attended youth academies' quality on future market values of a player.

Design/methodology/approach: A dataset containing 94 players, trained in 13 different academies, has been constructed. The dataset contains characteristics of the players and information on the quality of their attended academies. The impact of the quality of the attended academy on players' future market values was estimated empirically through multiple regression analysis.

Findings: The quality of a youth academy has a significant positive impact on a player's market value, which is correlated with higher future wages for players and transfer fees for clubs.

Research limitations/implications: Clubs are advised to pay sufficient attention to investments in their youth academy. This will eventually lead to better trained players and higher revenues. Players in turn should strive to be part of the best academies that provide good training and the opportunity to become a top-earning player. For policy makers, such as football federations, the results imply that stimulating club investments in academies can lead to better national team performances.

Originality/value: The impact of the quality of a youth academy on an individual professional football player's career has never been quantified in the literature before. To this end, a new variable has been constructed using scientific assessments of youth academies.

Keywords: football; talent development; player market value; youth academy; multiple regression analysis.

JEL classifications: L830, Z220, Z260.

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1. Introduction

European football clubs' youth academies play a crucial role in the development of players with potential to play in first teams. The talent development that takes place in these academies is an important determinant of club, but also national team success. The German football association acknowledged the need of high-quality academies after their disappointing EURO 2000 tournament. Ultimately, investments in youth football resulted in their national team consistently reaching the semi-finals of the major national team competitions from 2006 until 2016 (DFL, 2011) and winning the 2014 World Cup. The German experience is indicative of the long-run value and impact of youth academy investments.

Available academic research focuses on the two main functions of a youth academy. The first is talent prediction and identification, i.e. nature (Reilly et al., 2000). Second, an academy needs to develop the talented players so that they realise transition to first teams, i.e. nurture. Factors influencing player development have been identified by Mills, Butt, Maynard and Harwood (2012), Pauwels (2016) and Van Hoecke, De Knop and Schoukens (2009). In order to develop talents successfully, clubs need a good organisational structure and a strong link between the academy and the first team (Relvas et al., 2010).

What remains unclear however is the impact of the quality of a youth academy on an individual professional football player's career. A club invests to improve academy quality and develop young talents, but the pay-offs for players and club are not yet quantified in the literature. For sports managers, it is important to know the magnitude of benefits, if any, for the players and the club.

In order to investigate this new subject in the academic literature on youth football academy management, the impact of attended youth academy quality on the future market value of professional players is empirically estimated in this exploratory study. The market value of a player is defined as "an estimate of the amount of money a club would be willing to pay in order to make this athlete sign a contract, independent of an actual transaction" (Herm, Callsen-Bracker & Kreis, 2014, p. 484). In turn, this market value has been proven to be positively correlated with players' on-field performance and salary (Torgler & Schmidt, 2007), whereas for clubs, this is an indication of the potential return on youth development expected from future transfers.

Unfortunately, no detailed data was available on player salaries or individual on-pitch performances per match, such as aggregate player scores per match, determined by objective data (as opposed to more subjective scores of different journalists). Therefore, the scope of this exploratory research is limited to the impact of youth academy quality on player market values. The following research question has been formulated: "What is the impact of the attended youth academies' quality on the future market value of a player." Based on the literature, the research hypothesis in this paper is that the impact of academy quality on future player market value is positive. Intuitively, academies of a higher quality, i.e., with a better strategic vision and structure, better trainers, infrastructure and training methods, are expected to train talents better and prepare them better for a professional career, which should ultimately lead to higher player market values. It is expected that not only the intrinsic talent of a player matters, but also how these talents are trained and developed (Carmichael, Forrest, & Simmons, 1999). In this paper, the proposed hypothesis is tested using OLS multiple regression analysis, based on a newly collected dataset.

The structure of this paper is as follows. The next section presents a literature review about high-quality football academy management. Section 3 explains the

methodology applied in this paper to analyse whether applying this knowledge results in a higher market value of the trained players. The data are described in Section 4. In Section 5, the results from the analysis are discussed. The managerial implications are given in Section 6. Section 7 presents the conclusions, some limitations of this research and suggestions for future research.

2. A literature review on high-quality management of youth academies in football

In this section, the state of the art in youth academy management research is presented, in order to explore the concept and measurement of youth academy quality. First, the importance of youth academies to create value (profit and / or strong on-field performances) in European football is explained. Afterwards, the objectives and choices a club has to make to shape and organise its youth academy in order to create this value are discussed. Finally, the scientific academy quality assessment method that is used by Double Pass (2020), a Belgian academic spin-off specialised in youth academy assessments and consulting, is explained.

