

## Article

# Human Capital and Eco-Contractual Governance in Small Farms in Poland: Simultaneous Confirmatory Factor Analysis with Ordinal Variables

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**Abstract:** Human capital (HC) plays an important role in modern agriculture. The difference in efficiency of assets explains only about a half of the economic performance of agricultural farms, while the other half relies on HC. Although education and training are the main components of HC, it may also be viewed from the perspective of behavioral theories that were taken under consideration in this study. The role of HC in sustainable farming has not been sufficiently explained when it comes to contractual governance (CG). In this study, the meaning of contractual governance was extended and the eco-contractual governance (ECG) concept was proposed, which stands for CG induced by agri-environmental contracts. The main objective of the article is to confirm the latent concepts of HC and ECG and to verify their correlation in view of the standards imposed by the agricultural policy. To achieve this goal, a structural equation model was developed and simultaneous confirmatory factor analysis with ordinal variables was carried out based on the sample of 674 small farms in Poland. The analysis has confirmed a relatively strong correlation between HC and ECG. It was revealed that training plays a crucial role in this relationship, while economic dependence on agricultural policy weakens the effectiveness of both HC and ECG.

**Keywords:** sustainable agriculture; human capital; small farm; SEM; CFA; polychoric correlation; ordinal variables; contractual governance; theory of planned behavior; TBC



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## 1. Introduction

There are many factors determining the competitiveness and development possibilities of business units, sectors, and economies. Nowadays, human factor endowment seems to be one of the key elements of development, especially when knowledge-based economy and endogenous growth theory is considered. Since Schulz [1] and Becker [2] published their famous research, human capital (HC) has become the research focus for many individuals and institutions. The concept of human capital itself, however, is not clearly defined. It is assumed that human capital is concerned with abilities, skills, and acquired skills, which determine the development of enterprises as well as states and regions. Although, there is general consensus in the literature that education and training are the main drivers of HC, other indicators are less obvious. The cognitive approach suggests that self-efficacy (the self-efficacy theory, SET, as formulated by Bandura [3]) can be perceived as the 'hidden' human capital or non-cognitive skills [4] or accumulation of human capital [5]. Self-efficacy is part of the self-system comprising a person's attitudes, abilities, and cognitive skills, according to Bandura's concept and is developed through mastery and vicarious experiences, social persuasion, and the emotional, physical, and psychological well-being. Hence, training, education, and various types of social participation including cultural events may be associated with this notion [6–8].

The role of the human factor has also been analyzed in relation to the agricultural sector and farms. The farm's performance does not depend solely on classical production factors such as assets, land and labor, but also on human capital. Thus, the farmers' knowledge, their experience, or qualifications influence the accuracy of the farmers' decisions. As Parman points out: "Human capital plays an important role in modern agriculture, helping farmers use a chosen set of inputs efficiently and improving a farmer's ability to choose between different sets of inputs, outputs and technologies" [9] (p. 317). The difference in efficiency of assets accounts for about one half of the economic performance of agricultural farms, and the other half is determined by the quality of the human factor [10–12]. The human factor is analyzed in many aspects involving agricultural activities and its role has been surveyed in the context of sector [13] and farm level [14,15] in both developed [16,17] and developing countries [18].

In some studies, HC in agriculture has been perceived from the perspective of the theory of planned behavior (TPB) according to which behaviors related to sustainable and environmental farming practices are addressed [10,19,20]. To the best of our knowledge, however, there have been no studies in the area of agricultural economics that have explored the impact of HC on farm performance treated as a contractual governance structure rather than a simple production unit. The contractual governance is a well-established notion [21] embedded in transaction cost economics (TCE). The use of the TCE framework was thoroughly developed by Hubbard [22] and has had several applications ever since [23–26]. The core of the TCE approach is to perceive any firm (including farms) as a nexus of contracts designed to reduce transaction costs. Hence, economic activities such as sharecropping, contracting, vertical integration, consulting, certification, participation in cooperatives, and so on, have emerged as responses to transaction costs. This is a broader approach than the classic production structure perspective since the said nexus encompasses not only economic resource management, but also the processes of distribution and purchase of means of production.

