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Institutions and Agricultural Economics: a theoretical framework from Evolutionary Institutionalism

This paper aims to present central concepts of Evolutionary Institutionalism and to highlight analytical elements that may be useful for studies in agricultural economics. To this end, the study carried out a literature review based on the main references of institutional and evolutionary economics. The main analytical contribution of Evolutionary Institutionalism to agricultural economics lies in understanding economic relations from the perspective of human behaviour. Individuals become central to the analysis of the rural world, since they establish habits, behaviour patterns, and rules of conduct that, when interacting collectively, produce institutions. Thus, it is from the active role of the individual that rural dynamics emerge and consolidate an institutional environment and prevailing social structures. It is possible to point out some specific themes that emerge as potential applications of this line of thought: a) the analysis of the development trajectory of and institutional changes affecting different rural sectors; b) the role of habits, traditions and behavioural trends; c) power relations in agricultural markets; d) the evaluation of public policies for agriculture; e) innovation and technology as determinants of the evolution of routines, and f) the institutions “behind” the new relations of food production and consumption.

Keywords: Agricultural markets; evolutionary economics; original institutionalism; rural economy.

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Introduction

Agricultural economics is a branch of economics that investigates the relationships between rural organisations, markets, and the state, using the scientific method and economic theory to find answers to agri-food problems. However, this research area has maintained a certain conservatism in relation to its analytical assumptions, and although agriculture is a sector in continuous transformation, the specialised literature still maintains a close relationship with neoclassical economics and its “immutable” assumptions.

The emergence of neoclassical theory as part of the economic mainstream consolidated assumptions and methods for the economic understanding of rural dynamics starting in the late nineteenth century. The agricultural sector began to be analysed based on static supply and demand instruments, functions of diminishing marginal returns, profit maximisation models, and optimisation of resource utilisation. Over time, neoclassical assumptions such as substantive rationality, symmetric information flow, equilibrium, and competitive markets were added to the agricultural analysis.

During the 20th century, the rural world experienced intense transformations, changing both the productive structure of the agricultural sector and the individuals responsible for the development processes. Although these transformations gave rise to a new dynamic in agri-food markets, one very different from that found at the end of the 19th century, the dominant instruments of analysis of the rural economy remained practically unchanged.

The closer interaction of the rural with the urban, as well as the process of industrialisation of agriculture brought new characteristics to agricultural markets, disconnected from the assumptions of neoclassical economics, such as: dynamic behaviour, existence of imbalances, shocks and instabilities, asymmetry of information, productions focused

on tradition, culture and sustainability, the bounded rationality of individuals, the intense process of agro-industrial innovation, economies of scale and scope, market imperfections, new marketing arrangements, learning, the benefits of the interaction of individuals and the permanent influence of institutions.

Some transformations in the rural environment stimulated the application of heterodox concepts, as in the case of the role of institutions (as formal rules) and governance structures in the coordination of agro-industrial chains, based on the theoretical framework of the New Institutional Economics (NIE) (Williamson, 1993; North, 1990). However, in the NIE the static approach to analysis remains, and there is no prior institution to be explained. Institutions matter, but they are given within a general framework. From this perspective, there would be no prior cultural and social structure - there is no past (Hodgson, 1998).

It is believed that the assumptions of NIE and neoclassical instruments of analysis, such as estimation of supply and demand curves, elasticities, price transmission analysis, and scenario design remain relevant elements for the study of agricultural economics. However, they can be reconciled with a systemic and dynamic analysis, more compatible with the rural reality.

Original Institutionalism was born as a theoretical current at the end of the 19th century, seeking to recognise the importance of institutions and proclaim the need for a genuine evolutionary economy. This approach was called “original” to differentiate it from the NIE, which preceded it in the history of economic thought. His works offered different perspectives on the nature of the individual, based on the concept of habit, without the concern for a “theory of everything”, as in physics, but approaching a theory of change, like evolutionary biology (Hodgson, 1998). More recently, the literature concerning innovation processes

(neo-Schumpeterians) and the evolution of institutions (original institutionalists) have inspired evolutionary ideas and have demonstrated that the evolutionary perspective in economics can provide a useful theoretical framework for applied research (Dosi and Nelson, 1994). This recent approach, led by Geoffrey Hodgson, represents contemporary developments in the theory, culminating in the proposition of an Evolutionary Institutionalism.

This perspective of Institutionalism, even though it originated in the 19th century, only came to be used in rural studies more recently, based on interdisciplinary perspectives, which recognise the importance of institutions, from habits, traditions, and behavioural norms, as a fundamental part of the economic system, and not only as a given institutional environment, as determined by the NIE.

Thus, in the field of agricultural economics there is still a lack of research aimed at analysing problems based on the assumptions of Evolutionary Institutionalism. This means that the analysis should focus on the process of change, imbalances, the individual as an active agent, the importance of habits and customs, and the understanding of institutions and history as fundamental factors to understand the present and project the future. Therefore, this paper aims to present central concepts of Evolutionary Institutionalism and to point out analytical elements for studies in Agricultural Economics.

Institutionalism: origin and evolution

The expression “Institutional Economics” was first introduced by Hamilton (1919), who recognised that the economy should be understood by a theory of human behaviour, having institutions as the central element to explain it. The origin of this body of theory is due to the studies of Thorstein Veblen (1898), followed by Wesley Mitchell (1910) and John R. Commons (1931), who founded the school called Original Institutionalism.

The central concept of Original Institutionalism is the active character of the individual, viewed as a determinant in the evolution of economic life. It is from the individual and his collectivity that institutions originate: a fundamental element of the economic process. For Veblen (1898), institutions are individual thought habits established by common thought. Habits are the consequences of processes shared by a number of people in a given society.

The older the habit, the more legitimised it becomes; and the more a habit coincides with custom, the more persistently it will become fixed. The habit will be firmer if the special tendencies of human nature are tendencies already deeply involved in the vital process, or intimately connected with the life history of a given group (Veblen, 1899). If habits of thought transform the social structure, individuals become active agents in economic life and the direction of their individual activity is determined by their temperament, heredity, experience, and traditions. That is, through action, the agent also contributes individually towards modifying the environment in which he is inserted (Rutherford, 1998).

Veblen (1898) built a theory of change and sought to understand the effects of technical progress on the economy under a static state of equilibrium and under an evolutionary process (Hodgson, 1993). The ideas of Darwin’s Theory of Evolution were always present in Veblen’s works and Darwinism is found in the concept of institutions as units of selection (Hodgson, 2005), in the statement that the economy is “an infinite causal process of a cumulative nature without ever reaching equilibrium” (Hodgson, 1992, p. 290) and in the argument that “with the exception of the instinct of self-preservation, the propensity to compete is probably the strongest, most alert and persistent of the economic motives” (Veblen, 1899).

Economic history, in the Veblenian view, is a blind flight, in contrast to dialectical movements and the deterministic or progressing process. Thus, Veblen breaks with the teleological, finalistic future of Marxism and the Neoclassicals and the view that the economy moves toward a benevolent end; the economy is not based on equilibrium and the end is neither benevolent nor malevolent but depends on the angle used to interpret it (Dugger, 1988).

Original Institutionalism is a behavioural approach and analyses the behaviour of individuals when faced with choices. Choices are either voluntary or involuntary, imposed individually or by principles of collective action (Commons, 1934). John Commons was an important institutionalist who influenced the Behavioural Economics, New Institutional Economics, Post-Keynesianism and Regulation Theory (Hodgson, 1998). Commons (1934) strove to find a universal circumstance common to all behaviour known as institutional, and then defined an institution as collective action that controls, liberates, and extends individual action.

Collective action ranges from disorganised customs to social interests. The principle common to all links is the greater or lesser control, release, and extension of individual action through collective action, which results in a gain or a loss for another individual. Collective action is more universal in the organised form of customs than in the organised form of interests. Customs change over time, as the economic environment changes (Commons, 1934).

For Commons (1931), institutions determine what an individual can (or cannot), should (or should not) do, under collective sanctions. Thus, a world of institutions in the form of collective actions is a constantly changing world, in which the future becomes uncertain. It is worth noting that according to Commons (1934), the concept of institution forms established patterns of conduct, while in Veblen’s (1898) view the institution is more flexible and libertarian.

Evolutionary thinking can be found in John Commons in the way the author treats the role of the individual in economic transactions. For Institutional Economics to be evolutionary, a psychology of transactions rather than an individualistic and hedonistic psychology becomes necessary (Commons, 1934). John Commons’ thought stands out due to its search for a theoretical and methodological organisation capable of stimulating studies that are applicable to institutional economic realities. The legacies of his thought were: the construction of an institutional ontological character; the nature of the institutionalist theoretical environment; the consolidation of theoretical assumptions; and the search

to formulate a method of analysis. These efforts influenced the thought of Williamson (1993), who highlights Commons' contributions to the New Institutional Economics: dynamic view of institutions; formulation of the transaction as the basic unit of analysis; analysis of the relationship between the part and the whole; and a historical appreciation of how the habits, legal background and laws of a society evolve into a collective pattern of behaviour.

Evident in the ideas of Veblen (1898) and Commons (1934) is a break with the conception of the individual as "given", maximiser, and hedonist. They formulate an institutional theory that positions the individual as the agent of change through his common and collective habits of thought, which, over time, form the institutional structure.

The Development of an Evolutionary Institutionalism

The ideas of Original Institutionalism fell into disuse post-1930 due to the changes that occurred in the social sciences, especially those arising from the consolidation of the mathematical method and positivist philosophy. Within Institutional Economics, original thinking was nevertheless supplanted by the increasing theorisation and application of the NIE. However, starting in the 1980s, a group of academics reverted to the Original Institutionalism and brought it closer to being an evolutionary economic theory (Hodgson, 1998).

Led by Hodgson (1998), Rutherford (1998), Dugger (1988) and Samuels (1995), this movement has rescued the importance of the central concepts of Original Institutionalism, especially Veblen's, and brought them closer to the growing theoretical vigour of the neo-Schumpeterian tradition, developing an approach that can be called Evolutionary Institutionalism. The convergence between the institutionalist and neo-Schumpeterian schools resides in the evolution of institutions and their influence on technological change. Veblen's cumulative circular causation is nothing more than a synonym for evolutionary path dependence.

One of the main authors of this movement, Hodgson (1992) points out the main assumptions that guide Evolutionary Institutionalism and motivate researchers to use evolutionary metaphors in the economic field:

- a) the idea of a process of cumulative causation as opposed to descriptions of the economy as something that develops towards an equilibrium situation;
- b) the analogy between the natural selection process of biological organisms and the selective process in the social world;
- c) the taxonomic diversity of the economy through the diversity of individuals, variations, mutations, and dynamisms; and
- d) the need for an evolutionary analysis to include the three Darwinian principles of variation, inheritance, and selection.

From this perspective, the institutional body of theory is constituted by the emphasis on economic and social evolution. Culture has a dual aspect, as a cumulative process of causation and coevolution. Institutional analysis is pluralis-

tic, cannot be separated from historical analysis, and relates institutions, social structure, and the behaviour of individuals (Samuels, 1995).

When defining institutions, Veblen's influence is strong. Institutions are "habits of thought common to human beings generally" (Hodgson, 1992, p. 287). The habits of thought, which become routinised by a certain number of people in a society, are formed from instincts, which, in turn, are also formed by institutions, in a process of coevolution (Hodgson, 1992). In an evolutionary sense, habits and institutions have connective dimensions (today's situation forms tomorrow's institutions) and are analogous to genes in biology. The evolution of the social structure is consolidated as a process of natural selection of institutions (Hodgson, 1993).