2.1 Creating value in professional football

In general, two different objectives are seen among professional football organisations: profit maximisation or on-field performance optimisation given a budget constraint (the maximum amount of money a club can spend during a season). Some clubs combine both objectives in their weighted objective function (Kessenne, 2000; 2014). In some leagues, the budget constraint is formalised by rules, such as a salary cap or UEFA's Financial Fair Play (FFP) rule. On the one hand, a salary cap limits the total amount a club can spend on total team or individual player wages, in absolute terms or as a percentage of a club's income (Kessenne, 2014). Examples include LaLiga in Spain and

Major League Soccer (MLS) in the US. On the other hand, FFP imposes that own, internally-generated revenues should be used to finance expenditures, including player wages and transfer fees (UEFA, 2015). In practice, clubs in Europe are not always able to satisfy this budget constraint, leading to financial turmoil for some of them (Ascari & Gagnepain, 2006; Kuper, 2021). Clubs, like any professional organisation, require healthy financials to pay for their production factors (Di Minin, Frattini, Bortoluzzi, & Piccaluga 2014). Players are one of these production factors to create a sports event (Borland, 2006). The adopted objectives of the club will have an impact on the budget allocated to talent acquisition and development.

Clubs need a strong first team with talented football players in order to create value. To this end, the club can choose from, or combine four recruitment strategies, one involving talent development and three involving talent acquisition on the transfer market. These strategies are: (1) develop own talents in a youth academy, (2) acquire and further improve young talented players, (3) acquire (or hire for a short period) players close to retirement, after they have passed their best level, while at the same time they have a lot of experience to add to the team or (4) acquire (or hire for a short period) players at their best. Strategy (1) involves investments in youth academy infrastructure and trainers (FIFA, 2016b), whereas strategies (2) and (3) involve low to moderate transfer sums and strategy (4) involves the highest transfer sums, but not necessarily the highest guarantee for success. For a club, the performance and financial return (i.e., on-field results and the revenue from player sales)¹ on their investment are

¹ Also revenues from merchandising and ticketing might be impacted by better youth players being part of the first team, but the exact effects are more difficult to quantify.

crucial metrics to assess their talent recruitment strategy. (European Club Association, 2012b)

If clubs with limited budgets do not want to rely on older free agents or short-term loaned players alone, they are obliged to adhere to the first talent recruitment strategy and invest in a youth academy. Two options are then still available. On the one end, young players can be developed from the moment they make their first steps on a football pitch. On the other hand, 15 to 21 year old talents can be lured away from other academies (European Club Association, 2012b).

Well-trained youth players do not only offer an alternative for expensive transfers, they also improve the average quality of the game (Poli, Ravenel & Besson, 2015b). In this way, youth football is fundamental for the development of the sport. In order to be successful, clubs, football associations, leagues and other policy makers such as governments need to coordinate their work together. The talents of tomorrow need to be trained, and that is exactly what happens in the broad basis of youth academies in many different clubs. Additionally, as in other economic sectors, it is important to give young people opportunities to grow and gain experience. To this end, a good talent development environment, with the right regulatory framework and reward and compensation system is required.

For the youngsters, the most difficult, but at the same time most important step, is the transition from the youth teams to the first team of a club. First-team football is entirely different from youth football, with less margins for error, less space on the field and a shorter decision time for actions. Therefore, a good transition process is required to guarantee sufficient players to make it into the club's first team, while reducing their inclination to move to other clubs or even not reaching any professional first team at all (European Club Association, 2012a).

2.2 Strategic youth academy decisions: objectives, structure and building blocks contributing to academy quality

The main objective of a youth academy is creating an optimal environment for young talents to maximise their probabilities of transitioning to a first team of a football club as a professional player. This requires an academy to focus on developing football-related characteristics.

Football development takes place on an individual and team level (Double Pass, 2020). However, in society, an academy is often considered a place where minors develop their social skills and personality (Samuel, 2012). As a result, developing non-football-related capabilities, such as general knowledge, social and mental capabilities and their personality, is important (European Club Association, 2012a). In that light, a youth academy is not only influenced by the tradition, philosophy and ambitions of a club, but also by the cultural, social and pedagogical background of the country in which the academy is situated (FIFA, 2016b).

