Structural Change in Agriculture

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It is common sense that it needs social and economic perspectives to understand structural changes in agriculture. The current study asserts that, likewise, the integration of the farm level (micro), the sectoral level (meso), and the societal level (macro) are needed to gain insight into the system of agricultural structures.

structural change | mesoeconomics | farm succession | agricultural structures

1. Introduction

To adequately understand food production and food security in a given region, it is useful to comprehend the dynamics of the agricultural structure. In particular, the magnitude of farms in production matters for all three dimensions of sustainability, both in the Global North [1][2][3] and the Global South [4], but also the types of agricultural products produced and the types of land and infrastructure used contribute to current and future agricultural development. While agricultural economists always have theorized about factors leading to the dynamics of structural change [5][6], the empirical analysis of the number of farms in a given region is relatively recent. It emerged after the debate between the defenders of the family farm and proponents of an industrialization and partial collectivization of agriculture had ended, primarily as a result of the breakdown of socialism. Meanwhile, the factual statement that 90 per cent of all farms are family farms, producing 80% of all food [7], suffices to justify the scientific interest in agricultural structural change. Another requirement for the emerging research on this field was the development of computer technology in the late 20th century to quantitatively explain figures of farm numbers and average sizes, so that the 1990s saw the first major number of publications on structural change in agriculture, most of them from Europe (e.g., [8][9][10]). Since those early days of structural change research, many more case studies from almost all parts of the world have been added. Nevertheless, agricultural structures have neither made it into the mainstream of economic research nor into that of sociological sciences but are rather an example of a subject that only fully opens in the interdisciplinary discourse.

2. The Family Farm as Micro-Level

The family farm life cycle is key to understanding structural change in agriculture. Potter and Lobley [11] developed this concept to describe the sequencing of generations on a farm. Understanding the decisions that lead to farm succession is pivotal to a micro-level evaluation of structural change in agriculture.

Consider the day when an aged farm manager decides to enter retirement as an analytical starting point of the cycle. This decision may lead to three different outcomes, which all deserve closer consideration: one, the farm is

abandoned; two, the farm is transferred to a successor; three, the farm is split and transferred to several successors.

The literature typically refers to cases where successors are not available to take over farms, and this results in the subsequent liquidation of the farms, in relation to what were formerly collective farms in Eastern Europe and Central Asia after 1990, rather than in terms of family farms. However, there is a significant difference between both processes. The liquidation of large collective farms partly led to the fragmentation of land use patterns [12][13][14] and the abandonment of farmland [15][16][17]. Generally, the liquidation of family farms leads to the consolidation of the farm structure in the way that adjacent farms take over the lands, which enables the farms to grow [18][19].

In this context, there is a study from China [20] that sheds a first light on the added value of different levels of aggregation. Explaining the decision to stop cultivating, they compare the explanatory value at the parcel (natural conditions), household, and village levels. They concluded that 80% of the reason behind the decision to stop cultivating was attributable to the parcel level. The slope of the parcel, distance to the farmhouse, and soil quality were shown to be important determinants.

Although global statistics are not available on succession, it is likely that farm succession involving a single successor is the most frequent pattern. According to an Austrian survey performed by Quendler et al. [21], 98% of such transfers occur within the family. The dominance of intra-family successions is a global phenomenon, and it is likely that other global farm succession patterns involve the farm successors being first-born children [22][23][24], and more often than not, they are male [25][26][27]. Heggem [28] explains the latter phenomenon in relation to the perception by parents of the “tractor gene” of their male descendants.

Handing over a farm is considerably more than a legal formality. The emotional attachment to family traditions [29] and family land [30] may have a decisive impact on a potential farm successor. The perception that something valuable can be handed over to the next generation generates pride [31][32] and joy [33] for the retiring generation, and this is also the case for siblings who do not benefit from the intergenerational handover [34]. Compared to the abandonment of a farm, in fact, both retiring farmers and their children who do not take over usually pay for these positive affections by financial disadvantages, because the intra-generational handover of a farm is often compensated far below the market value [35][36]. Nevertheless, Morais et al. [37] reported that pressure is often placed on other family members to take over the farm as potential successors.