The presence of biological analogies is evident. The idea of the evolution of institutions as a process of variation, inheritance and social selection is the central aspect of the recent development of the theory. In Rutherford's (1998) words, the evolution of institutions is determined by material conditions and the innate and persistent propensities of human nature. Instincts are the initial conditions for the cumulative evolution of habits and institutions. However, the crucial element is subsequent cultural development, where the environment regulates the thought and action of individuals. Habits of thought embedded in institutions are supported by social sanction, and can stabilise in the form of laws, making institutional schemes more permanent (Rutherford, 1998).

Thus, the culture, traditions, and behavioural norms of a people or nation are as or more important than its legal system. For Hodgson (1992), habits can be shaped or introduced by culture, everyday practice, and technology - a habitual line of conduct leads to a habitual line of thought. Habits of thought, in the form of institutions, are not founded simply on instincts, but also on culture and action (Hodgson, 1992), and last longer than individuals. Instead of trying to explain who came first, individuals or institutions, one should unravel the processes that led to the development of both (Hodgson, 1998).

In this sense, for Hodgson (1998) it is possible to trace common characteristics to the concept of institution in institutional theory:

- a) Institutions involve the interaction of agents;
- b) Institutions are formed by shared habits and routines;
- c) Institutions sustain and are sustained by shared habits;
- d) Although not immutable, institutions exhibit durable qualities; persistent and self-reinforcing;
- e) Institutions incorporate a society's values and reinforce its moral legitimacy.

Thus, it can be observed that the concept of institution in Evolutionary Institutionalism is broader and more libertarian than the concept expressed in the NIE. In this conception, the "rules of the game" of the NIE are only part of a complex institutional framework determined by human nature. This broader perspective of the concept of institution, expressed in the importance given to the behavioural norms of society, is present even in recent publications by Douglass North. North (2005) presents ideas capable of integrating a "micro" approach, based on the individual of Evolutionary Institutionalism, with a "macro" scheme of economic change,

based on the coevolution between empirical reality, beliefs, technologies, institutions, and policies. In this view, North emphasises the importance of the “informal rules of society,” and remaps the economic performance of regions as a function of evolutionary change of institutions and technology.

Another key point of Evolutionary Institutionalism is the idea of “blind flight”, or “non-teleological movement”. There is no intention, purpose, and planning during the process of economic development; yet individuals are purposeful actors, hence institutional or cultural evolution should be considered as the unintended result of causal processes, in constant institutional change (Rutherford, 1998).

For Rutherford (1998) institutional change is a process that follows: i) a start, from instincts and/or social institutions; ii) influence of the environments of individuals aiming at certain goals; iii) change in the material pattern of life; iv) new habits of thought; v) previous institutions become backward. Within this process of institutional change, one seeks to find an amount of imitation, inertia, and “cumulative causality”, through the patterns and regularities of human behaviour (Hodgson, 1998).

In this sense, Hodgson (1997) criticises the neoclassical reductionism that reduces the whole to the rational, optimising and maximising individual, and the “macro” environment resulting only from the sum of individuals. For Hodgson (1997), breaking with reductionism does not mean breaking with the individual, but treating the individual without methodological individualism and in an evolutionary way, where the concept of institution connects the microeconomic world of individual actions, habit and choice, with the macroeconomic sphere.

From this critique of methodological individualism, a central concept of Evolutionary Institutionalism emerges. The connection between institutions and individuals results in emergent properties, fundamental to structural change and economic development, which are produced from a process of “upward and downward causation” between individuals

and institutions. That is, habits and choices reinforce and are reinforced by institutions. The interactions consolidate a macroeconomic environment that stimulates change in an evolutionary environment (Hodgson, 1997). Therefore, the individual is affected by the current institutional framework and, at the same time, determines with his habits and actions the future institutional framework.

Within the economic theory, Hodgson (2007) positions Evolutionary Institutionalism as presented in Figure 1. The horizontal dimension refers to the minimum number of actors in the theory in question. The vertical dimension refers to the degree of assumed knowledge, deliberative (rational) consideration of decisions, and knowledge of other actors in the theory.

In the central region of the figure lies the domain of evolutionary and institutional economic theory. These theories, like Game Theory, assume a world structured according to rule-bounded interrelationships. However, unlike Game Theory, institutional theory takes a more limited view of individuals’ capabilities and decision deliberation. Decision making occurs in a context of complexity and uncertainty, limiting logical thinking. The analytical focus on equilibrium becomes less central, and its ontological foundations include institutional structures and processes involving habits and rules (Hodgson, 2007).

Thus, Hodgson (2007) argues that one of the factors inhibiting the potential use of Evolutionary Institutionalism in economics is the form of mathematical modelling used in economic studies and the lack of interdisciplinarity and holistic knowledge in economic education. These factors exposed by Hodgson (2007) can also be used to explain the limited use of the theory in agricultural economics.

Therefore, it becomes important to position the applicability of Evolutionary Institutionalism in Agricultural Economics. We start for a comparative discussion of its main conceptual and methodological aspects with the mainstream theoretical approach: Neoclassical Economics.

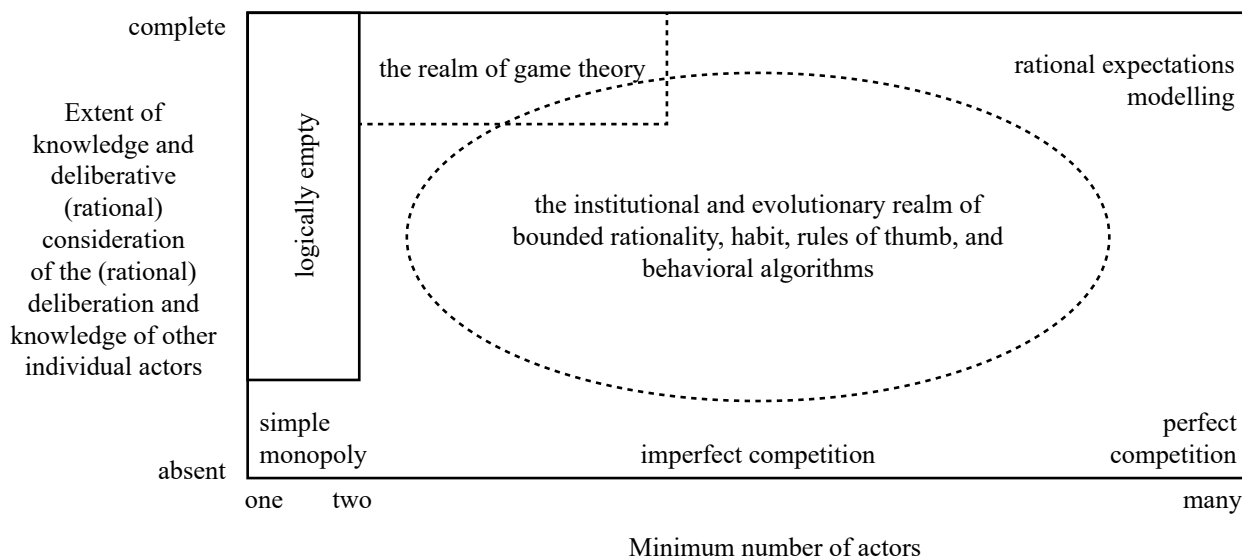


Figure 1: Graphical presentation of Evolutionary Institutionalism. Source: Hodgson (2007)

Neoclassical Economics and Evolutionary Institutionalism: conceptual and methodological differences for Agricultural Economics

The recent resurgence of interest in institutional and evolutionary theories is due, fundamentally, to the dissatisfaction with the way that orthodox economics deals with the processes of technological change and with any type of transformation that alters the form and dynamics of the economic system (Saviotti and Metcalfe, 1991).

The characteristics of each economic school are due to the scientific environment lived at the time of their origins: the classical theory in the 18th century, under the influence of Newton's theory, and the Original Institutionalism, in the 19th century, under the influence of Theory of Evolution of Darwin. Neoclassical economic theory and the construction of its assumptions of human nature, social universe, and progress reflect Newtonian mechanical, fixed, and repetitive laws. In contrast, Institutionalism is based on a constant and cumulative evolution, where its assumptions of human nature, social organisation, and progress are part of an evolutionary change process of Darwinian origin (Hamilton, 1990).

Stanfield (1999) argues that Institutionalism differs from mainstream economics in scope, method, and significance. The scope of mainstream economics is based on a science of choice, which is to examine the allocation of resources to achieve maximum real output. The desires of individuals are infinite, resources are finite, but both are given. For Institutionalism, individual desires and resources are available and are part of the variables to be explained. Human desires and technology change, redefining the scope of available resources. These changes emerge from the exercise of power and habit. The method of Institutionalism differs from mainstream economics in its emphasis on econometric models for generalisations. Econometrics is part of the methodological scope of Institutionalism, but qualitative empirical information of a historical and cultural nature, participant observation, and comparative studies are added to these methods. The significance of Institutionalism is based on the evolutionary emphasis on social change and the inclusion of power and culture in its field of analysis. Desires, technologies, and resources are endogenous, in contrast to the economic tradition.

The main difference between the neoclassical and evolutionary economic approaches lies in the concept of change. Neoclassical economists view change discontinuously and treat it as a process of restoring equilibrium or a state of quiescence. The cause of change is independent of the economy and caused by disturbances generated outside the system. Thus, a new adjustment must be made in response to the disturbances to rearrange the equilibrium. On the other hand, Evolutionary Institutionalism considers change as part of the economic process. The economic system is constantly undergoing a process of cumulative change; and the study of economics becomes a study of this process (Hamilton, 1990).

From this perspective, institutionalists such as Veblen (1898), Commons (1934), North (1990), and Hodgson (1998) have made criticisms of the assumptions of mainstream economics. For Commons (1934) orthodox economics is a hedonistic school, which seeks to understand the man-nature relationship, where the behaviour of exchange takes place in an individualistic way and the unit of analysis is the good produced by labour. In contrast, for Commons (1934), economics should be concerned with transactions and the rules of operation of collective action, seeking to understand the man-man relationship, where the unit of analysis is the transaction. Institutionalism determines the legal control of things, while neoclassicism determines the physical control of things (Commons, 1931).

For Veblen (1898), the problem with neoclassical economics is that human nature is conceived solely in a hedonistic, passive, inert, and unchanging way. The hedonistic conception of man is that calculator of pleasures and pains, which oscillate like a homogeneous globule of desires. This man has no antecedents and no consequences. He is a human datum in stable equilibrium, except for forces that shock him and move him in one direction to another. When the impact of the force subsides, he rests as a globule of desire. The hedonistic man is not a promoter of anything, he is only a man subject to external circumstances (Veblen, 1898).

As pointed out, Neoclassical Economics assumes given individuals, that is, it establishes rights and freedoms. But if rights and freedoms are changeable rules, from institutions, there is no way to predict a future framework. There is nothing predestined by equilibrium or the laws of nature (Commons, 1931). In this light, for Hodgson (1998) an individual governed by given preferences is a prisoner of his social environment, he is a robot programmed by a utility function. There is no free will and possibility of choice in this form of being. Therefore, for Veblen (1898), economic action should be the *raison d'être* of economics, that is, it is on human material, and not on resources, that the development process should be studied.

In turn, for North (1990), from a macro-analytical perspective, Neoclassical Economics is an inappropriate theory to analyse and prescribe policies that induce the economic development of countries and regions. The economic mainstream was consolidated with mathematical precision and the elegance of models considering a static world. In analysing economic performance over time, Neoclassical Economics has two fundamental flaws: institutions do not matter, and time does not matter (North, 1990).