The support environment and club operations (e.g., maintenance of facilities) are other determinants of academy quality (Double Pass, 2020). Samuel (2012) highlights the importance of attracting the right staff, such as coaches, doctors and psychologists, in order to shape the youngsters according to the academy's values. Next to this, infrastructure is crucial to offer all required facilities to the players. This involves pitches, training material, a sporting complex, etc., but even a boarding school and a canteen in some cases. Finally, detecting talent for the academy at an early age requires a well-developed scouting department, including a philosophy, scouting tools and of course scouts.

The strategic vision regarding an academy is important for successful talent development. Every football club has a different strategy with different accents in order to manage its youth academy successfully (European Club Association, 2012a). For

instance, the academy of Anderlecht aligns training schemes of different age groups to the physical capacities of the players at these ages (Gault, 2015). This is necessary to make optimal use of the stamina of the players and reduce physical recuperation periods (Rebelo, Seabra, Oliveira & Krustup, 2014).

According to Relvas et al. (2010), clubs can choose between two approaches to fit their academy within the club structure. As a consequence of the first team being the main revenue driver of clubs, many clubs organise everything in the interest of their first team. As a result, the academy gets limited attention and resources. Recruiting youth players for the first team is rather a happy coincidence, than a strategic objective for them. Due to a weak link between the youth and the first team, transitioning between the youth and first team is difficult. Such a strategic choice is often reinforced by first-team coaches being evaluated on short-term results. Since fitting youth players in a first team requires some adaptation time before the results follow, this short-term inspired evaluation process blocks long-term thinking and reduces first-team playing opportunities for youth players.

An alternative approach is that the club is managed as a whole, with the youth academy having a full-fledged position within the organisational structure of the club. This allows better aligning development objectives of the academy and first-team objectives and results, leading to transition facilitation (Relvas et al., 2010). Hence, cooperation between the first team and the different youth academy departments is a crucial condition for youth development success (FIFA, 2016a). Moreover, if clubs want to secure long-term cooperation with key academy staff members, clubs need to pay sufficient attention to their youth academy and recognise its strategic importance as part of a club. To this end, a culture of giving first-team opportunities to youth players and allowing these players to grow is required (Walters, 2013). A lack of such a culture is a more frequent cause of the failure of a youth academy than the lack of talent. Also,

fluent and open internal and external communications are necessary (Van Hoecke et al., 2009). Moreover, success stories of youth team trophies or successful youth players in the first team can motivate a club to further invest in and pay attention to its youth academy (Real Madrid C.F., 2020).

Poli, Ravenel and Besson (2015a) moreover highlight the importance of a balanced squad in terms of age and experience, in order to facilitate players transitioning from the academy to the first team. Without too many yearly incoming transfers, youth players that join the first team get more opportunities to play with and learn from the more experienced players. As a result, the future revenue from youth player transfers can be higher. Also, first-team stability leads to better results on the pitch in the long run. Hence, the easy, short-sighted solution of acquiring players on the transfer market, which indicates a lacking long-term club strategy, can have many long-term disadvantages (Poli et al., 2015a).

During the last decade, the strategic importance of a youth academy for European clubs has grown as a result of two recent UEFA regulations (European Club Association, 2012a). Financial Fair Play limits among other things transfer budgets of clubs. As a result, European clubs are encouraged to pay sufficient attention to developing youth players (UEFA, 2015). In addition, the Homegrown Player Rule, which holds for clubs in the UEFA club competitions, as well as in some domestic competitions, limits the size of first-team squads. Out of a maximum of 25 players, eight players should be locally trained, making the development of youth players a formal prerequisite for those clubs (UEFA, 2016).

2.3 A scientific academy quality assessment method

Initially, Van Hoecke (2000) developed the IKGym framework with the objective to evaluate clubs' youth academy quality and implement total quality and performance

management in sports. To this initial framework, additional dimensions were added by Schoukens and Van Hoecke (2005). The resulting (Foot) PASS (Professional Academy Support System) instrument was further developed by on field practice and research. It is an application of Total Quality Management and Performance Management for youth academies in team sports (Peljhan & Marc, 2018).

The academy quality assessment scores of Double Pass (2020) are based on the Foot PASS instrument, using a framework to analyse and assess youth academies. This framework is displayed in Figure 1. It involves a number of European standards for good-working academies, grouped in nine dimensions (see Figure 1). The summed, weighted scores for each of the standards, which do take a correction for club revenues into account, result in the aggregate academy quality assessment score. The assessment scores are based on ISO's evaluation by standards principle.

FIGURE 1 ABOUT HERE

ISO's evaluation by standards principle is also used in the study of Pauwels (2016) to find out what defines the standards of youth development in European football. Pauwels (2016) used a sequential mixed method explanatory design, involving 85 quantitative surveys and 20 semi-structured interviews with club academy managers.