As agricultural activities are connected with the management of natural resources and incorporated in sustainable development, we extended the notion of contractual governance by adding the 'eco-' prefix. Therefore, the eco-contractual governance (ECG) is defined as contractual governance induced by agri-environmental contracts (AEC) in which public authorities are one of the parties (e.g., the European Union). Thus, such a governance structure consists of three components: market contractual integration (MCI), policy contractual integration (PCI), and public goods-oriented eco-efficiency (PGEC). The PGEC reflects the environmentally adjusted efficiency of the management of resources. Typically, the efficiency is a ratio of economic output (agricultural products value) to capital, land, and labor input. In this case, it is assumed that the output also includes, apart from the market value of products, the environmental public goods required by AEC. Hence, PGEC is directly correlated with PCI. We believe that the above concept is particularly suitable for small farms. The issue of small farms also creates a dilemma in light of the new Common Agricultural Policy (CAP) 2021–2027. Should they only play the role of 'landscape guardians' while being buffered by public support condemning them to economic stagnation, or should they persevere in converting to ecological production to improve their added value? Such small-scale farms are mainly located in Central and Eastern European countries such as Poland and Romania. Even though their agricultural sectors are characterized by highly fragmented land, the agricultural sector continues to play a relatively important role in maintaining jobs.

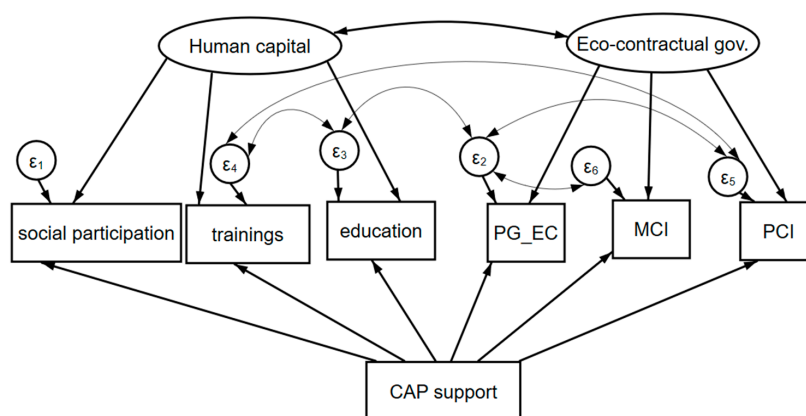
The main objective of the article was to verify the correlation between HC, which is manifested by cultural and social participation, training and education, and ECG under standards that have been shaped by the EU's agricultural policy. To achieve this goal, a structural equation model (SEM) was developed and a simultaneous confirmatory factor analysis (CFA) with ordinal variables was carried out based on polychoric, polyserial, and Pearson's correlations. We employed the results of surveys carried out in 2018 in Poland on a group of 674 small-scale farms. Our contribution to the literature is to develop a

framework for the concept of eco-contractual governance and also to better understand the driving factors of contractual governance from the perspective of human capital in agriculture.

## 2. Theoretical Background and Literature Overview

### 2.1. Human Capital Indicators

We can support the concept of the assumed latent HC variable by both the theory of planned behavior and self-efficacy theory framework. According to the TPB, behavior is guided by its favorable or unfavorable evaluation—the so called attitude toward the behavior (A), subjective norms (SN), and perceived ability to perform the behavior—so called perceived behavioral control (PBC). A measure of perceived moral obligation [11] is also sometimes incorporated in the TPB model. In general, the more favorable the attitude and subjective norm and the greater the perceived control, the stronger the intention to display a given behavior should be [10,17,20,27,28]. Although in our theoretical model we did not measure A, SN, and PBC directly by asking farmers for their subjective judgement, we engaged observable variables that corresponded to the respective TPB components. In particular, we assumed that farmers' PBC was built through vocational training and participation in social and cultural events as indicated by SET. We also assumed that the Common Agricultural Policy has created SN. In new Member States that joined the EU in 2004, there is a Single Area Payment Scheme (SAPS) under CAP. The area payments are associated with the general principle of good agricultural and environmental conditions (GAEC), which is subject to on-site inspection by a government agency. If any deficiencies are found, a farmer may lose their payments. As far as additional support from an agri-environmental scheme (AES) is concerned, farmers sign an environmental contract and cooperate with the designated supervisor who advises them on environmental management solutions. In the case of conversion to organic farming, a farmer must follow the practices and methods defined in the EU Organic Regulation (EC Regulation No. 834/2007), which are also subject to frequent inspections. Still, it is not the only potential control that affects the farmers' behavior. In the case of small farms and fragmented agriculture, which we investigated in this work, the opinion of neighbors is essential. In Poland, farmers, especially in small villages, 'keep an eye on each other'. There are frequent reports to government agencies on the alleged non-compliance with CAP rules, which is why CAP has also triggered bottom-up processes of controlling the standards and has been shaping SN concerning farm practices. We also assumed that attitudes are shaped in the course of an educational process [29,30], which leads, for example, to knowledge playing an important role in the individual's choice pertaining to decision making [31,32]. Behavior-related knowledge can be understood as knowing how to present the intended behavior and to apprise the perceived effectiveness of a specific behavior [33]. It should be stated, however, that our assumed relation does not give any information on how the attitudes are oriented toward environmental issues. This is why we drew an additional covariance path between 'education' and PGEC, assuming that its coefficient will indicate whether or not these attitudes are conducive to the environmental performance of a farm (Figure 1). It should also be underlined that attitudes are influenced by many factors [34] and can be partially learned and are partially innate. In this context, Bourassa [35], for example, proposed that individual differences in landscape preference can be determined by cultural factors (learned behavior), biological factors (innate behavior), or a combination of the two [36]. Referring to previous studies in the field of agriculture, different relations between the three components of the TPB and behavioral intentions can be found. In some surveys, attitudes, subjective norms, and perceived behavioral control have positive and significant impact [37–40], while in other studies, the attitudes [41,42], the subjective norms [10,43], or the perceived control [44] were insignificant.