North's (1990) desire to understand these interactions is present in the evolutionary idea of economic change. For Metcalfe (2001), in an equilibrium theory time would pass without change and without a process of cause and effect. In this sense, the neoclassical idea of "equilibrium" is nothing more than a formal way to avoid inconvenient problems with the facts. The evolutionary approach rejects "perfect prediction" and radical subjectivism; instead, the future can be imagined and guided. The disruption of equilibrium is the evolutionary nature of capitalism, the challenge is in capturing historical records, identifying the emergence of quantitative and qualitative changes to understand long-term development (Metcalfe, 2001). In summary, in the

Table 1: Summary of the theoretical-methodological differences between Neoclassical Economics and Evolutionary Institutionalism.

Neoclassical Economics	Evolutionary Institutionalism	Literature
Newtonian influence	Darwinian influence	Hamilton (1990); Hodgson (1998; 2005); Nelson (2006).
Convergence to equilibrium	Imbalances, shocks, instabilities, and Evolution.	Nelson and Winter (1982); Hodgson (1992).
Static analysis	Historical and dynamic analysis	Veblen (1898, 1899); Nelson and Winter (1982); Hodgson (1992); Dopfer (2005).
Passive and maximising individual	Active, non-maximising individual: influence of habits, tradition/culture and collective actions.	Alchian (1950); Commons (1934); Nelson and Winter (1982); Van den Bergh <i>et al.</i> (2007).
Disciplinary analysis	Interdisciplinary analysis	Nelson (2006); Hodgson (1998).
Mathematical models form the theory	Mathematical models help in the understanding of empirical reality	Stanfield (1999)
Market as a means for resource allocation	Market as institution, as filter of adaptation and selection; social construction	Magnuson (1994); Dopfer (2005).
Institutions don't matter	Institutions matter; permanent influence of institutions on the economy	Veblen (1898, 1899); Metcalfe (2001); Dugger (1990); Hodgson (2004); Rutherford (1998); Nelson (2002).
Exogenous technology	Endogenous technology: imitation, learning, innovation, and industrial R&D	Nelson and Winter (1974, 1982, 2002); Winter (2005); Nelson (1995); Freeman (1995); Freeman and Soete (2008).
The aggregate (macro) is the sum of the individuals (micro)	The aggregate is the sum and interaction between the individuals; emergence properties and reconstitutive downward causation	Hodgson (1997, 2007); Samuels (1995).
Methodological individualism; hedonism.	Individual as agent of change; variation, diversity, and routines	Veblen (1898); Commons (1934); Nelson and Winter (1982, 2002); Hodgson (1993; 1997); Metcalfe (2001).
Economic irreversibility	Circular cumulative causation and path dependence	Veblen (1898, 1899); Nelson and Winter (1982); Van den Bergh <i>et al.</i> (2007).
Substantive rationality	Cognitive failures; bounded rationality	Simon (1955, 2005); Nelson (2008); Van den Bergh <i>et al.</i> (2007).
Finalistic future	Non-projected future; blind flight; non-theological	Veblen (1898); Dugger (1988); Rutherford (1998).
Mathematical analysis method	Quantitative and qualitative methods of analysis; participant observation, comparative studies, biological analogies, and historical research	Stanfield (1999); Dopfer and Potts (2009); Hodgson (2007); Frenken and Idenburg (2006).

Source: Own composition

argument of Dopfer and Potts (2009), neoclassical economics is focused on the study of economic growth viewed through the prism of profit maximisation and optimisation of resource uses, and an evolutionary approach is linked to the study of economic evolution based on an analysis of structural, institutional, and knowledge changes.

Under this comparative context, Table 1 presents a summary of the main theoretical-methodological differences between Neoclassical Economics and Evolutionary Institutionalism, indicating the authors who theorise about the distinctions presented.

Therefore, Institutionalism provides a broad theoretical and methodological framework for studies in agricultural economics. The following section highlights the analytical elements for application in studies and projects about the transformations in the rural world, the processes of technological change, and the dynamics in agricultural and agro-industrial markets.

Analytical Elements of Evolutionary Institutionalism for Agricultural Economics Research

The main analytical contribution of Evolutionary Institutionalism to agricultural economics lies in understanding economic relations from human behaviour. As emphasised by Commons (1931), the approach bases its theory on the human-man relationship, rather than the mainstream human-nature relationship. Based on this premise, individuals become central to the analysis of the rural world, since they establish habits, behaviour patterns, and rules of conduct that, interacting collectively, produce institutions. Thus, it is from the active role of the individual that rural dynamics emerge and consolidate an institutional environment and a prevailing social structure.

For Evolutionary Institutionalism, man is not a mere handful of desires. He is an active structure of propensities and habits that seek fulfilment and expression. The circumstances are constitutive elements of man's brain structure and are the results of his antecedents, his life history, his hereditary characteristics, forged by traditions and conventions (Veblen, 1898). In this way, habit is defined as a non-deliberative, self-acting propensity involved in a general pattern of behaviour. Beliefs and prior knowledge are the essence of habit establishment (Hodgson, 1998). Habits determine choices, which, in turn, materialise a routine of actions, which, when repeated and generalised, shape institutions.

When we think this way, we see that productive systems are formed by a complexity of institutions, shaped over time by shared habits, traditions, and cultures. These, in turn, cannot be neglected as an exogenous factor in the agricultural economic analysis, but rather as a constituent element of the production system itself. Institutions are the determining elements of the economic and productive performance of rural organisations. For Hodgson (1998), organisations can be defined as a special subset of institutions. Thus, when we think of agricultural organisations as institutions, we determine the farmer himself, based on his habits, traditions, and culture, as the central element of this economic life.

From this understanding, a contribution of institutionalism to agricultural studies is its vision of the individual no longer with the sole objective of maximisation. The farmer cannot be seen exclusively as an optimising being, allocating resources based on the signalling of an "efficient" price system. The farmer is a result of human nature, a being full of certainties and uncertainties, of hits and misses, limited rationally and, at the same time, with logical flashes. His behaviour is determined by his habits and previous experiences. Therefore, when studying agricultural socioeconomic phenomena, understanding these institutions, formed by habits and behavioural norms of the farmer, is as important, or even more important, than understanding the legal and/or normative institutional environment in which the agro-industrial organisation is inserted. Corroborating this perspective is the statement by Commons (1931) that institution is more universal in the form of disorganised customs than in organised interests, and customs that change economic conditions may be more indispensable than the decree of a dictator.

Allied to the central position of the individual is the importance of time in agricultural analysis. The economic and social conditions of the present are the result of its previous conditions. The economic picture cannot be analysed exclusively in a static way. History matters. That is, when taking a non-deterministic perspective, one must study the process of change as something that has an eminently evolutionary character. It therefore follows that the notion of path dependence must be integrated into studies of agricultural economics, and the perspective of analysis of change becomes central.

Thus, to understand any problematic in the rural world, it is necessary to understand human behaviour, expressed in the habits, actions, and rules established by the generality of individuals, and their relationship with time. The individual cannot be understood as given and maximising, his behav-

our is the result of his history and his environment, under a non-substantive rationality. It is in this integration between the concept of active individual and path dependence that the perspective of institutional change emerges, either as a process of cumulative circular causation of institutions, in Veblen's (1898) view, or in Hodgson's (2007) notion of reconstitutive downward causation. Therefore, the idea of progress is grounded in the idea of institutional change. One can also use evolutionary concepts to understand this process of change, starting from the elements of variation, inheritance, and selection.

How do institutions affect the choices and motivations of farmers? How has time shaped the institutional environments of different agribusiness sectors? What role do institutions play in food markets? How are formal rules (e.g. laws, norms, etc.) recognised and legitimised by institutions for individual behaviour? Or even, why are some public policies aimed at agriculture not effective or incorporated in their target audience? These are some examples of questions in the agricultural economics with strong influence of the concepts of individual and path dependence of the institutionalist approach.

Two other central elements in agricultural economics can be understood as institutions: technology and markets. Technology cannot be understood as exogenous. It originates in public and private entities or within the organisations themselves, from the development of an R&D environment. However, technology cannot be characterised as a given, because its application in productive systems depends exclusively on the decision of farmers to adhere or appropriate technological packages. And, as already seen, the individual decision process is grounded on previous habits and experiences, determined by institutions.

In this line, Evolutionary Institutionalism can contribute to agricultural studies on two fronts: a) the analysis of institutional conditioning factors of technology appropriation by producers, based on the relationship between habits of thought and the available credit and technical assistance policies. The analysis of farmers' "mental models" is a research potential, integrating North's (1990) contributions with evolutionary institutionalism; and b) in the study of the evolution of technological change in agriculture and its impact on agro-industrial dynamics, determining technology as an element of transformation of firms' routines. The issue of learning becomes important. This front has a strong neo-Schumpeterian influence, with the work of Nelson and Winter (1982) as a reference.

Still, in agricultural economics, market studies take a prominent position. In the institutional approach, the price system is a convention and depends on habits. Therefore, the market is the result of human interaction, and institutionalism is the theory that examines the institutions in which prices are being formed (Hodgson, 1998). Thus, markets are institutions because they reflect collective behaviour and power relations. In the institutionalist view, it is not the markets that determine the choices of individuals, it is the habits and actions of individuals that determine the markets. And their conditions are given by the social structure in which agents interact. A structure that is not guided by benevolence. As already stated by Commons (1931), economic relations are

not guided by harmony, but by regular conflicts of interest due to the universal principle of scarcity.

Instead of seeing an omnipresent and omnipotent price system, it is necessary to develop specific price theories that reflect the institutional structures of the real world (Hodgson, 1998). Therefore, it is possible to study the specificities of agri-food markets from the viewpoint of institutions, where a market can be modified or even constructed by human action, under a permanent relationship of conflict and power between the parties.

It was in this vision of “false harmony”, of constant conflict in market relations, that Commons (1931) determined transactions as the main unit of analysis in economics. Transactions are not the “exchange of commodities”, but instead involve the alienation and acquisition of freedoms and property rights between individuals, negotiated before labour can produce, or consumers can consume, or even before commodities are exchanged (Commons, 1931). There is neither exchange nor consumption before a transaction. This view of Commons (1931) associated with Coase’s (1937) nature of the firm inspired the NIE in Williamson (1993) formulation of Transaction Cost Economics.

From 1990 on, the NIE was positioned as a dominant theoretical approach in studies about agri-food markets. In this movement, the analysis of transaction costs and the determination of more efficient governance structures were the central points of application. However, little progress was made in the analysis of power relations in agro-industrial transactions. The Evolutionary Institutionalism stream can contribute by giving less focus to the governance structure and more attention to the social relations present in economic transactions, especially those determined by Commons (1931): conflict, dependence, and order. A state or an organisation can establish and enforce rules that determine the economic relations between individuals in a market. However, collective actions in economic organisations are more powerful than political collective actions (Commons, 1931), which can help to explain different types of conflicts in relations between farmers and industries in agro-industrial chains.

Here we seek to determine some useful analytical elements of institutionalism for application to agricultural economics phenomena. Since it is an interdisciplinary approach, other elements should be added, especially with the approach of other theoretical approaches. However, Hodgson (1998) highlights some contemporary issues of institutionalism that, from the perspective of this paper, together emphasise its importance for studies in the agricultural economics:

- a) Institutionalism does not seek to be a theory of everything;
- b) Institutionalism seeks a conceptual framework coherent with the analysis of reality and viable methodologically based on interdisciplinarity;
- c) Studies focused on individual economic behaviour;
- d) Concept of rules and habits as the centre of the theory, approaching concepts from other approaches, such as neo-Schumpeterian routines;
- e) Learning and mental models emerge as new study themes.