In order to verify whether implementing the existing state of the art academy management insights in youth academies actually pays off, an empirical analysis is made in this paper. The methodology is presented in the next section. The way how the academy quality scores are used in this research is described in Section 4.

3. Methodology

The ordinary least squares (OLS) multiple regression method is used to be able to calculate the impact of the quality of the academies a player attended during his education period on his market value. The impact of a vector of independent variables

and relevant interaction effects X (e.g., academy quality) on the dependent variable Y (i.c. market value) is calculated by empirically estimating the equation

$$Y = \alpha + \beta'X + \varepsilon, \quad (1)$$

with α the intercept, β' the vector of coefficients related to the X -variables and ε the random error term. The other relevant X variables and some additional information about the Y variable are presented in Section 4, supported by the available literature.

A similar OLS regression approach has been used by Carmichael and Thomas (1993), Reilly and Witt (1995), Speight & Thomas (1997), Medcalfe (2008) and Ruijg and Van Ophem (2015) to determine the impact of a number of factors on transfer market values in the UK and by Eschweiler and Vieth (2003) in Germany.

Some conditions need to be satisfied in order to calculate OLS estimators as done by Frick (2007). First, no correlations between the error terms may be present. Second, strong correlations between explanatory variables should be avoided. Such multicollinearity would impede correct coefficient interpretation and its absence can be checked by verifying that the variance inflation factors (VIFs) of the coefficients are below 10 (Greene, 2012). Third, heteroscedasticity, i.e. a different error term variance for different observations, may lead to incorrect conclusions about the significance of coefficients as a result of wrong standard errors. To this end, the Brown and Forsythe (1974) test is used to verify the absence of heteroscedasticity. In this study, the model coefficients have been calculated and the hypothesis tests have been executed using the JMP Pro 13 software from SAS.

4. Data

To carry out the analysis, a cross section containing 94 complete player observations from the season 2016-2017 has been constructed. Unfortunately, no data from previous

or later seasons was available to this first, exploratory study. However, Reilly and Witt (1995), Medcalfe (2008) and Ruijg and Van Ophem (2015) showed that for such initial, exploratory research as a basis for follow-up research, one season of data can be sufficient.

To obtain the data, only the academies owned by clubs playing uninterruptedly in a national first division of one European country in the seasons 2012-2016 are considered, to exclude the impact of relegation or promotion on the findings, and because full data are available only for the highest division. Due to this, the resulting group of players in the dataset becomes more homogeneous. The data had to be anonymised as it contains information on player academies, obtained from projects carried out by Double Pass (2020).

Players that were part of the selected clubs' academies for at least three years,² and who moved from one such youth team into a first team of the same or another professional football club between 2012 and 2016,³ have been selected. Finally, those players for whom it was not possible to retrieve accurate market values, were removed from the dataset. These are the players who were no longer part of a first team of a professional club in the 2016-2017 season. Of the resulting 189 observations, 95 were omitted due to data unavailability on parts of their youth education trajectory. Since the given selection procedure focuses on the best players only, a robustness check to the selection procedure is required (see Section 5).

² This is to guarantee a sufficient impact of the youth academy on the formation process of the player (exposure to the academy).

³ This is to guarantee data availability.

The dependent variable in this research is the *MARKET VALUE* of a player at the end of the 2016-2017 season, which is available independently of a transfer and negotiations between clubs and player agents. The market value estimates of Transfermarkt (2018) were proven to be of high quality for academic research (Herm et al., 2014; Peeters, 2018). Although it would have been interesting to use data on players' salary and on-field performance, this data was not available for this research. As a result, the impact of youth academy quality on the latter two variables could not be estimated. This impact can only be assumed similar to the impact on market value, as market value has been proven to be strongly correlated with salary and on-field performance (Torgler & Schmidt, 2007).

The selection of independent variables is supported by the available literature and an expert interview with Double Pass (2020) staff members. Carmichael and Thomas (1993) already highlighted the positive impact of a player's performance on market value. Carmichael et al. (1999) and Serna Rodríguez (2020) consider the number of season *GOALS* and *ASSISTS* to have a positive impact on the dependent variable. These variables are easy to gather, but are not well suited to measure the performance of defenders or goalkeepers (Eschweiler & Vieth, 2003). According to Hughes et al. (2012), on-field performance indicators should be position dependent. As Richau, Follert, Frenger and Emrich (2010) show, many offensive and defensive metrics play an important role for different positions. For instance, goals are the most important determinant for the market values of attackers, whereas assists are more important for midfielders. Defenders are strongly judged on age, but also shots, passes, clearances, duels and interceptions play a role. Unfortunately, these more detailed statistics, which also influence the value of attackers and midfielders (Serna Rodríguez, 2020), were not consistently available for this research.