**Figure 1.** Structural equation model (SEM) for human capital and eco-contractual governance under Common Agricultural Policy (CAP) influence. Notes: For the description of variables, see Table 1; one side arrows indicate regression; two-side arrows indicate covariance. Eco-contractual gov. stands for eco-contractual governance, MCI—market contractual integration, PCI—policy contractual integration, PGEC—public goods-oriented eco-efficiency.

**Table 1.** Statistics and description of variables (*n* = 674).

Description	Variable Levels/Score	Level Frequency
<b>‘CAP support’—dependence on state support (share of support in agricultural income)</b>		
<20	1	0.199
21–40%	2	0.493
41–60%	3	0.205
61–80%	4	0.064
>80%	5	0.040
<b>‘Education length’—length of education of farm managers in years</b>		
None, less than 8 years	1	0.001
Primary, 8 years	2	0.052
Junior high school, 6 + 3 years	3	0.006
Basic vocational school, 8 + 2/3 years	4	0.445
Secondary vocational/technical school, 13 years, vocational exam	5	0.349
Secondary high school, 12/13 years, secondary school leaving exams	6	0.031
College/university, more, than 13 years	7	0.116
<b>‘Training’—regular vocational training/lifelong learning of family members</b>		
Nobody	1	0.537
One family member	2	0.332
Two family members	3	0.120
Three or more family members	4	0.010
<b>‘Social participation’—participation in cultural and social events including rural society events, festivals, cinema, theater performances, concerts, exhibitions, professional organization events</b>		
Never	1	0.364
1–2 times a year	2	0.377
3–4 times a year	3	0.184
5–10 times a year	4	0.061
More than 10 times a year	5	0.015

Table 1. Cont.

Description	Variable Levels/Score	Level Frequency
<b>'MCI'—strength of market contractual integration, 1–17 points cumulative score; mean = 10.521; min = 5.2; max = 15.2</b>		
<i>Share of market sales in total agricultural output</i>		
<20%	1	0.044
21–40%	2	0.086
41–60%	3	0.099
61–80%	4	0.220
> 80%	5	0.552
<i>Value chain for agricultural products (level of structure hierarchy weighted by the share of respective channels)</i>		
<ul style="list-style-type: none"> <li>The farmer delivers to a point of purchase or to processing plants; or the intermediary collects produce from the farmer;</li> </ul>	1	0.818
<ul style="list-style-type: none"> <li>The farmer delivers directly to the wholesaler or retailer's store;</li> </ul>	2	0.019
<ul style="list-style-type: none"> <li>The farmer sells himself at the marketplace, or directly from the farm; or at festivals, markets, fairs</li> </ul>	3	0.135
<i>Contract type for market sales—sale risk management</i>		
<ul style="list-style-type: none"> <li>Sales without previously signed contracts;</li> </ul>	1	0.743
<ul style="list-style-type: none"> <li>Sales based on short-term contracts;</li> </ul>	2	0.162
<ul style="list-style-type: none"> <li>Sales on the basis of long-term—multi-annual or periodically renewed contracts, including sales within a producer group or cooperative;</li> </ul>	3	0.095
<i>Contract type for purchases of means of production—purchase risk management</i>		
<ul style="list-style-type: none"> <li>No transaction for means of production</li> </ul>	1	0.128
<ul style="list-style-type: none"> <li>Most of the means of production come from suppliers without long-term contracts</li> </ul>	2	0.754
<ul style="list-style-type: none"> <li>Most of the means of production come from the market from permanent suppliers bound by long-term contracts</li> </ul>	3	0.119
<i>Contractual bargaining power from farmer perspective</i>		
<ul style="list-style-type: none"> <li>The terms and conditions of the contract are determined mainly by the buyer</li> </ul>	1	0.501
<ul style="list-style-type: none"> <li>The terms and conditions of the contract are determined by the farmer and the buyer to the same extent</li> </ul>	2	0.408
<ul style="list-style-type: none"> <li>The farmer sets the terms of the contract—price, quality, sales date, place of sale, etc.</li> </ul>	3	0.091
<b>'PCI'—policy contractual integration, share of environmental schemes; continuous variable; mean = 13.64%; min = 0%; max = 75%</b>		
<b>'PGEC'—public goods-oriented eco-efficiency DEA score; bias corrected inverted Farrell output-based measure under VRS; continuous variable; mean = 0.365; min = 0.058; max = 0.674</b>		
<i>Outputs (production value and public goods induced by AEC)</i>		
<ul style="list-style-type: none"> <li>Total agricultural output (value in PLN): mean = 53,284.79; min = 5000.001; max = 220,000</li> <li>Share of permanent grassland (% UAA): mean = 19.55; min = 0.00; max = 100.00</li> <li>Winter arable land coverage (% of arable land): mean = 41.56; min = 0.00; max = 100.00</li> <li>Soil organic matter balance (synthetic index): mean = 1.48; min = −1.40 *; max = 5.411</li> </ul>		
<i>Inputs</i>		
<ul style="list-style-type: none"> <li>AWU—all work unit: mean = 1.566; min = 0.121; max = 3.961</li> <li>Land (ha): mean = 13.58; min = 1.51; max = 40.191</li> <li>Operating capital (fertilizers, pesticides, energy) in PLN: mean = 13,125.73; min = 0.03; max = 69,051.6</li> <li>Fixed capital-composite equipment index 0–1: mean = 0.2903021 min = 0.1 max = 0.715</li> </ul>		