From these items, it can be concluded that Evolutionary Institutionalism presents several analytical elements that can be useful for understanding the rural world. Now, it is worth pointing out some specific themes emerging in this line such as:

- a) the analysis of the trajectory and institutional changes of different rural sectors;
- b) The role of habits, traditions, and behavioural norms in productive systems and in the process of rural development,
- c) Power relations in agricultural markets;
- d) The evaluation of public policies for agriculture with a focus on the capacity of their appropriation by rural farmers;
- e) Innovation and technology as determinants of the evolution of the routines of agro-industrial firms;
- f) The institutions “behind” the new relations of food production and consumption,

Institutionalism provides these emerging issues with an interdisciplinary approach, which supports quantitative and qualitative methods of analysis, comparative studies, biological analogies, and a historical and cultural contextualisation. It is only from this methodological plurality, the understanding of change, the exposure of the individual and history as central, that we can approach the realities of the agricultural economics.

Conclusions

Agricultural economics is a field of study in constant transformation. Changes in the social, productive, and technological environments define the characteristics of world agribusiness, driving global economies. In this sense, agricultural economics lacks a theoretical lens that is more flexible, interdisciplinary, and feasible to the current reality.

In this context, we outlined in this paper the alternative of Evolutionary Institutionalism as an approach capable of understanding this contemporary agricultural dynamic. In opposition to neoclassical economics, Evolutionary Institutionalism is attentive to change and to the role of the individual in the economic system. It positions institutions as the central element of analysis, in a process of path dependence. These concepts provide a wide application in agro-industrial phenomena, bringing the problems of modern agriculture closer to economic theory.

In this perspective, for the economic analysis of agriculture the main inspiration should be the idea of evolution from biology, rather than the notion of equilibrium from physics. As in the words of Kenneth Boulding (1981, p.795) “agriculture is also a good example of a reverberant system, where the echoes do not die away but set the system on a course of irreversible evolutionary change”.

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Investigating eligible markets for Radicchio Rosso di Treviso PGI: the OMOI method

This paper contributes to the existing literature on geographical indications and, in particular, on the economic analysis of vegetables bearing a Protected Geographical Indication label. This study deals with the niche topic of methodologies that may be used to select ideal foreign markets for the Radicchio Rosso di Treviso. The aim is to suggest an adequate investigative methodology for identifying the foreign countries that are most suitable targets for promotional strategies. The specific analysis considers many variables, chosen with a view to selecting eligible markets, and ultimately draws up a consistent ranking of the five best nations. To determine the most promising country, the Overall Market Opportunity Index (OMOI) method has been used. This focuses on the most relevant indicators for each of the seven categories used to assess their appeal. The findings show that Denmark can be the best market for focusing the segmentation strategies of the Treviso Radicchio. After this, policy and business implications are addressed and opportunities for future research into emerging related issues are suggested. Strengthening the ranking analysis methodologies used for selecting target markets for the companies that produce Made in Italy luxury foods can also help improve such companies' competitive profile on international markets.

Keywords: PGI products, Made in Italy, foreign markets, OMOI method, ranking analysis

JEL classification: Q13

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Introduction

The Italian agri-food sector represents more than 15% of national GDP, and Italy ranks first among European countries in terms of value added. More than a billion people in the world consume Made-in-Italy food, with exports amounting to more 50 billion euros; the appeal in foreign markets is very strong and constantly growing (Istat, 2020).

Made-in-Italy food is defined as “the set of products recognised for their strong typical character, given their close link with the territory on which Italy enjoys comparative advantages related to the environment and production systems” (ISMEA, 2012). Italian food specialities consist of branded and typical products, whose strict link to their area of origin is what makes the difference in international markets. The commercial role of Made in Italy is realised through the analysis of the country's foreign trade, taking into consideration that after the breakeven reached in 2019, the agri-food trade balance becomes positive (+2.6 billion euros, 2020). This historic shift is significant, considering the chronic deficit of the Italian agri-food trade balance. Precisely, the strategy based on Made in Italy foods has enabled this goal to be achieved. Made in Italy can be certified with Protected Designation of Origin (DOP) and Protected Geographical Indication (PGI) labels, specifically defined as directly related to the territorial and geographical origin. Mediterranean EU countries (above all France and Italy) strongly dominate the domestic and external EU GI market (Török and Moir, 2018).

Török and Jambor (2013) recently investigated the impacts of EU expansion on the competitiveness of fruit spirits in six Central-Eastern European Countries (CEECs), concerning geographical indications, carrying out the theory of revealed comparative advantages. A recent study (Török *et al.*, 2020) highlights the crucial spill-over effects that are

due to synergies among GI food, tourism, and handicraft businesses.

More than 73% of Italian food exports are designated as Made in Italy, an extremely significant amount in terms of both value and volume. These foods are high-end products and represent superior quality, both in terms of composition (organoleptic characteristics, raw materials, and processing system) and in terms of image (emotional aspects, brand, collective trademark, geographical origin). When all the requirements of consumer top demand are met, this reduces the relevance of price, making its curvature inelastic. The superior food quality of Made in Italy is confirmed worldwide.

In addition, vegetables are more consumed thanks to their nutritional benefits (Pasquali *et al.*, 2016; Migliore *et al.*, 2015; Schimmenti *et al.*, 2013). Users conceive food as a ‘therapy’, improving wellness and health (Fiore *et al.*, 2019), especially in the last two years of pandemic. This specificity is mostly appreciated by demanding customers who belong to the upper class (Alaimo *et al.*, 2021).

The link with territory is a foundational element for typical products. That of Treviso derives from the ample availability of resurgence water, which, together with the fertility of the land and a certain amount of imagination, made it possible for ancestors long ago to create a unique product. The authentic Radicchio “Tardivo” (i.e. Belated cultivar, *Cichorium intybus*) comes from the typical area and is obtained according to the traditional forcing-and-bleaching technique, during which bunches are filled with running spring water. This especially long and laborious process, in and out of soil, requires a significant labour force, which is often under-remunerated.

Farming is possible only in 17 municipalities in the Treviso hinterland, and in another 7 in the neighbouring areas of Venice and Padua. The certified production covers

about 500 hectares, of which more than 300 consist of “Tardivo” cultivar. The slogan “the flower you can eat” refers to the name given to the radicchio, or “winter flower”. What consumers actually eat is the new sprout, blossomed in the spring water. This complex production process, which requires very high skills, rightly makes it the king of vegetables. About one hundred of the traditional family farms producing the cultivar are certified, and these farms in terms of size, ranging from small and very small, up to those of 15-20 hectares. Nevertheless, it features a good gross saleable production per hectare, which also reaches €20,000-25,000. The seed is 100% self-produced, and over the years the farms have evolved considerably, selecting varieties that accentuate the red colour, that increase the sugar content, and that are capable of adapting to recent climate changes. This innovation has coincided with the expansion of the surfaces and an increase in the mechanisation, specialisation, and qualification of production techniques. Nevertheless, the work time dedicated to Treviso Radicchio is about 700-800 hours/hectare. Alongside the professional farms, there are small family businesses, heirs to the legacy of the past, which are often managed part-time.

Some iconographic studies testify the presence of Radicchio in Treviso as early as the sixteenth century AD. It is worth noting that in the painting by Leandro Da Ponte ‘The wedding at Cana’ (1579-82), it is possible to glimpse two baskets inside which the cultivar can be seen. Also belonging to the Radicchio PGI category is the “Radicchio Precoce” (i.e. early cultivar). Although less valuable in terms of trade,

it is rich in fibres and can be included in low calorie diets, which are being implemented more and more by younger and older consumers (Spada *et al.*, 2020; Chiara *et al.*, 2019; Defrancesco *et al.*, 2005). It is high in mineral salts, polyphenols, caffeic and chlorogenic acid, as well as flavonoids (Pasquali *et al.*, 2016; Koukounaras and Siomos, 2010). Above all, the geographical indication PGI label represents the most competitive product feature affecting profitability (Bellia *et al.*, 2017). Customers trust certified products, which they believe deliver higher quality and added value.

Using previous studies (D’evoli *et al.*, 2013; Bassi *et al.*, 2003) as starting point, the specific SWOT analysis displays its main characteristics below in Figure 1. This methodology shows how the businesses’ threats may be overcome and is recognised as a key resource for strategic planning (Benzaghta *et al.*, 2021). Moreover, recent Chinese research also shows that the same method can be used to develop opportunities for agricultural product brands (Zhang *et al.*, 2019).

Its high premium price is justified by the long manufacturing process. Although the analysis deals with small countries far away from Italy, it is possible to satisfy foreign niche demand thanks to new preservation methods, reaching distant markets (Antonelli *et al.*, 2017; Pasquali *et al.*, 2016; Lucarini *et al.*, 2012). The recent growing demand for Radicchio Rosso di Treviso PGI suggests that there is huge potential for the development of its niche market, whose main marketing lever is the territory it is associated with (Di Vita *et al.*, 2021; Contò *et al.*, 2016). In response to this rising demand, the supply is constantly growing (Figure 2).

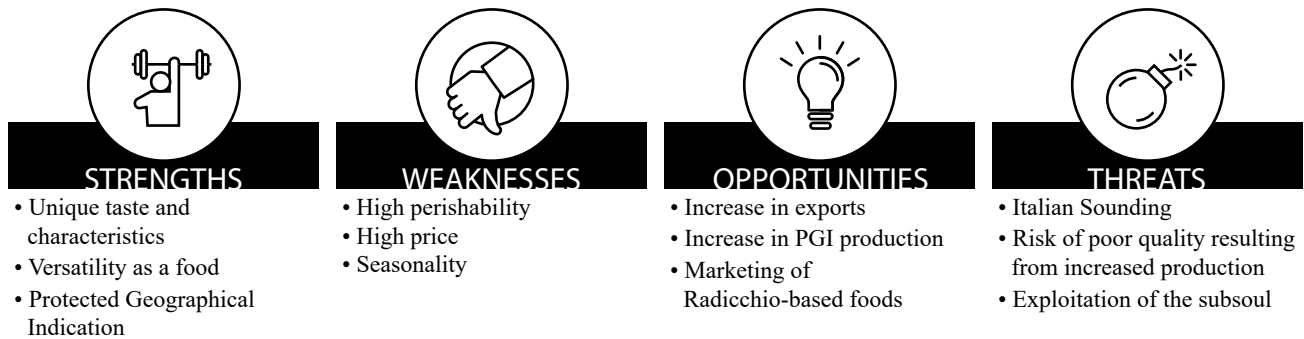


Figure 1: The SWOT analysis of the Radicchio Rosso di Treviso PGI.

Source: Own composition

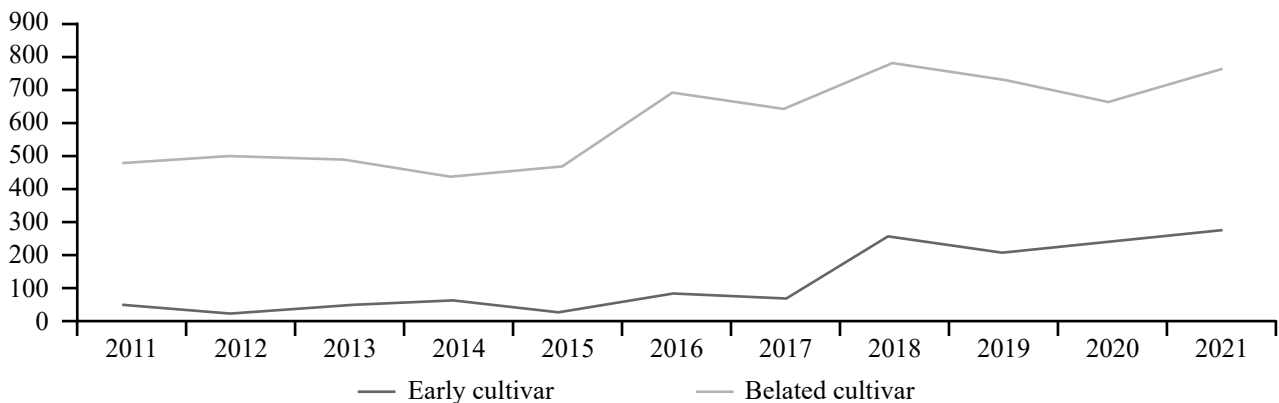


Figure 2: Production of Radicchio Rosso di Treviso PGI in tonnes, 2011-2020.