Moreover, the number of total professional playing minutes (*PROFMIN*) is collected, as experience improves the market value of a player (Müller et al., 2017; Serna Rodríguez, 2020). The impact of this variable on player market value is hence expected to be positive. This variable is preferred over minutes in the considered season, since the total number of minutes involves a lower risk of inducing endogeneity in the model than using the number of minutes in one season. Such endogeneity might be caused by reverse causality of higher-valued players being given more playing time in the considered season, whereas this effect is expected to be lower in the long run, as players with limited playing opportunities can then change clubs.

Subsequently, Medcalfe (2008) and Poli, Ravenel and Besson (2017) include the total number of national team appearances (caps). This accounts for the potential positive impact of exposure from these matches on player market value. In this research, *CAPS* are multiplied by FIFA ranking points to include weighing that accounts for the greater difficulty to play in world's best national teams.

Although some club-related variables can be omitted due to the use of market value as the dependent value, sporting performance of the player's team should be retained as an independent variable in such models, as it is expected to have a positive impact (Felipe et al., 2020; Richau et al., 2010; Ruijg & Van Ophem, 2015). As a proxy of a player's current team strength, the average market value of the team's other players (*AVGTEAMVALUE*) is included in the model. It is expected that playing with good team mates improves a player's performance. Since in this research, market values are considered rather than actually paid transfer prices, only the value of the current team could be considered. No proxy on the negotiation power of the buying team could be included (Carmichael & Thomas, 1993).

Next, Speight & Thomas (1997) state that age relates to performance, experience and player potential that still needs to be developed. Dendir (2016) shows that a player

reaches his physical top at an age of 25 to 27 years. After this age, physical capabilities decrease, but experience still increases (Eschweiler & Vieth, 2003; Poli et al., 2015a). Hence, *AGE* and its square (AGE^2) are included to account for this specific impact on market value. Its effects are expected to be positive and negative respectively, since players gain more experience and become wiser by ageing, but at the same time their physical traits also weaken after a certain age (Dobson & Gerrard, 1999; Serna Rodríguez, 2020).

The final independent variable included, which is not used in the existing literature, is the youth academy quality (*QUAL_ACAD*). It measures the weighted average annual quality of the academies to which the player has been exposed. This is the main independent variable of interest in this research. Since detailed quantitative appraisals of youth academy quality are not publicly available, these unique but confidential data were obtained from Double Pass' projects, and anonymised. The framework used for calculating the academy quality assessment scores has been described in Section 2.3. For the academies considered in this research, a new assessment took place every three years. For each player, an average annual academy score is calculated, weighted by the duration the player stayed in a particular academy. This approach is needed, since players generally do not stay in one academy for the entire length of their youth training period. As a consequence, the standard errors could not be clustered at the academy level. As stated in Section 1, the research hypothesis in this paper is that this academy quality has a positive impact on future player market value.

Performance variables that are not frequently used and that were not included in this research either due to a lack of data are among other things the number of successful passes (Herm et al., 2014), the number of fouls (He, 2015) and the number of cards (Ruijg & van Ophem, 2015). Other player-related variables that could have a

positive impact on market value, such as being ambipedal (two-footed) (Herm et al., 2014; Bryson, Frick & Simmons, 2012), player height (Fry, Galanos & Posso, 2014) and popularity of a player (Franck & Nüesch, 2012), have been omitted due to a lack of data availability or potential endogeneity problems.

Table 1 lists the descriptive statistics of the collected variables. In this section, the expected impacts of the independent variables on the dependent variable have been described. They are summarised in Table 1 too, and are expressed by the expected signs of their coefficients in the model. These expectations are also in line with the signs in the correlation matrix in Appendix A.

Table 1 about here

5. Results and discussion

The OLS regression coefficients of the four models with the best adjusted R^2 are given in Table 2. The VIF of all variables are below five, indicating the absence of multicollinearity problems. Model (2) omits the non-significant variables *goals* and *assists* from model (1) to verify coefficient stability. Since heteroscedasticity is present in models (1) and (2), alternative models without heteroscedasticity are estimated as robustness checks. To this end, models (3) and (4), using only the observations of 42 players in a first national division club in 2016-2017, are estimated. This results in a more homogeneous group of players in the sample. As a result, in these models (3) and (4), the homoscedasticity hypothesis is not rejected at the 5% level, whereas the conclusions remain robust. Another advantage of these models is that they offer a robustness check with respect to the selected sample of players, as half of the observations have been omitted.