\* As DEA needs positive values of outputs to each soil balance score, a similar constant value was added to make all of them positive.

## 2.2. Human Capital as a Determinant of Environmental Performance and Integration Link of Farm to Market

The farmer decides, to some extent, whether an agricultural activity is more or less environmentally sustainable, which is determined by human capital endowment. We assumed that human capital manifests itself by: (i) education length, (ii) training, and (iii) participation in social and cultural events. We used the TPB framework, with subjective norms and attitudes leading to a behavioral intention, providing that the human capital endowment dictates the perceived behavioral control. The farmers' PBC is built through vocational training and, to some extent, through participation in social and cultural events as above-mentioned. Joining the CAP in 2004 has created a new set of subjective norms toward farming practices and agribusiness between farmers and their families. The farmers' education shapes their attitudes, which are also impacted by social participation. Indirect influence of education is also important and is demonstrated by the fact that better educated farmers are more likely to develop their knowledge and search for information from extension agents, services, and leading farmers, for example, regarding new technologies and their implementation. They also appreciate knowledge more and expect more benefits from it [45,46]. According to Welch [47] increased education has an effect on labor productivity and an allocative effect on resources. The former is associated with the productivity growth of an educated farmer, while the latter means that a farmer has the capacity to choose a better combination of inputs and technologies in order to increase their production and is more likely to adopt new technologies [46,48,49]. That probability of acquiring a new technology by educated farmers seems to be particularly important in the context of climate change and farmers' activities in volatile conditions. To some extent, farmers need to work in the new conditions of risk and imbalance [50]. At the same time, in agricultural activities (including the choice or adaptation of technology), they strive (consciously or not, and partly "forced" by CAP) for a certain level of sustainability, which is manifested by the improvement of eco-efficiency (the latter is explained in detail in the Methods section). If, as Schultz [1] emphasizes, education facilitates the activities of entities under unbalanced circumstances, then the improvement of education as a "token" of higher human capital shall have a positive impact on the farms' environmental performance.

There is extensive literature devoted to issues of the contractual integration of farms and their involvement in market transactions [23,51–55]. From the perspective of our research, the relation between human capital and so called marketization is decisive. Education, as an expression of human capital, improves the farmers' ability to cooperate with other people and participate in group activities [56]. Better-educated and more self-conscious farmers are more aware of the benefits of vertical integrations and appreciate them more [57–59]. A positive relationship between the education level and the decision to join cooperatives were found for dairy producers in China [57] and in Thailand [60] and for vegetable producers in China [59]. It is worth signaling that cooperatives also play a significant role in facilitating access to education by increasing household income, which, in turn, enables covering educational costs. Sometimes cooperatives finance education and provide school infrastructure [61]. Researchers have pointed out the positive role of investment in human capacity to develop human capital, which allows farmers to become more prominent players on the market [14]. In spite of the positive relation between market integration and HC, it should be mentioned that the level of integration of small farms in Poland (and in other countries) is still very low, which may be linked to inadequate knowledge of the benefits of this type of activity (e.g., limiting production and price risk) and little willingness to cooperate [62,63]. A survey conducted among Polish farmers revealed that they did not engage in direct sales due to adverse legal provisions affecting them and weak awareness and understanding of these provisions [64].