The third possibility, splitting the farm into more than one farm during the course of succession, is usually described in the literature as a typical option pursued in medieval times [38] and the early modern age [39]. Scholars in the Northern Hemisphere, in particular, have overlooked a major number of developing countries in which the number of children, in combination with the lack of non-agricultural income opportunities, has led to frequent farm divisions between several successors. This is the explanation for why numerous Third World countries face shrinking farm sizes, for example, a reduction from an average of 1.4 hectares to 1.0 hectare in Ethiopia between 1977 and 2000, respectively [40]. This pattern is occasionally mentioned [41][42], but it is rarely analyzed in a rigorous way, and it probably constitutes the largest research gap in the literature with respect to agricultural structure. A study by

Burton and Walford [43] was a notable exception to this rule; they wrote about the division of farms in the south east of England.

Taking over a farm and founding a family are often categorized as falling within the same life phase. In this context, Fischer and Burton [44] emphasized that a personal interest in farm succession usually emerges in the early phase of childhood. They identified a socially constructed endogenous cycle from many external influences on the process. Mann [45] showed how factors that impact an interest in taking over the family farm usually change over the course of adolescence and early adulthood. Identity-related variables, such as personal skills and preferences, are most important to adolescents. Later, environmental-related variables, such as the size of the farmland or the quality of the house, gain importance. The latter variables are sometimes specific to the region. In dry regions, like Australia, water security is a prerequisite for taking over a farm [46], whereas potential Spanish farm successors are negatively influenced by having to travel long distances to the urban center [47]. Regardless, considerable attention rests on the sons of farmers. Even though the pressure of taking over the farm was stronger for earlier generations [48], it remains a question that parents prioritize [49].

Farm managers can increase the likelihood of succession during this phase by effecting various measures, one of which is the transfer of extensive knowledge to the next generation since this increases the sunk costs for the latter [50]. Farm growth can also constitute preparations for the upcoming intergenerational succession process. Calus and van Huylenbroeck [51] traced such processes from the farm manager's forty-fifth birthday onwards.

While this elucidates the family farm life cycle (i.e., taking over the farm to handing it over to the next generation), an explanation of atypical farm successions has not yet been provided. Joosse and Grubström [52] focused on extrafamilial farm succession and concluded that such processes often preserved the continuity of the farm's strategy; conversely, successions within the family sometimes led to severe reorientation of the farm's organization. From a structural perspective, handing over farms to non-family members may be considered a tool with which to preserve the structure of small farms [53].

3. The Agricultural Sector as Meso-Level

The difference between the micro and meso-levels is that the focus shifts from a single enterprise with an individual family constellation towards the entire sector. In general, this allows for a top–down engineering approach. There is a thread of literature, dominated by Chinese scholars [54][55][56], that considers the planning of agricultural structure from an optimization perspective. However, even if the sectoral perspective is taken into account from a purely descriptive point of view, an additional value was identified by Hüttel and Margarian [57] (p. 760):
"The exclusive focus on isolated behavior of single farms in the relevant literature does not suffice in order to explain the different patterns of regional structural change. Quite the contrary, the continuous interaction among agents and failures of coordination in different historic environments need to be taken into account."

On this conceptual basis, Hüttel and Margarian used microeconomic models of oligopolistic behavior to model the strategies of farms in a region, together with their interdependencies.

An econometric explanation of indicators that are relevant to farming structures is a more conventional approach that constitutes a sectoral view of structural change in agriculture. While some scholars have considered the increasing specialization of farms [58] or farm size distribution [59] as noteworthy subjects, most studies have focused on farm number and farm size development, which are assessed according to three different methodological perspectives. Firstly, some scholars explain the structure of the persistence of single farms using probit or logit analysis [60]. Although this resembles the literature in the previous section, the focus is usually on factors that are relevant to the entire sector, not solely farm-specific characteristics. Secondly, the number of farms in a region or its average size can be explained by time series analysis [61]. Thirdly, as a compromise between these options, it is possible to explain the prevalence or average farm size of geographically or socially homogeneous farm groups [62].

The research performed by Neuenfeldt et al. [63] serves as a convenient starting point for a discussion of the meso-level perspective. Structural change in agriculture in the European Union was evaluated, and it was concluded that 36% of the variance in agricultural structure was attributed to the prior structure of the farm, 16% to natural conditions, 14% to farmgate prices, 9% to macroeconomic variables, 7% to subsidies, 6% to population density, and 6% to agricultural income. Despite the high value of its contribution, this study also demonstrated that the research design influenced the results. While it is obvious that the past farm structure influenced the current one, the chosen timeframe was the decisive variable. The farm structure today certainly determines the farm structure tomorrow by above 99 per cent.