Table 2 about here

The signs of the control variables are in line with the expectations derived from the literature. As an addition to the literature, this model supports the hypothesis that players being trained by better youth academies have a significantly higher market value in their career [$p < 0.01$]. This market value has in turn been proven to be positively correlated with salary and performance by Torgler and Schmidt (2007). Hence, the research hypothesis is accepted. Including the centred interaction effects controls for the impact of the strength of a player's team and the total playing minutes during the professional career on the first order effect of academy quality. The significant positive coefficient [$p < 0.01$] of the interaction effect with average team market value illustrates the continuation of education through gaining experience in a strong first team after transitioning.

The positive impact of academy quality on market value is expected to be due to academies of higher quality educating the players better, i.e. nurture. This in turn affects the players' future first-team performances positively and in that way enhances their future market value. A potential bias of the academy being a quality label is expected to be limited, since the academy scores vary over time and are not publicly available. Moreover, the nature effect of best academies recruiting the most talented players at an early age has a very limited impact on the finding. This is supported by the fact that the Double Pass (2020) academy quality score is not significantly correlated with the number of points earned by the Under-17 team of the considered clubs in their respective leagues.⁴ This result is plausible, as the best young talents are often divided

⁴ The Under-17 category is the youngest age category on which consistent league results are available. The younger the players, the larger the impact of nature over nurture. Market values are however unavailable for this age group.

over the top academies of first division clubs according to their regional provenance. The supporting random effects panel regression results with robust standard errors of 13 first division clubs for the time period 2012-2016, i.e. four seasons, are included in Appendix B. Finally, the potential bias of the best clubs recruiting players from the best academies, boosting players' market values, has been avoided too. The correlation between *QUAL_ACAD* and *AVGTEAMVALUE* is negative, and the model controls for this interaction effect.

6. Practical implications

Based on the results, it is beneficial for both clubs and players to have high-quality football academies. A club investing in improved youth education with better staff, infrastructure, knowledge or analytics and business management software to have better processes within the academy and better integration with the club's other departments, benefits in various ways. First, it should be able to benefit financially from player transfers, as player market values go up. Second, investing in long-term, sustainable academy quality leads to the development of stronger players for the club. When they make it to the first team, the necessity of acquiring additional players on the transfer market is lower on the one hand, and afterwards, these home-grown players can be sold at a higher price on the other hand. Even wealthy clubs, such as Real Madrid C.F. (2020), seem to acknowledge this. Strong results in their youth teams lead to (a) the club wanting to invest even more in the youth academy, (b) some excellent first-team players (e.g., Lucas Vázquez, Daniel Carvajal and Nacho Fernández) and (c) some other talented youth players that could be sold for a nice amount of money (e.g., Achraf Hakimi), leading to additional funds for future investments on the transfer market or in the club's organisation.

These results have also important implications for players. These athletes should strive to be part of the best academies, because this improves their market value. Since market value is positively related to player salary and on-field performance, as Torgler and Schmidt (2007) argued, being part of good academies prepares players in the best possible way for their future professional football career. If they want to be among the best performing and earning players, they need to be trained in the best possible circumstances. To this end, making independent academy assessments publicly available can help young players and their entourage to make better decisions. At the same time, transparency within the sport would increase.

Finally, policy makers can make use of the results in this paper as well. Stimulating investment in education is expected to be beneficial for football federations too, as their (future) national (team) players will become better, potentially leading to better performances in international tournaments. The additional money that is generated can then be reinvested in football education programs or other football-related projects. Moreover, the general quality of the sport will increase further when the players are better trained in the academies. This can lead to increased interest of more people in football, in turn attracting more money to the sport, that can be invested in the further development of football.

7. Conclusions, limitations and future research

Although measures for improved football talent development have been researched extensively in the past, the impact of better youth academies for players and clubs has not previously been estimated empirically. The results in this paper indicate that current professional players who have been part of a better youth academy, have a higher market value. This market value is strongly related to the players' salary, on-field performance and potential transfer revenues for their club (Torgler & Schmidt, 2007).

However, due to a lack of data, a direct positive impact of youth academy quality on these latter two variables could not be verified and is left for future, in-depth explanatory research. Nevertheless, based on the findings in this research, policies stimulating investment in sports players' education are potentially beneficial for players, clubs and football federations.