## 2.3. Using Structural Equation Modeling (SEM) for Assessing Behavioral Determinants of Sustainable Farming

Structural equation modeling has been applied in many studies devoted, for example, to factors influencing consumer purchase of organic food in developing countries [65],



behavioral determinants of adopting new technologies by Scottish farms [66], motivating and challenging factors of implementation of organic farming in Iran [67], perceptions and responses to climate changes by Californian farmers [68], or factors determining mastitis in Belgian dairy herds [69].

### 3. Materials and Methods

#### 3.1. Data and Small Farm Definition

This study was based on a sample of 674 small-scale farms from 16 Polish provinces as determined by the stratified selection process. The sample was collected between January and March 2018 by a network of national agricultural extension officers providing data for the Polish Farm Accountancy Data Network (FADN). For the sake of clarity, no FADN data were used, but rather the FADN sampling methodology to determine the size of a sample of farms that met the criteria. As there is no single official definition of a small farm or small-scale farming, various criteria were used to describe them. In this study, a small farm was defined by its economic size. The recommendation for this dataset was to use the criteria of the FADN [70] for very small and small farms. It translates into an economic size of 4000–15,000 EUR of standard output. The standard output (SO), of an agricultural product is the average monetary value of the agricultural output at farm-gate price calculated in EUR per hectare or per head of livestock. There is a regional SO coefficient for each product, which is an average value over a reference period. The sum of all the SOs per hectare of crop and per head of livestock in a farm is a measure of its overall economic size expressed in EUR [71]. However, there is also an additional criterion: 75% of a farm's family work unit (FWU) must be engaged in farm activities. This criterion was introduced since our intention was to study only those farm households for which farming was the main economic activity. The number of small farms (i.e., those which have the so called standard output-average annual output value over a 5-year period, under 15,000 EUR) can be estimated in Poland at 1.1 million or 0.9 million if those below the 4000 EUR threshold are excluded (i.e., subsistence farms) and the total number of agricultural holdings in Poland equals 1.4 million. Hence, our random sample is representative at the 95% confidence level, 0.5 fraction, and 3% maximum error. For interpretation of our model results, EU FADN data were also used concerning the share of environmental schemes in total subsidies in small farms in Poland against the backdrop of other European countries [70].

#### 3.2. SEM Building and Variable Selection

The structural equation modeling (SEM) term does not describe a single statistical technique but refers to a family of related econometric tools [72,73]. SEM allows researchers to verify whether the pattern of covariances in data and regression between variables is consistent with the specified theoretical model. Let us consider the model depicted in Figure 1.

We tested whether the latent construct of HC and ECG, based on the studies with regard to applications of TPB and SET in agriculture [10,19,20,27], were correctly specified and what the correlation between them was. Hence, Hypothesis 1 (H1) *predicted that HC was positively correlated with ECG*. In addition, several hypotheses (covariances) were implemented as derived from the particular studies, CAP institutional solutions, and common knowledge:

- Hypothesis 2 (H2) ( $\varepsilon_3 \leftrightarrow \varepsilon_2$ ): *Education length is positively correlated with eco-efficiency [74–78].*
- Hypothesis 3 (H3) ( $\varepsilon_2 \leftrightarrow \varepsilon_5$ ): *PCI (agri-environmental schemes share) is positively correlated with eco-efficiency [75,79].*
- Hypothesis 4 (H4) ( $\varepsilon_2 \leftrightarrow \varepsilon_6$ ): *MCI is positively correlated with eco-efficiency [78].*
- Hypothesis 5 (H5) ( $\varepsilon_4 \leftrightarrow \varepsilon_5$ ): *Training is positively correlated with agri-environmental schemes share (agricultural advisory boards in Poland offer training dedicated to farmers who sign AES contracts).*

- Hypothesis 6 (H6) ( $\varepsilon_4 \leftrightarrow \varepsilon_3$ ): *Training is correlated with education, which may result both from the substitution of a higher level of education by vocational training and/or from the willingness to learn triggered in the educational process.*
- Hypothesis 7 (H7): *Dependency on state aid (i.e., CAP support share in income), perceived as SN with regard to TPB, influences all components of HC and ECG [80].*

Eco-contractual governance is a new concept coined in this study. As already mentioned, it consists of three components: MCI, PCI, and PGEC. The latter reflects the efficiency of resource management, referring to the adjusted production efficiency model [81], but with a new assumption that the output side also includes, besides the value of market products, public goods required by AEC. Hence, PGEC should also be directly correlated with PCI, which is depicted by the two-side covariance arrows between  $\varepsilon_2$  and  $\varepsilon_5$  (Figure 1).