Source: IGP, 2021.

In Italy, the role of PDO and PGI labels is widely recognised. The research by Nomisma (2022) states that about 20% of the population is a habitual user (23% in central Italy; 19% in north and south). Statistically, women consume a larger quantity of food that is labelled in this way, and they do so more frequently than men (22%, against 18%), while those who are over 45 are more likely eat geographic label food (23%). The fact that the greatest propensity for consumption is by families with children highlights the important role such food plays in nutrition. The regular consumer is economically wealthy, is cultured, seeks quality, and loves healthy-tasty foods.

Dividing the characteristics of final consumers into three reference ranges, according to the type of food sought you can split the market into upmarket, mid-market and cost-conscious segments (Bellini and Ziliani, 2006). Treviso Radicchio falls within the upmarket range, where one may refer to “gourmet users”, who have little time, have high incomes, and who buy luxury goods daily, or “healthy consumers”, who regularly buy organic meat, fruit, and vegetables, and pay attention to their fitness.

Sadly, the market value of fake food and “pirate” goods has already reached the value of €100 billion globally (Francioni and Albanesi, 2017). The Radicchio PGI has been subject to several counterfeiting attempts, not only overseas, but also within Europe. The real problem lies in the unbranded red radicchio, which occupies the markets without legal recognition. We are talking about a vast market, considering that the branded product represents only 25% of the total, compromising the possibility of unitary management for marketing purposes. Since adherence to the certification process is carried out on a voluntary basis, a relevant legal requirement is lacking. As the protection of Made in Italy in the global market involves the completely legal framework of international trade, this ought to be a prerequisite for the success of any business.

Despite multiple limitations arising from the nature of the product, market barriers and information asymmetries, the increase in the quantity exported highlights a determination to increase international trade, which is viewed as the market with the highest potential for growth. Still, it is necessary to adjust international marketing strategies, identifying markets where it is best to focus one’s strategic positioning based on demand segmentation. Here, the main role is no longer played by price. Identifying the most promising segments of niche demand remains a primary goal for the coming seasons.

Within this framework, the current paper aims at identifying the most suitable countries for focusing the promotion and commercial development of Radicchio di Treviso, whose PGI label confers an intangible strategic value (Bellia *et al.*, 2017). The paper proposes a selecting method to identify the most attractive and accessible countries by using OMOI methodology (Cavusgil, 1985, 1997; Cavusgil *et al.*, 2004). We analyse the distinctive factors of the selected nations, focusing on a complete and integrated data set, to delineate the ranking of areas with the highest potential for the enhancement of Treviso Radicchio PGI. The results are evaluated, and finally, the discussion section outlines some crucial lines of research that have the potential to be addressed.

Methods

A planned approach to international trade development requires an analysis of the different foreign markets so as to identify and select the countries that offer the best opportunities (Ozturk *et al.*, 2015; Rahman, 2003; Wood and Robertson, 2001; Robertson and Wood, 2000; Russow and Okoroafo, 1996). It may seem obvious, but a number of companies choose their foreign markets in a reactive, or even worse, random way, based on a few requests from local customers, or privileging criteria that do not assess the existence of an adequate level of potential demand (Albaum *et al.*, 2016; Górecka and Szałucka, 2013, Alesina *et al.*, 2003). The differences and similarities among alternative nations are crucial to determining the most suitable market. Over the years, many comparative methods have been presented to address the specific characteristics of each country and to identify the best business opportunities within them (Johansson, 2009; Craig and Douglas, 2005). The starting point for this analysis, which is included in the research hypothesis, is what makes a market attractive. Two complementary approaches for the evaluation and preliminary selection of the foreign market are clustering and ranking (Terpstra *et al.*, 1967).

If used in combination, these two methods can be extremely effective, they will allow nations to be selected that demonstrably, through the examination of quantitative data, possess the characteristics to embrace and appreciate the product more than others. In the first, clustering technique, we put together a collection of countries that are more similar in terms of specific character. The first significant effort involving the clustering of countries was reported in the late 1960s (Terpstra *et al.*, 1967). The authors grouped the countries according to their similarity in terms of economic development. In our example, we selected the countries with a GDP per capita higher than that of Italy, which has been adopted as a benchmark. As the Radicchio can be considered a luxury good, it is appropriate to target consumers with higher incomes.

The ranking method then evaluates countries in terms of the overall attractiveness of their market, identifying, on several fronts, the nations with the greatest potential for Radicchio. Initially, the demographic, economic, political, territorial, cultural, and commercial variables are in focus, together with the efficiency of the transport and infrastructure. Next, we assess market accessibility, considering the extent of the entry barriers that would confront the introduction of Radicchio. We adopt a gradual selection model, which aims at removing at each step the countries showing unfavourable values for the indicators that are considered relevant.

Finally, to achieve the most correct ranking, an in-depth analysis of the stand-out nations is carried out, focusing in particular on consumption trends, agri-food sector development, political-commercial relations with Italy, and on the culture of business.

The ultimate ranking is the closing output of the report. To reach its goal, the paper makes significant use of subordinate data and sources, which refer both to government agencies, as well as to previous studies and research.

Attractiveness of countries

Many of the academic contributions that have aimed at developing methodologies to limit risks associated with the erroneous selection of a target market, emphasise the need to carry out an analysis of a country's attractiveness based on secondary data sources (Pellicelli, 2010; Valdani and Bertoli, 2006; Cavusgil *et al.*, 2004; Bradley, 2005).

In order to identify the most attractive countries, our analysis performs a series of successive screenings. These aim to show which country has the minimal score of acceptance with respect to the indicators selected, from time to time removing those who do not meet the requirements (Bellini and Ziliani, 2006; Gould, 2002). This selective process allows the sample elements to be reduced to the desired size. In line with the literature, the patterns of indicators are analysed under the following categories: demographic, economic, political, transport and infrastructure efficiency, territorial, cultural, trade, and accessibility.

Demographic indicators

The demographic indicators are selected to highlight specific phenomena, which may have an impact on the potential demand of niche markets. Among several relevant variables, we chose the six indicators considered most useful for our purpose. The knowledge of the total population, for instance,

even if it is still used as a raw indicator, helps to estimate the absolute potential demand. Consequently, we exclude countries with fewer than 100,000 inhabitants, as the effort to plan exports and adapt the product for sale could lead to a rather small success (Table 1).

Economic indicators

Among others, we selected the six indicators we believed to be the best for detecting the prospective of the consumers to purchase the premium-price Radicchio, instead of substitutes. While per capita income has led to no exclusions, we deemed the Gini Index, as a measure of income dispersion, to be more discriminatory. The assumption is that the highest value of inequality (100% of Gini Index) is not in accordance with our marketing idea for Radicchio. Therefore, just for this reason we excluded the United States (Table 2).

Great prominence has been attributed to the Vegetable Price Index (world average = 100), assuming a positive correlation between high prices and the demand for top-of-the-range goods. Therefore, we decided to exclude all states with a value lower than 170. This index value is assumed to allow Radicchio to be competitive, despite the export and production costs. This selection significantly contracted our sample, excluding prominent European countries (e.g. Germany, France, the Netherlands, the United Kingdom), and other more distant markets (e.g. United Arab Emirates, Qatar, Singapore).

Table 1: Demographic indicators for selected countries, 2019.

Country	Total population	Urban population (%)	Population density (persons/km ²)	Population above 15 years (%)	Total employment (%)	Share of agriculture (%)
Switzerland	8,575,280	73.8	215.4	85.1	65.1	2.6
Norway	5,347,896	82.6	14.5	82.7	61.7	2.1
Ireland	4,934,040	63.4	70.6	78.8	57.7	4.4
Singapore	5,703,569	100.0	7,953.0	87.6	68.3	0.0
Qatar	2,832,067	99.1	242.1	86.4	86.7	1.1
United States	328,239,523	82.4	35.7	81.4	60.2	1.4
Denmark	5,814,422	87.9	144.8	83.6	59.1	2.2
Australia	25,365,745	86.1	3.2	80.7	62.5	2.5
Sweden	10,278,887	87.7	24.9	82.3	60.0	1.7
Netherlands	17,344,874	91.8	511.7	84.1	62.1	2.1
Austria	8,879,920	58.5	107.1	85.6	58.1	3.6
Finland	5,521,606	85.4	18.1	83.9	55.3	3.8
Hong Kong	7,507,400	100.0	7,096.1	87.6	58.1	0.2
Germany	83,092,962	77.3	237.2	86.2	59.3	1.2
Belgium	11,502,704	98.0	377.3	82.9	51.0	0.9
Canada	37,593,384	81.4	4.1	84.1	61.8	1.5
U. Ar. Emir.	9,770,529	86.7	135.6	85.2	80.1	1.4
United King.	66,836,327	83.6	274.7	82.3	60.6	1.1
New Zealand	4,979,300	86.6	18.3	80.4	66.7	5.8
Israel	9,054,000	92.5	410.4	72.1	61.2	0.9
France	67,055,854	80.7	122.3	82.2	50.3	2.5
Japan	126,264,931	91.7	347.1	87.4	60.8	3.4

Source: World Bank (2022)

Policy indicators

The six indicators chosen to represent the political situation of the different countries left report the opinions of citizens, public and private entrepreneurs, experts, and NGOs, on the quality of many aspects of governance. To define values, we have adopted a specific screening method. Initially, the most pertinent information from the various sources used

was collected. The next phase consisted in the operation of values standardisation, in the range [0–1], depending on the positive, or negative statement regarding the indicator. Then, making use of the “Unobserved Components Model (UCM)” statistical tool, the previously standardised data are compared, assuming a standard normal distribution (with average [0], and a standard deviation [1]), on a scale ranging [-2.5–2.5], with higher values corresponding to better performance (Table 3).

Table 2: Economic indicators for selected countries, 2018.

Country	GDP per capita (\$)	GNI per capita (\$)	Gini index (%)	Imports (million \$)	Food imports (%)	Vegetable price index
Luxembourg	124,590		35.61	24,175	12.41	147.57
Switzerland	72,376	73,620	33.19	279,528	4.38	243.55
Norway	70,006	70,330	28.23	866	9.22	249.20
Ireland	89,684	69,190	31.31	107,669	9.93	177.33
Singapore	101,649		35.00	370,881	3.62	161.71
Qatar	94,029		35.55	31,696	10.62	121.65
United States	65,298		41.17			
Denmark	62,090	62,120	27.26	102,605	13.56	175.54
Australia	53,381	50,540	34.53	235,386	6.52	208.06
Sweden	56,632	56,670	28.66	170,605	10.40	186.71
Netherlands	61,285		29.06	645,502	12.23	142.88
Austria	60,418	58,940	29.90	193,722	7.41	175.08
Finland	53,172	51,800	27.44	78,624	7.54	180.96
Hong Kong	62,496	65,240	39.38	626,616	4.67	174.82
Germany	57,530		33.57	1,284,353	7.76	149.13
Belgium	56,349		27.28	454,738	8.96	132.85
Canada	51,669	50,010	33.32	470,522	7.97	179.90
Un. Ar. Em.	70,089		32.58	261,538	7.31	128.14
Un. Kingdom	49,932		34.18	672,267	9.66	130.63
New Zealand	45,382	43,950	33.46	43,793	11.33	215.78
Israel	42,898		39.32	76,598	8.42	145.29
France	50,993		30.60	676,441	9.41	159.96
Japan	43,594	43,760	32.86	748,488	9.43	289.34

Source: World Bank (2022) and United Nations (2022)

Table 3: Policy indicators for selected countries, 2019.