Future research estimating academies' investment and operational cost functions, in combination with this paper's results, would allow clubs to determine their optimal academy investment level. Furthermore, in explanatory, in-depth follow-up research, the presented model should be extended with more market value and academy quality observations per player. Data from multiple seasons, including players during their education, would allow for panel data estimation techniques, such as fixed effects estimations (Torgler & Schmidt, 2007). Moreover, having more data, as well as additional variables such as an on-field performance indicator and player salaries, would allow further exploratory research with a broader scope than possible in this paper. It might even be possible to focus not only on those players that made it to professional football, but investigate the impact of academy quality on all players' market value, football salary and on-field performance. In addition, it would also be interesting to verify whether those players that did not make it to professional football would drop the sport, continue to play for many years as an amateur player, or move into coaching, refereeing or some other role.

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Intentionally left out.

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Appendix A. Correlation matrix.

	<i>Market value</i>	<i>Age</i>	<i>Professional minutes</i>	<i>Avg. Team Value</i>	<i>Goals</i>	<i>Assists</i>	<i>Weighted Caps</i>	<i>Academy Quality</i>
<i>Market value</i>	1	-0.20	0.53	0.76	0.42	0.48	0.64	0.07
<i>Age</i>	-0.20	1	0.30	-0.34	0.18	0.02	0.03	-0.04
<i>Professional minutes</i>	0.53	0.30	1	0.30	0.42	0.38	0.51	0.08
<i>Avg. Team Value</i>	0.76	-0.34	0.30	1	0.29	0.31	0.60	-0.07
<i>Goals</i>	0.42	0.18	0.42	0.29	1	0.78	0.36	0.12
<i>Assists</i>	0.48	0.02	0.38	0.31	0.78	1	0.36	0.17
<i>Weighted Caps</i>	0.64	0.03	0.51	0.60	0.36	0.36	1	-0.18
<i>Academy Quality</i>	0.07	-0.04	0.08	-0.07	0.12	0.17	-0.18	1

Appendix B. Random effects panel regression results (dependent variable = *LeaguePoints_U17*).

Variables	Coefficient	Robust Std. Error
<i>CONSTANT</i>	33.23 (***)	10.9
<i>QUAL_ACAD</i>	.231	.153
<i>R² between</i>	0.22	
<i>N</i>	51	

Notes: 13 clubs and 4 seasons included (2012-2013, 2013-2014, 2014-2015 and 2015-2016); (***) Significant at the 1% level.

Table 1. Descriptive statistics.

Variables	Mean	Std. Dev.	Min.	Max.	Hypothesis
<i>Market value</i>	€2.37 M	€5.33 M	€0.100 M	€35.00 M	
<i>Age</i>	21.83	1.325	18	24	+
<i>Professional minutes</i>	3 167	2 636	0	13 585	+
<i>Avg. Team Value</i>	€1.69 M	€2.69 M	€0.123 M	€14.12 M	+
<i>Goals</i>	1.60	2.182	0	9	+
<i>Assists</i>	1.83	2.823	0	13	+
<i>Weighted Caps</i>	1 076.30	4 278.0	0	30 220	+
<i>Academy Quality</i>	65.36	6.933	42.3	79.3	+