In most studies, eco-efficiency is defined as the input-orientation ratio of the output (the value of products and services produced by a firm, a sector, or the economy as a whole) divided by the input (the sum of environmental pressures generated by the firm, the sector, or the economy) that is sought to be optimized by the input-oriented methods [74,76,79,82,83]. However, we argue that for small-scale farming, an output orientation that includes public goods (PGs) is much more suitable for the sustainable development of this sector and its agricultural policy objectives (i.e., simultaneously maximizing production and PG provision with regard to current inputs). Family farms and smallholder farms, in particular, may contribute to public good provision and also play an important role in supporting the local economy. Small farms should not act as ‘landscape guardians’ only while being maintained by public support that condemns them to economic vegetation. Small farms must strive to improve productivity for the well-being of local communities, social balance, and food security. For this reason, the output orientation focusing on agricultural output and public goods provision was applied following Stepień et al. [78]. To sum up, the results of the output-oriented approach are much more consistent with the desired direction of the development of small farms and better correspond to the realities of Central and Eastern European countries.

In light of the above, eco-efficiency was estimated by the DEA method (radial eco-efficiency). The output-oriented approach known as the BCC-O model [84] in the following multiplier form [85,86] (p. 13) was used:

$$\begin{aligned} \min q &= \sum_{i=1}^m v_i x_{io} + v & (1) \\ &\text{subject to} \\ &\sum_{r=1}^s \mu_r y_{ro} = 1 \\ &\sum_{i=1}^m v_i x_{ij} - \sum_{r=1}^s \mu_r y_{rj} + v \geq 0 \\ &\mu_r, v_i \geq 0(\varepsilon), \end{aligned}$$

where  $x_{io}$  is the input  $i$  used by object  $o$  ( $i = 1, \dots, m$ );  $y_{ro}$  is the output  $r$  used by object  $o$  ( $r = 1, \dots, s$ ); and  $\varepsilon$  is the infinitesimal constant;  $v$  is free.

DEA score was bootstrapped using the methodology of Badunenko and Mozharovskyi [87]. The outputs and inputs as well the rest of variables used in SEM are described in Table 1. As we mainly dealt with ordinal, observable variables and two continuous variables (see Table 1), our SEM needed to be fed with the polychoric and polyserial correlation matrix in order to not violate the linear regression assumptions [88,89]. When both correlated variables were ordinal, the polychoric correlation was calculated; when only one of the variables was expressed in categories and the other was continuous, the polyserial correlation was calculated; for two continuous variables, Pearson’s correlation was calculated [90] (for a description of the variables, see Table 1).



### 3.3. The Goodness of Fit

A key part of SEM involves testing the goodness of fit of the model, using multiple tests described in Table 2 [91].

**Table 2.** Fit statistics for structural equation modeling (SEM).

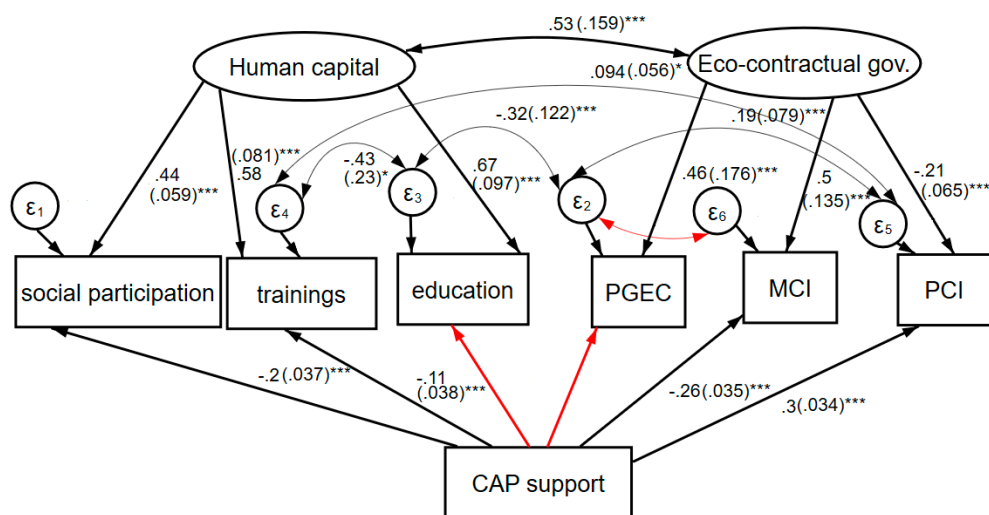
Measure	Name	Description	Obtained Values
Chi-Square	Chi-Square Model	It tests the null hypothesis that the estimated model is equal to the saturated one.	chi2(3) = 2.732 $p > \text{chi}2 = 0.435$
NFI (TLI)	(Non) Normed-Fit Index or Tucker Lewis Index	An NFI of 0.95 indicates the estimated improves the fit by 95% relative to the null model.	0.999
CFI	Comparative Fit Index	A revised form of NFI. Less sensitive to sample size.	1.000
RMSEA	Root Mean Square Error of Approximation	A parsimony-adjusted index. Values smaller than 0.03 represent excellent fit.	0.000
SRMR	Standardized Root Mean Square Residual	The square-root of the difference between the residuals of the sample covariance matrix and the hypothesized model.	0.010
CD	Coefficient of determination	Interpretation is similar to R-square	0.889

Source: [92].