Country	Voice and responsibility	Political stability absence of violence	Government effectiveness	Regulatory quality	Rule of law	Corruption control
Switzerland	1.53	1.34	1.95	1.66	1.91	1.98
Norway	1.69	1.19	1.86	1.80	1.98	2.07
Ireland	1.34	0.97	1.28	1.60	1.39	1.46
Denmark	1.58	1.01	1.94	1.57	1.90	2.11
Australia	1.32	1.09	1.57	1.87	1.73	1.81
Sweden	1.59	1.05	1.83	1.80	1.91	2.12
Austria	1.33	0.98	1.49	1.46	1.88	1.55
Finland	1.59	0.91	1.93	1.85	2.02	2.15
Hong Kong	0.21	-0.27				
Canada	1.46	1.03	1.73	1.72	1.76	1.77
New Zealand	1.57	1.51	1.67	1.88	1.88	2.17
Japan	0.96	1.04	1.59	1.33	1.54	1.48

Source: World Bank (2022)

It is essential for a correct implementation of commercial strategies abroad that each indicator has a value at least in line with the world standard. Therefore, as a result, we remove the countries with a negative performance. Thus, our sample is reduced to eleven nations.

Transport and infrastructure efficiency indicators

Nowadays, the efficiency of transport and infrastructure, and logistics in general, plays a fundamental role. We tried to identify the six indicators most relevant and able to provide a comprehensive picture about the remaining studied nations. The quantification of indicators results from an online survey among logistics, multinational shippers, and couriers. The responses are provided by companies of different sizes, the large companies - with 250 employees, or more - accounting for about 20% of the total. For the six fundamental components of logistics services, a score from [1] to [5], for best performance, is assigned (Table 4). The final value of each indicator is the average of the points scored, related to each

nation. Avoiding giving more weight to one indicator rather than another, considered equally important, we made the sum of the six values referring to each state. In this case, we have decided not to exclude any competitor, given the similarity in the final score.

Territorial indicators

As regards the individualities of the territory, the indicators selected serve to highlight the relevance of agriculture in each country and the facility to reach the final consumer via internet network. However, most importantly, a relevant measure of distance, representing an eliminatory variable, resides in the remoteness of the foreign nation from the production place of Treviso (Table 5).

The importance of providing the final consumer with a fresh product is emphasised. The vegetable's consistency and taste are the strong points determining the quality of Radicchio, naturally preserved only for a limited time between harvest and consumption. Preserving the product's freshness when it is transported over long distances is an expensive

Table 4: Transport and infrastructure efficiency indicators for selected countries, 2018.

Country	Quality customs efficiency	Infrastructure quality	Shipments competition	Quality of logistics	Track trace shipments	Quality delivery time	Total
Switzerland	3.63	4.02	3.51	3.97	4.10	4.24	23.47
Norway	3.52	3.69	3.43	3.69	3.94	3.94	22.21
Ireland	3.36	3.29	3.42	3.60	3.62	3.76	21.05
Denmark	3.92	3.96	3.53	4.01	4.18	4.41	24.01
Australia	3.87	3.97	3.25	3.71	3.82	3.98	22.62
Sweden	4.05	4.24	3.92	3.98	3.88	4.28	24.35
Austria	3.71	4.18	3.88	4.08	4.09	4.25	24.19
Finland	3.82	4.00	3.56	3.89	4.32	4.28	23.87
Canada	3.60	3.75	3.38	3.90	3.81	3.96	22.41
New Zealand	3.71	3.99	3.43	4.02	3.92	4.26	23.33
Japan	3.99	4.25	3.59	4.09	4.05	4.25	24.22

Source: World Bank (2022)

Table 5: Territorial indicators for selected countries, 2018.

Country	Land area (km ²)	Agricultural land (%)	Arable land (%)	Chicory production (tonnes)	Internet users (% of population)	Distance from Treviso (kilometres)
Switzerland	41,290	38.21	10.07	59.069	93.15	390
Norway	385,207	2.70	2.19	26.576	98.00	1,585
Ireland	70,273	65.55	6.54	5.68	84.52	1,580
Denmark	43,094	65.80	59.80	23.52	98.05	1,110
Australia	7,692,024	46.66	4.02	133.525	86.55	16,240
Sweden	450,295	7.39	6.26	32.14	94.49	1,570
Austria	83,871	32.15	16.08	41.29	87.75	420
Finland	338,425	7.48	7.38	13.62	89.61	1,815
Canada	9,984,670	6.49	4.31	84.902	92.70	6,470
New Zealand	270,467	39.75	1.86	40.098	90.81	18,525
Japan	377,956	12.13	11.36	582.416	92.73	9,555

Source: World Bank, FAO, 2022

undertaking and is not without risks, as goods may be subjected to long waits for both shipment and commercialisation. For these reasons, we exclude those countries whose capital is far from Treviso. Consequently, we removed from the sample New Zealand, Australia, Japan, and Canada.

Cultural indicators

The cultural peculiarities of the target consumer are of key importance to defining the commercial potential of Radicchio, and developing a proper promotion campaign. In our case, the discriminating variable is the per capita consumption of vegetables, considered in kg per year, which certifies the real quantitative potential for the Radicchio. For this reason, we also remove Norway from the seven destinations left, which shows a relatively low propensity towards vegetables (Table 6).

Trade indicators

In the last phase, we analyse the commercial indicators of different categories of horticultural products, in addition to our chicory. This is how we try to capture the potential interest and the willingness to pay of each nation towards fresh and cut vegetables. Finland's low propensity to consume immediately emerges, making it the last excluded from the potential target markets (Table 7).

Thus, via a path of analysis that may appear in some ways tortuous and controversial, we have reached our previously set goal. Following the screening carried out from preceding research, the most attractive five nations for the marketing of Treviso Radicchio Rosso PGI are identified as Switzerland, Ireland, Denmark, Sweden, and Austria. These stand out in

terms of their characteristics, indicating a higher potential for business development (Antonissen, 2020; Obrist *et al.*, 2019; Whitelock and Jobber, 2004).

Comparison of the examined countries

However, quantitative analysis based on macro-indicators does not seem to be an exhaustive way to understand a product's potential to penetrate a food market niche. Therefore, we now focus, for each country, on the purchasing habits of consumers and the different trends in consumption, on the importance of the agri-food sector, and on the exchange of foods with Italy. Subsequently, the political-commercial relations of each nation with Italy and the business culture are analysed more widely, with a view to obtaining economic indications that may point towards a correct commercial approach.

As a last step, to establish the most promising country for the marketing of Treviso Radicchio PGI, the five most suitable nations are compared using the Overall Market Opportunity Index (OMOI), developed by Tamer Cavusgil (Cavusgil, 1985, 1997; Cavusgil *et al.*, 2004). The OMOI method aims to attribute an order and a rank to the attractiveness of possible foreign markets. The method provides the standardisation of the values of the relevant indicators to determine the potential of a country by comparing variables with very different distributions. The system also delivers the attribution of a weight to each indicator, based on the prominence held for the purposes of selection.

Table 6: Cultural indicators for selected countries, 2020.

Country	Social globalization	Human development	Vegetable consumption kg/pop.	Ethnical fractionation	Linguistic fractionation	Religious fractionation
Switzerland	90.79	0.96	92.82	0.53	0.54	0.61
Norway	85.47	0.96	71.36			
Ireland	85.54	0.96	86.73	0.12	0.03	0.16
Denmark	87.96	0.94	104.16	0.08	0.10	0.23
Sweden	89.44	0.95	83.21	0.06	0.20	0.23
Austria	88.56	0.92	87.70	0.11	0.15	0.41
Finland	87.70	0.94	83.73	0.13	0.14	0.25

Source: United Nations, FAO, 2022

Table 7: Trade indicators for selected countries, €, 2019.

Country	Import of fresh Italian vegetables	Import of Radicchio	Export of vegetables	Import of vegetables	Export of chicory	Import of chicory
Switzerland	86,543,200	3,334,100	7,085,390	522,711,673	564,459	49,585,144
Ireland	6,612,300	25,400	112,489,330	353,446,809	1,522,630	23,708,783
Denmark	33,805,100	526,200	161,384,292	446,102,190	8,455,420	34,467,944
Sweden	31,649,600	1,168,300	76,732,118	620,023,034	15,338,012	43,670,092
Austria	129,407,800	5,411,700	156,895,284	598,175,949	5,559,768	52,949,637
Finland	3,249,300	–	–	–	–	–

Source: Istat (2020), World Bank (2022)

Multiplying the weight of individual indicator with its value, we proceed with the sum of the resulting values for each nation. The final points allow making the comparison among different countries: the nation with the highest score is clearly preferred. The OMOI system emphasises the importance of focusing on the most relevant indicators. Of course, every weight attributed can be reviewed, lending to various kinds of simulations, based on the different goals to pursue. In our case, it is implemented so as to draw up the definitive ranking of the five most promising countries.

In a first step, for each of the seven categories used in assessing the attractiveness of each country is selected the indicator deemed most significant, among demographic, economic, political, transport and infrastructure efficiency, territorial, cultural as well as commercial indicators (Table 8).

Each indicator is given a fractional weight, based on the importance that has been subjectively assigned. This is multiplied by the ranking position that each value covers in the comparison among the five countries selected. In the case of equal values, the same position in the ranking is given. As to the first indicator (urban population), for instance, a weight of 9% is given. The highest mark takes five points in the ranking, the lowest one takes one point. The single score is given by multiplying the value in the ranking and the weight.

In addition, we added a further dimension of competitiveness, relating to the variable accessibility. Indeed, an appealing market must also be accessible for the companies. To evaluate this dimension, we chose some specific information concerning the competitive environment, such as the importance of the origin of the products (8), the presence of Italy among the top five food exporting countries (9), the relevance of healthy eating (10), the weight of local vegetable supply (11) and the attention to sustainability (12). To these we added two purely economic indicators, such as the incidence of tariff barriers (13) and product standards (14).

For these indicators a dichotomous qualitative evaluation is made. To every variable is assigned a maximum value of [2.5], in case of positive evidence; or [0], in the event of a negative assessment, or due to the presence of barriers. It should be noted, however, that the five countries differ only in specific assessments. Thus, while the relevance given to origin of foods, healthy eating, sustainability is everywhere high; Switzerland is characterised by the presence of barriers to trade. In Denmark, horticultural production is high, compared to Ireland, among the top five importers of Italian food. In the light of all these considerations, we proceeded to the addition of the values of all indicators used, until reaching the final score (Table 9).

Table 8: Comparison of the most significant indicators.

Indicator (Category)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country	Urban population (%)	Vegetable price index	Rule of Law (Index)	Quality of Logistics (Index)	Distance (km)	Vegetable consumption (kg/person)	Import of Radicchio (€)
Austria	58.5	175.1	1.88	4.09	420	87.70	5,411,700
Denmark	88.1	175.5	1.90	4.18	1,110	104.16	526,200
Sweden	87.7	186.7	1.91	3.88	1,570	83.21	1,168,300
Ireland	63.4	177.3	1.39	3.60	1,580	86.73	25,400
Switzerland	73.8	243.5	1.91	3.97	390	92.82	3,334,100

Note: 1 = Demographic, 2 = Economic, 3 = Policy, 4 = Transport and infrastructure efficiency, 5 = Territorial, 6 = Cultural, 7 = Trade indicators.
Source: Own composition

Table 9: Summary of final scores.