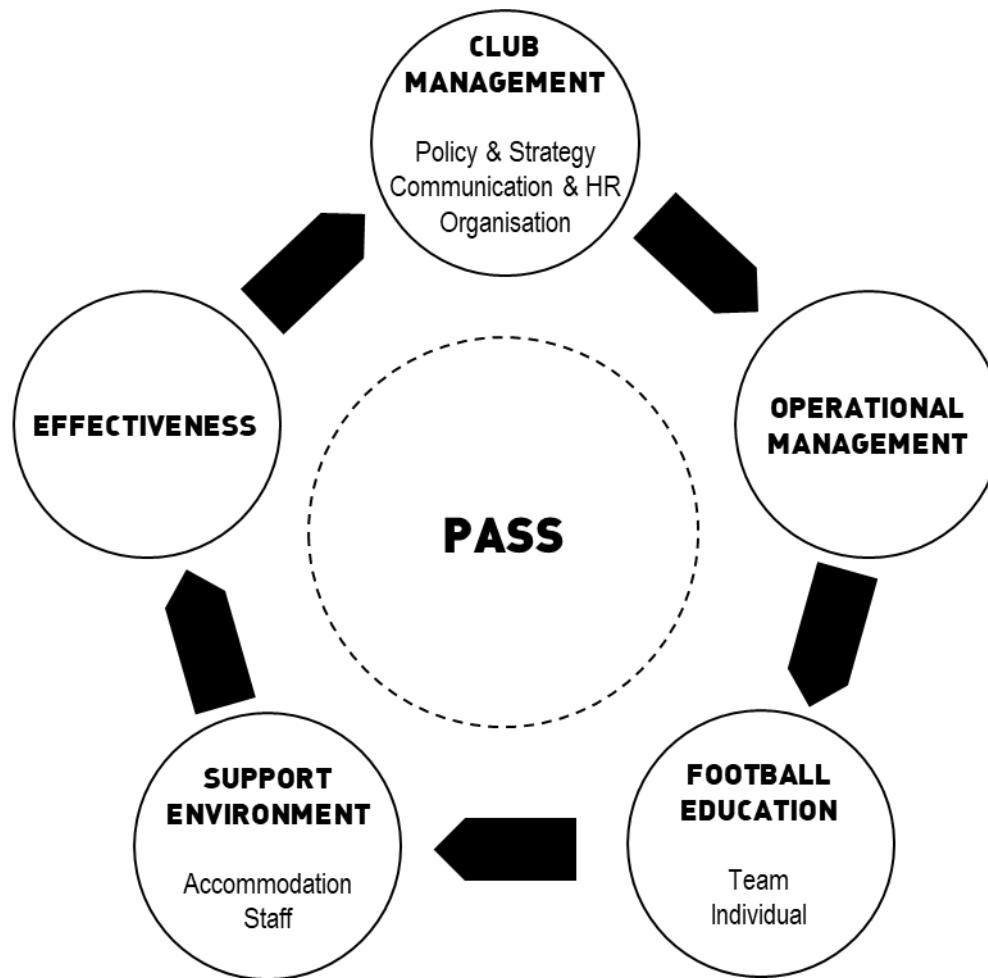
Note: ^{*} Age² is expected to have a negative impact.

Table 2. OLS Regression results (dependent variable = *MARKET VALUE*).

Variables	(1)		(2)		(3)		(4)	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
<i>CONSTANT</i>	-1.48×10 ⁸ (***)	5.28×10 ⁷	-1.44×10 ⁸ (***)	5.29×10 ⁷	-1.98×10 ⁸ (***)	9.45×10 ⁷	-2.06×10 ⁸ (***)	9.47×10 ⁷
<i>AGE</i>	1.33×10 ⁷ (***)	4.84×10 ⁶	1.27×10 ⁷ (***)	4.84×10 ⁶	1.74×10 ⁷ (**)	8.74×10 ⁶	1.80×10 ⁷ (***)	8.76×10 ⁶
<i>AGE</i> ²	-3.12×10 ⁵ (***)	1.11×10 ⁵	-3.00×10 ⁵ (***)	1.11×10 ⁵	-4.15×10 ⁵ (**)	2.04×10 ⁵	-4.32×10 ⁵ (***)	2.04×10 ⁵
<i>AVGTEAMVALUE</i>	1.09 (***)	0.13	1.11 (***)	0.14	0.90 (***)	0.24	0.90 (***)	0.23
<i>PROFMIN</i>	360.71 (***)	117.90	402.93 (***)	117.20	653.52 (***)	225.00	696.12 (***)	224.03
<i>CAPS (weighted)</i>	468.21 (***)	96.67	513.10 (***)	95.22	427.94 (***)	158.45	507.52 (***)	150.09
<i>QUAL_ACAD</i>	1.02×10 ⁵ (***)	3.82×10 ⁴	1.20×10 ⁵ (***)	3.76×10 ⁴	2.43×10 ⁵ (***)	7.56×10 ⁴	2.76×10 ⁵ (***)	7.29×10 ⁴
<i>GOALS</i>	7.54×10 ⁴	1.85×10 ⁵			2.38×10 ⁵	3.89×10 ⁵		
<i>ASSISTS</i>	1.47×10 ⁵	1.40×10 ⁵			1.14×10 ⁵	2.62×10 ⁵		
<i>QUAL_ACAD</i> × <i>AVGTEAMVALUE</i>	0.11 (***)	0.02	0.11 (***)	0.02	0.11 (***)	0.03	0.11 (***)	0.03
<i>QUAL_ACAD</i> × <i>PROFMIN</i>	18.09	15.10	21.87	15.05	30.12	24.28	34.39	24.39
<i>Adjusted R</i> ²	0.82		0.82		0.81		0.81	
<i>N</i>	94		94		42		42	

Note: (**) Significant at the 5% level, (***) Significant at the 1% level.

Figure 1. The framework to analyse and assess youth academies, used by Double Pass



Source: Double Pass (2021).