The obtained statistics for our model are presented in the fourth column of Table 2 and indicate that the model was very well-fitted. There were no modification indices (MI) to report, as all MI values were below 3.842.

### 4. Results and Discussion

Figure 2 shows the standardized results of our model estimates.



**Figure 2.** Standardized SEM estimations for human capital and eco-contractual governance under CAP influence. Notes: Standard errors in brackets; Red arrows indicate insignificant relations; \*\*\*  $p < 0.01$ , \*  $p < 0.1$ ; Eco-contractual gov.—eco-contractual governance; MCI—market contractual integration; PCI—policy contractual integration; PGEC—public goods-oriented eco-efficiency.

The estimations confirmed most of the hypotheses represented by regression and correlations paths in Figure 1 with H1—confirmed; H2—confirmed; H3—confirmed; H4—not confirmed; H5—confirmed; H6—confirmed with negative direction; H7—confirmed, except the influence on education and eco-efficiency, and the CAP support impact turned out to be mostly negative excluding positive regression on PCI, which might have been expected.

The model revealed high determination coefficients, exceeding 0.88. The factor loads for latent variables were satisfactory ( $>0.3$ ), except the load for the PCI indicator. The latter was negative, which is the most striking finding. Nevertheless, the correlation of PCI with PGEC was statistically significant and positive, as expected. In light of the above, it can be concluded that the participation of small farms in AES in Poland does not foster MCI, although it supports providing non-market, environmental public goods. Under Polish circumstances, just like in other Central and Eastern European countries, AES and organic farming in the small farm sector proved to be non-effective in terms of integrating farms to the market. In Poland, year by year, fewer and fewer farmers are engaged in organic production. In 2013, there were more than 26.5 thousand organic farms, while at present, there are slightly more than 19 thousand, which contributed to the decrease in the area of organic crops, currently amounting to 484 thousand hectares. In comparison, in 2017, there were 10 thousand hectares more! Paradoxically, however, 2019 brought a record increase in demand for organic products in Poland and throughout Europe [93]. Initial estimates suggest that sales in Poland increased by over 20% to over 1.2 billion PLN. The discrepancy between the dynamics of domestic supply and demand for organic products shows that the problem is growing. The adoption of environmental schemes among small-scale farmers in Poland is significantly lower than in other European countries (Table 3). This means that they are relatively reluctant to adopt ecological practices and to capitalize on them by selling organic products, however, there is no clear answer why this is happening.

**Table 3.** Share of environmental schemes in total subsidies in small farms in Poland against a backdrop of other European countries (according to the Farm Accountancy Data Network).

Country/Economic Size of Farm in EUR Thousand (Standard Output)	2 < 8	8 < 25
UE15 (weighted mean)	8.3%	14.7%
(CZE) Czech Republic	na	25.3%
(EST) Estonia	28.1%	24.8%
(SVN) Slovenia	16.2%	24.4%
(CYP) Cyprus	23.8%	15.7%
(LVA) Latvia	15.5%	14.5%
(MLT) Malta	18.0%	13.1%
(HRV) Croatia	13.7%	12.0%
(LTU) Lithuania	5.7%	11.0%
(HUN) Hungary	7.5%	10.9%
(SVK) Slovakia	na	na
(BGR) Bulgaria	4.7%	8.8%
(POL) Poland	5.4%	6.1%
(ROU) Romania	0.0%	0.0%

Source [70].

The most important objective from the article's perspective is, of course, the coefficient of the correlation between HC and ECG, which proved to be significant, positive, and of medium strength. Therefore, HC is positively correlated with eco-contractual governance. This picture is complemented by mostly negative regression coefficients of agricultural policy, which is in line with the reports on the weak impact of SN on the farmers' behavior, as presented in the review section. An interesting observation was the negative correlation between education and PGEC. In accordance with the adopted assumptions, it proves that a longer education process does not translate into pro-ecological attitudes. Another puzzling aspect is the negative, significant relationship between training and education. It may be assumed that less educated farmers more often build their skills through vocational training.