Indicators	1	2	3	4	5	6	7	8	9	10	11	12	13	14	TOT
Weight	9%	9%	6%	6%	4%	9%	6%	4%	9%	6%	6%	4%	11%	11%	100%
Ranking values															
Austria	1	1	2	4	4	3	5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	37.5
Denmark	5	2	3	5	3	5	2	2.5	2.5	2.5	0	2.5	2.5	2.5	40.0
Sweden	4	4	4	2	2	1	3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	37.5
Ireland	2	3	1	1	1	2	1	2.5	0.0	2.5	2.5	2.5	2.5	2.5	26.0
Swiss	3	5	4	3	5	4	4	2.5	2.5	2.5	2.5	2.5	0.0	0.0	40.5
Final scores															
Austria	0.09	0.09	0.12	0.24	0.16	0.27	0.30	0.10	0.225	0.15	0.15	0.10	0.275	0.275	2,545
Denmark	0.45	0.18	0.18	0.3	0.12	0.45	0.12	0.10	0.225	0.15	0.00	0.10	0.275	0.275	2,925
Sweden	0.36	0.36	0.24	0.12	0.08	0.09	0.18	0.10	0.225	0.15	0.15	0.10	0.275	0.275	2,705
Ireland	0.18	0.27	0.06	0.06	0.04	0.18	0.06	0.10	0.000	0.15	0.15	0.10	0.275	0.275	1,900
Swiss	0.27	0.45	0.24	0.18	0.20	0.36	0.24	0.10	0.225	0.15	0.15	0.10	0.000	0.000	2,665

Note: 1 = Urban population, 2 = Vegetable price index, 3 = Rule of Law Index, 4 = Quality of Logistics Index, 5 = Distance, 6 = Vegetable consumption, 7 = Import of Radicchio, 8 = origin of the products, 9 = the presence of Italy among the top five food exporting countries, 10 = the relevance of healthy eating, 11 = the weight of local vegetable supply, 12 = attention to sustainability, 13 = incidence of tariff barriers, 14 = product standards.

Source: Own composition

The most promising country for the marketing of Treviso Radicchio PGI places Denmark first, followed by Sweden, Switzerland, and Austria. The last place of Ireland highlights a rather significant gap compared with the others.

In line with previous research and recent trends, Denmark's population appear increasingly conscious of healthy foods, evaluating production processes, preferring to purchase seasonal goods (Górecka and Szałucka, 2013). These favourable features are in line with the commercial expectations of Radicchio PGI. Considering the appreciation of Italian agri-food products in the country, and the presence of a considerable consumer share linked to vegetarian and vegan cuisine, it might be thought Radicchio becoming a viable dietary alternative.

Sweden, in second place in terms of importance, can rely on one population very informed on nutrition issues, and well-disposed to buy foreign food. Customers are very attentive to quality rather than price, characterised by the choice of healthy fresh food, and paying particular attention to the production process (Pekala, 2019). Switzerland, Austria, and Ireland, despite some limitations in terms of attractiveness, may in the future become very promising countries, as well as representing proximal outlets, for winning marketing strategies.

Conclusions

PGI certification implies the rationalisation of all phases of the supply chain, also for promotional strategies, which are now oriented towards foreign markets. Radicchio di Treviso, characterised by a geographically concentrated and limited production, cannot compete either in terms of volumes, or costs, with horticultural models from other countries. Consequently, by exploiting the opportunities offered today by the dynamics of consumption, the producers are examining the potential of placing Radicchio in the high-end of foreign markets. But which market is the most promising?

Far from being exhaustive, this paper tries to respond rationally to this question, making use of the original OMOI methodology. This sheds a different light and gives new insights on procedure for selecting those foreign markets where international commercial strategies are to be focused. The index allows new target markets to be recognised, unmet customer needs to be discovered, and firms' competitive advantages to be realised. Indeed, it is a flexible, effective and stable instrument for preliminary analysis of foreign market opportunities (Mullen and Sheng, 2006).

For Radicchio PGI, connoted by various export limitations that derive from its nature as a fresh cut vegetable, the strategic positioning can only be based on segmentation and concentration in specific niches, in which price no longer plays the major role. That is implicit for certified foods: the required strategy is one where the product competes on reputation. Due to the peculiarities of Radicchio PGI, which is distinguished by small volumes and a concentrated supply area, the ability to implement network strategies and collective marketing activities is of primary importance to reaching new business opportunities.

More generally, in terms of scientific research, the topic of study intends to focus attention on the methodologies used for selecting outlet markets, with a view to the widening of competition to an international scale. Just as the evaluation of the competitiveness of companies is based on ranking methodologies, the choice of markets can also be anchored similarly. The goal is to display new tools to face the challenges of global competition, based on specific scientific methodologies, capable of linking the selection of outlet markets with improvements in both the competitive profile of companies and Italy's position in international trade.

Referring to Radicchio PGI, right choices need to be made regarding the outlet markets, as given limited financial resources, the selection of where to focus commercial efforts becomes crucial. A precise direction that addresses the business implications of our results must therefore be followed. In support of Treviso Radicchio, there are specific trends observable today: behaviour is rapidly changing, nutritional needs are becoming increasingly urgent, and a growing multitude of young people is forecast to have unprecedented economic impacts on the demand for food. These factors are associated with the desire to taste typical Italian food, as well as with customs that are extremely receptive to modern marketing strategies, facilitated by new distribution technologies. Overall, the accelerated growth of consumption can drive the success of Radicchio PGI.

As regards economic theory, the new opportunities offered by the international trade require innovative interpretation tools to be proposed, which at the same time make it possible to identify the strategic variables that companies need to improve if they wish to increase market penetration. In practical terms, the results arrived at here can help the farms of Radicchio di Treviso PGI address their foreign market segmentation strategies, taking emerging consumer trends into consideration: the increased attention being paid to healthy foods, vegetarian/vegan cuisine, and production processes, but even more so the widening appreciation of Made in Italy luxury food.

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Appendix

Set of Indicators

Demographic indicators

Total population, Urban population (%), Population density (people per km²), Population over 15 years (%), Total employment (%), Employment in agriculture (%).

Policy indicators

Voice and responsibility index: the perception of the extent to which citizens can participate in the selection of their government, as well as freedom of expression, association, and media.

Political stability and absence of violence, or terrorism index: perception of the probability that the government is destabilized or assaulted by unconstitutional means, through political violence or terrorism.

Government effectiveness index: perceptions about the quality of public services, civil service and degree of its independence from political pressures, quality of formulation and implementation of internal policies and credibility of government entities by citizens.

Regulatory quality index: perception of government's ability to formulate and implement sound policies and regulations that enable and promote private sector development.

Rule of law index: perception of the extent to which the population has confidence and respects the rules of society, the capacity of the State to enforce the rules and property rights, the effectiveness of the police and the courts.

Corruption control index: perception of the extent to which public power is exercised for private gain is considered.

Transport and infrastructure efficiency indicators

Efficiency of customs and customs clearance: perception of the efficiency of the logistics processes and customs clearance of the goods, speed, simplicity and predictability.

Quality of trade and transport infrastructure: perception on the quality of trade based on the characteristics of infrastructure related to the transport, in particular ports, railways, roads and information technologies.

Easy organization of shipments at competitive price: perception of the ease of organizing shipments at competitive prices.

Competence and quality of logistics services: competence and quality of logistics services of transport operators and customs brokers.

Ability to track and trace shipments: possibility and ease of tracking and tracing international shipments.

Frequency with which shipments reach the recipients within the scheduled, or expected delivery times: probability that shipments reach the recipients within the scheduled delivery times.

Territorial indicators

Land area (km²): total area, excluding areas under the main inland water bodies, national claims on the continental shelf and exclusive economic zones. The larger the territory the more important is to focus on areas with a greater concentration of population.

Agricultural land (%): arable land, under permanent crops, pasture.

Arable land (%): temporary crops, grassland for mowing, or grazing, vegetable gardens.

Lettuce and chicory production (tonnes): produce products substitutes to Radicchio lead the consumer to choose the latter, at the expense of Radicchio.

Internet users (% total population aged over 5 years).

Distance by air from Treviso to the capital of the foreign country (KM), distance index.

Cultural indicators

Social globalization index (0 = low; 100 = high): ability of a nation to share ideas and information with different countries, including topics such as education, culture, politics, trade. This cultural stream tends to flow from the most to the least developed countries. The macro-variables considered, with equal weight, are economic, social, political globalisation.

Human development index (0 = low; 1 = high): measures the quality of life (UNDP, 1990). Parallel to the index of social globalization, it allows to understand the social condition of the people of a nation. The key dimensions of human development, calculated by applying the geometric mean, for each of the three variables: health and life expectancy, level of education, quality standard of life.

Per capita vegetable consumption (kg/person per year).

Ethnic, linguistic and religious fractionation (0 = low; 1 = high): compares the characteristics of each people from the point of view of ethnic, linguistic and religious similarity. For the calculation of the value of each splitting category, the Herfindahl index is used. The final value reflects the probability that two randomly selected individuals from a population belong to different groups for ethnicity, language, and religion. High values herald high diversity. The formula used for the calculation of the fractionation is (Alesina *et al.*, 2003):

$$\text{FRACT}_j = 1 - \sum_{i=1}^N s_{ij}^2$$

where s_{ij} is the share of group i ($i = 1 \dots N$) in country j .

Trade indicators (euro)

Import of fresh Italian vegetables. Import of Radicchio and other Italian chicory. Export of edible vegetables, roots and tubers. Import of edible vegetables, roots and tubers. Export of fresh or chilled lettuce and chicory. Import of fresh or chilled lettuce and chicory.

Accessibility indicators

Importance given to the origin of the products. Italy among the top five exporting countries for food. Importance of a healthy eating. Relevance of local horticultural production. Attention to products sustainability. Tariff barriers. Non-tariff barriers.

Source: our composition based on the OMOI method (Cavusgil, 1997)

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Business opportunities in short food supply chains: the economic sustainability of three Hungarian para-gastro restaurants

Social enterprises have both economic and social motivations. This hybridity also determines their business model: these companies survive economically in a sometimes very competitive market by fulfilling their main objectives to achieve their social mission. In Hungary, the number of social enterprises within the catering industry is minimal; however, the para-gastro movement collects companies with catering or food processing activities that employs disabled and/or disadvantaged workers. This paper investigates the three most prominent members of the Hungarian para-gastro movement that consider sourcing inputs via short food supply chains as an opportunity. Based on a mixed methods approach, we can conclude that these enterprises must face all the industry's difficulties, and their unique circumstances might make their operations even more difficult. Taking into account the support these enterprises have received in pursuit of their social goals, the opportunities provided by the short food supply chains can help them only if they are also able to find a niche market where solvent demand can accept the specialties of local sourcing.

Keywords: short food supply chains, social enterprise, social innovation, business model, Hungarian para-gastro movement

JEL classification: Q13

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Introduction

After World War II, agriculture and food production in Europe were characterised by the pursuit of economies of scale based on mass production, standardisation, and delocalisation of processes, which was well illustrated by the main guidelines of the Common Agricultural Policy. Producers and consumers have become alienated from each other in every respect, and the relationship of trust, which used to be the characteristic of food production and consumption for centuries, has been less and less determinative and dominant. As a result of this and the increasing number of food scandals since the 1970s (e.g. salmonella infections, BSE epidemic, dioxin residues, etc.), there is a growing demand of consumers for alternative food systems (non-industrialised food supply chains) (Renting *et al.*, 2003).