The effect of farmgate prices, highlighted by Neuenfeldt et al. [63], was also confirmed in other studies [64]. The price of milk was demonstrated to have a particularly prominent role. On the one hand, milk price was an effective indicator of farm growth [65] and farm exit [66]; on the other hand, standard deviations in the price of milk also contributed to explaining structural change [67].

Regarding the role of agricultural policies, other studies on EU agriculture found that their effect on farm structures exceeded that of market forces [68]. Governmental transfers clearly slow down structural change [69]. Mishra and El-Osla [70] demonstrated that not only current support for the sector, but also anticipated future support, influenced the decision of whether or not to take over a parental farm. Taxing agriculture to fuel the industrialization of a country has been shown to accelerate structural change [70]. Under other circumstances, it has been proposed that land laws make a vital contribution to public policies in terms of structural change. This includes barriers to the ability of certain stakeholders to purchase land [71] but also the (re)distribution of state-owned land to private farms [72].

This finally leads us to the fact that structural change in agriculture does not only have causes that are worthwhile to be analyzed, but also economic and social impacts. In many cases, large farms have been shown to be more profitable than small ones [73]. Social networks in large farm structures have been demonstrated to switch from local to larger entities [74]. Thus, in some cases, structural change may lead to the disappearance of infrastructure, which is essential to the well-being of rural communities [75][76].

4. The Economy as Macro-Level

The core question of structural change in agriculture from a perspective that includes the entire economy relates to the range of interdependencies between farming sector dynamics and other economic sectors. The push–pull theoretical framework [77] proposes that developing non-agricultural sectors 'pull' workers out of the farming sector, and, simultaneously, technical progress within farming 'pushes' workers out of the labor force, as the amount of farmland remains constant.

It is the subject of economic debate as to whether either of these factors dominates the other. In support of the 'push' component of the theory, Gollat et al. [78] identified productivity growth in the farming sector as the main force behind the expansion of the non-agricultural economy. Similarly, Üngör [79] showed empirically that productivity growth in agriculture was decisive to structural change, although he (like Henderson [80]) considers the share of households being subsistence farmers as a limiting factor, as smallholders under some circumstances may not follow economic rationale. This goes along with the finding of Alvarez-Cuadro et al. [81], who suggested that a 'sticky' capital to labor ratio in agriculture was responsible for slow growth and a sectoral shift away from agriculture. Finally, cultural factors also play a strong role in the expulsion of workers from the agricultural sector. Swiecki [82] established that disinclination towards farm work was a strong driver of departure from the farming sector, particularly in poorer countries. Braun and Kvasnicka [83] demonstrated how immigration undermined the role of agriculture in an economy.

'Pull' factors significantly influenced structural change in agriculture. Alvarez-Cuadro and Poschke [84] showed that particularly in the first phase of industrialization until 1920, the pull factors have played the main role, whereas the progress in the agricultural sector only plays a dominant role for structural change in agriculture from 1960 onwards. Cavicchioli et al. [22] confirmed the importance of 'pull' factors in intersectoral shifts. They proposed that structural change in agriculture can be explained, to a large extent, by the inclusion of the local development of the non-agricultural labor market as a variable [22]. Another factor, locality, was the center of a case study in India [85] in which it was found that the rural non-agricultural labor market pulled farm workers away from the primary sector.

Vice versa, the push components have impacted economic development as a whole. The reallocation of former peasant workers into the secondary and tertiary sector in China was shown to stimulate factor productivity growth [86]. All this makes obvious that structural change in agriculture always mirrors technical progress in the farming sector. Typically, technical progress increases the capital to labor ratio, and invested capital in the sector tends to increase [87]. This reduction in labor input usually corresponds to an increase in farm size. However, when an in-depth evaluation of this association was performed, it was established that only a third of productivity growth translated into structural change [88].

In general, structural change reflects the expansion of the tertiary and sometimes the industrial sector at the expense of the agricultural sector. However, there are exceptions to this rule, as demonstrated by Spolador and Roe [89]. Land productivity in Brazil is high and continues to grow, together with agriculture's capital intensity in this

country. Thus, the share of Brazil's primary sector to GDP has remained constant. Kristensen and Birch-Thomsen [90] attributed such differences between countries to differences at the micro- and macro-levels.

Finally, Pensieroso and Sommacal [91] demonstrate that intersectoral shifts do not only have economic but also social impacts. In the USA, a decrease in the number of farm households was shown to strongly correlate with a reduction in the number of multi-generational households. More importantly, the role of agricultural productivity in combatting poverty exceeds the role of productivity in other sectors [92].

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