The literature lacks studies with an identical approach to HC and contractual (eco)governance perceived by the farms' performance, as in our case. However, the relation between education and the environmental pressure of farms has been the subject of many studies. The conclusions drawn from them are not unequivocal. In some papers, education

had a positive effect on eco-efficiency [74–77], while [79] indicated that education was insignificant. According to Gómez-Limón et al. [75], farmers with secondary education were more eco-efficient than farmers with higher studies. Similar results were presented in the research of Picazo-Tadeo et al. [74] where university education does not need to be related to agricultural activities, or the farm was not the first source of income for farmers with higher education.

In the study by Gómez-Limón et al. [75], the positive influence of agricultural training toward eco-efficiency was significant for traditional mountain groves next to two other systems of olive farming in Spain. Brown and Ashman [94] argued that training contributed to the development of social capital that can help small farmers to protect their interests. As Latruffe et al. [95] underline, “human capital might be crucial for the future of Polish farming”. In their study, the total technical inefficiency was mainly affected by pure technical inefficiency, which, in turn, can be connected to inefficient management practices.

Therefore, the education and training of Polish farmers can be perceived as a vehicle to improve efficiency. Hence, it should be incorporated in policy strategy directed at strengthening sustainable development with the active participation of small farms.

In some papers dedicated to eco-efficiency, the positive relation between eco-efficiency and the participation in environmental schemes were also indicated. Other surveys [74,76,79] have confirmed our results. It is worth underlining that agri-environmental payments can compensate higher costs or lower revenues and the related agricultural practices can alleviate environmental pressure. This may account for the aforementioned positive relations. However, according to Godoy-Durán et al. [77], subsidies had no significant effect on eco-efficiency, which was explained by the scarce influence of public programs in the Spanish horticultural sector.

The participation of farmers in AES is voluntary, so the farmers’ willingness to participate in AES is crucial [96,97]. Still, some surveys indicate that voluntary participation is not effective enough considering sustainable environmental management [98]. This may, to some extent, account for the insignificant factor load that was obtained in the study. It is worth mentioning that according to some researchers, economic incentives are not crucial in AES participation as other benefits can be priorities or equal to financial gain [99]. In the literature, different factors influencing the participation of farmers in AES have been analyzed, for example, financial incentives; the farmers’ characteristics, attitudes, and preferences; the underlying financial, geographic, and regulatory context; and farm characteristics [97].

## 5. Conclusions

This article builds the human capital latent variable referring to the theory of planned behavior and self-efficacy theory and introduces a new concept of eco-contractual governance, which extends a typically perceived contractual governance by farm integration induced by agri-environmental schemes. The contractual governance induced by policy opens a new perspective for further research anchored in the background of NIE and TCE. Such a hybrid structure combining market and policy incentives of Williamson’s hierarchy may inspire the search for a new explanation of farm contractual integration going beyond transaction cost premises. The eco-contractual governance can also enrich the most common approach to farms (i.e., from the perspective of neoclassical production function that may oversimplify reality). The obtained results show that human capital matters in contractual integration and for public good oriented eco-efficiency, which is an issue of rising global importance. By 2050, the global population is expected to have increased to 9.7 billion [100]. At the same time, it is predicted that incomes in developing and emerging countries will also increase, resulting in a growing demand for food and changes in the structure of this demand. In contrast, the resources needed for agricultural production (such as land, soil and water) are threatened by environmental degradation and climate change. In this context, it is clear that the future belongs to more sustainable food systems, in which it would be possible to produce high-quality food without the

deterioration of the environment. It was hypothesized that eco-contractual governance is significantly manifested by three components: market contractual integration, policy contractual integration, and public goods-oriented eco-efficiency. The latter assumes that there are also public goods required by agri-environmental contracts on the output side next to traditional agricultural products. The analysis confirmed statistical significance of the above concept of governance, showing, however, the specificity of the functioning of small farms in Poland, where environmental contracts, while contributing to the delivery of public goods, do not foster integration with the market (that might occur e.g., by creating short marketing channels). Our research confirmed that eco-contractual governance is quite strongly correlated with human capital. At the same time, it was revealed that training plays a crucial role in this relationship, while economic dependence on agricultural policy weakens the effectiveness of both human capital and eco-contractual governance. Therefore, several recommendations can be formulated for policymakers. The current model of CAP support is mainly based on economic incentives. Still, as one can see, they are not enough to trigger the willingness to adopt ecological practices in small farms. Therefore, agricultural policy should offer more programs particularly aiming at human capital formation. Such programs should focus not only on the transmission of knowledge, but also on the farmers' attitudes, self-efficacy, and norms. Moreover, the policy should be more oriented toward supporting the marketization of public goods provided within agri-environmental schemes. This is a promising avenue for further research. Still, it must be borne in mind that our research is limited by the construction of unobservable variables, especially human capital, which is an ambiguous concept in itself.

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