Social innovations can be created by different organisations (state, local government, NGOs and social enterprises) (Moulaert *et al.*, 2017). Social enterprises, which citizens primarily initiate, and non-governmental organisations have a fundamental goal of doing their work to benefit the community and promote commitment towards social responsibility. At the same time, the social and economic objectives of social enterprises are attained. The economic nature of the activity is ensured by the fact that social enterprises primarily perform production and service activities. The continuous production of products and services confirms the economic sustainability of the establishment of social enterprises. Besides, social enterprises take on the economic risk because the acquisition of resources of an enterprise depends on the efforts of members and employees; thus, they are risking their survival. It is also an economic objective that social enterprises not only employ volunteers but also employ paid labour. Social enterprises are often created by the cooperation of people in a community or group for a specific purpose. A collective approach to problem-solving is in particular usu-

ally present throughout the operation of the organisation. In social enterprises, the realisation of a social objective takes priority over profitability, but that does not mean that only a non-profit approach prevails to run the business. It is also the characteristic of some social enterprises that a high degree of autonomy (which means independence from state influence primarily) and decision-making does not depend on the level of ownership and is based on the consensus of the employees (Nyssens, 2014).

The purpose of this paper is to identify the opportunities provided by short food supply chains (SFSCs) for social enterprises, with a particular focus on the catering industry. To this end, after a brief review of the literature, we present three social enterprises participating in the short food supply chain concept. Each of the three initiatives is linked differently to the SFSC approach. Still, all of them share a common motivation for social innovation by employing disabled and/or disadvantaged people. After describing the qualitative methodology, we present the companies themselves and the most relevant results of our research. Finally, the last chapter of the study draws the main conclusions.

Literature review

In the 1990s and around the turn of the millennium, the literature was increasingly concerned with alternative food systems. The short food supply chain concept has been defined as a form of amassing concept that focuses on informative products that bear the “face” of the producer, rather than anonymous mass products (Marsden *et al.*, 2000). Based on the initial classification of SFSCs, three main types are distinguished. In the case of direct sales, the producer and the consumer interact directly with each other during the purchase of food so that a relationship of trust can be formed directly. The most common forms are

sales at the farmyard, the farmers' market, or the producer's home delivery, even in the so-called "box" schemes. When there is no direct connection, but the location and key features of production are made known to the final consumer through (typically a small number of) intermediaries, it is spatial proximity. Typical examples are local shops, restaurants and public catering establishments working with SFSC's suppliers or the so-called community-supported agriculture. The SFSC type, which describes the most geographically distant relationship, is an extended approach, where certain certification marks (for example, geographical indications) are intended to provide product information to consumers who may not have even been close to the production site, thereby giving confidence (Delicato *et al.*, 2019; Hyland *et al.*, 2019; Marsden *et al.*, 2000; Renting *et al.*, 2003;).

Marsden, Renting, and their co-authors (2000; 2003) made the classical SFSCs classification based on geographical distance. In this study, we look at quasi-local SFSC sales through restaurants, including restaurants that serve (also) public catering services. For the final consumer, through this SFSC channel, the goal is the same as in the other cases: to buy fresh and healthy food, preferably produced on a local farm. Purchasing such products can often cause problems of convenience and efficiency; however, they can be solved by committed consumers in restaurants where purchasing through SFSCs is dominant (Craven and Krejci, 2016). Using other classifications, selling local food via restaurants belong to sales to small retail outlets (Malak-Rawlikowska *et al.*, 2019), which can be considered as one of the most effective short food supply chains including only one intermediary.

Examining English and American case studies, Fleury *et al.* (2016) also demonstrated that in these value chains, restaurants committed to SFCS could generate revenue that allows them to pay a premium for such inputs, making this model even more attractive to the producer. Also, based on North-American data, in those restaurants where there is a high percentage of locally sourced ingredients, the price is not a determinative factor when making purchasing decisions, but rather quality is the key (Starr *et al.*, 2003). The higher quality of the local food ingredients is mainly identified with better taste (Inwood *et al.*, 2008). In addition to the direct economic benefits, the farmer has the advantage of delivering the minimum amount required directly to each restaurant, which is much lower than if they have become a standardised hospitality supplier. This allows small-scale or even start-up farms to gain sales opportunities (Givens and Dunning, 2019). To conclude, quasi-local sales through restaurants can be mutually beneficial to the consumer, the restaurant, and the producer.

Some social enterprises are trying to exploit the various opportunities offered by SFCSs to fulfil their mission, which can be considered a form of innovation. Social innovation, as a concept, has no uniform definition. Moulart *et al.* (2017) mean such innovations in social relationships capable of meeting a collective need. The definition of Mulgan *et al.* (2007) fits most of the research purpose, which regards social innovation as a process of collective action and social transformation aimed at developing new forms of governance, community building, participation, empowerment and

capacity building. Finally, it is important to mention that the European Commission considers enterprises as social enterprises where "those for which the social or societal objective of the common good is the reason for the commercial activity, often in the form of a high level of social innovation; those where profits are mainly reinvested to achieve this social objective; and where the method of organisation or ownership system reflects their mission using democratic or participatory principles or focusing on social justice." (European Commission, 2011, pp. 2-3).

In social enterprises, the "hybrid entity" was also apparent in their business models. Depending on the social mission, the target groups and the markets of these companies, according to the literature, nine different business models are the most common (Grassl, 2012), which can identify the type of a social enterprise. In most of the cases, social enterprises in the catering industry follow the employment business model, as their primary goal is to provide employment opportunities and job training to their clients and then to sell its products or services on the open market.

Dickerson and Hassanien (2017) investigated three social enterprises in the UK that had a common goal: providing restaurant services and their social mission (supporting local suppliers, employing women from ethnic minorities, and employing homeless people). The authors identified several critical areas where managers of these businesses had to make clear decisions to achieve their business model goals. On the one hand, it is crucial that company management clearly decides whether making a profit or executing a social mission is a priority. On the other hand, it is critical to define the business' social dimension to position and identify direct competitors correctly. In addition, it is essential for income generation to identify the potential target customers from which their regular customers can arrive and who provide a steady source of income to finance their operating costs. It is also important in the context of liquidity to look for long-term sources of financing (including third-party aid), which can also withstand financially challenging times, not only the shorter periods. Finally, the authors emphasise that these businesses need to be able to manage, at the strategic level, the financial pressures generated by the extra costs of fulfilling their social mission (which do not occur with a purely business-based competitor).

From an international perspective, several different strategies of social enterprises acting in the catering industry can be identified. Nunez and Musteen (2020) analysed successful sustainable ventures in the Cali Baja (Mexico) gastro industry. Based on their results, these businesses operate on the basis of a viable business opportunity that addresses both environmental and social goals because they have general knowledge of natural and communal environment along with compassion for the environment. The Terra Noble is a restaurant with a menu based locally grown products. The social goal of this restaurant is the local sourcing of vegetables and protein, knowledge transfer through experience shared with manly customers and employees. Cervceria Media Perra is a craft beer brewer and tasting room. The social dimension in this company is reflected in the fact that the organic waste from the production process is donated to a local pig farm and the knowledge about sustainable practices is shared with

their partners and customers. Finally, the Flor de Calabaza is a retail store of local sustainable and/or organic products (eggs, cheese, jams etc). This business donates compost to local garden nursery next to local sourcing and promotion (of agri-products).

These sustainable entrepreneurs gain a general understanding of environmental and social issues and challenges. This acquired knowledge is closely intertwined with the compassion for those affected by environmental and social problems (Shepherd and Williams, 2014). It is important to acquire business-related knowledge in the lives of these entrepreneurs and only then will follow the emergence of social (e.g. wellness of the venture stakeholders) and environmental (e.g. selective waste collection) dimensions. According to the authors, it is questionable how governmental institutions influenced the decision to start a sustainable business (or the performance of the enterprise). This is despite the existence of local programs in the Baja California region specifically for the sustainable development of the gastro industry.

The spread of various digital innovations in recent decades has affected social enterprises. Obermayer *et al.* (2019) investigated the knowledge-based networking technologies among wine and gastro SMEs in the Balaton region (Hungary). The sustainable development and the cooperation of the enterprises are essential. The authors consider it important to explore the application of knowledge-based networking tools (such as social media technologies) and to develop good practices and case studies for local businesses. In addition to this, we can speak about ‘digital hybridity’ which refers to the combination of economical (commercial) mission and social mission where digital innovations (AI and big data analytics) are a strategic approach to address sustainability concerns (He *et al.*, 2022). Digital hybridity supports creative engagement with financially excluded groups (social dimension) and this generates new revenue streams (e.g. loan) (financial dimension) for social enterprises. Embedding digital innovations in organisational operations can reduce uncertainty, thus social value creation and economic value creation do not need to be perceived as a trade-off (Wry & Zhao, 2018).

Our study aims to analyse socially innovative catering businesses where it is emphasised in their input sourcing that as much of the raw ingredients as possible come from a short food supply chain. Although Fekete *et al.* (2017) identified approximately 13,000 social enterprises in Hungary, the number of such enterprises in the hospitality industry is insignificant. Therefore, we simply selected those that deal with hospitality, and shortening the supply chain is of paramount importance in their mission, alongside their socially innovative initiative. There are currently seven organisations involved in the recently started para-gastro movement, all of which operate hospitality or food business units as social enterprises employing disabled and/or disadvantaged workers (Jakubinyi, 2017). The study analyses three of them which deal with hospitality in a classical sense as main profile which are directly involved in the previously defined SFSC-dimensions: *Ízlelő Restaurant* in Szekszárd, county seat of Tolna county in Southern Transdanubia region (and opened the second restaurant in Budapest the capital in the last years), the *Hatpöttyös Restaurant* in Székesfehérvár,

county seat of Fejér county in Central Transdanubia region, and the *Batyu-Téka* in Miskolc, county seat of Borsod-Abaúj-Zemplén county in Northern Hungary region. The main economic focus of all three companies is the public catering and restaurant business (primarily serving a daily lunch menu on various channels and, to a lesser extent, event organisation) employing disabled and/or disadvantaged workers.

Materials and Methods

In our empirical study, we applied mixed method research to integrate both qualitative (case study) and quantitative (case report) research questions (Pluye and Hong, 2014). Given the limited size of the sample (3 enterprises) due to the restricted number of actors in the sector (7 enterprises), this approach could provide the best insights. Our sample includes all the para-gastro enterprises of Hungary that consider SFSCs as an important source for their food inputs.

In the field of social sciences, applying mixed methods research is quite common (Baškarada and Koronios, 2018), and many of the recent social innovation related studies have followed this approach (e.g. Bozic, 2021; Chatzichristos and Nagopoulos, 2021; Faludi, 2020).

As part of the quantitative data collection, we conducted a secondary analysis to collect the background information available on the websites, Facebook profiles, and other news sources of the businesses complemented with all publicly available and up-to-date economic and legal information. With these case reports, a descriptive analysis of the selected organisations was applied, including the calculation of several indicators that serve as a basis of objective comparison.

In the qualitative data collection phase, we conducted face-to-face and telephone interviews (with an average duration of 90 min) with the management of each of the three selected organisations, following a semi-structured interview approach. In these case studies an in-depth analysis of the selected organisations was conducted. In our interviews, we were interested in the mission of the companies, and how it is implemented in their business concepts, within their specific market environment. Also, the role of the SFSC-concept in the restaurants’ business models were investigated, together with the identification of the characteristics of cooperation with their SFSC partners.

The expert interviews were conducted with the executives of all three companies at the end of 2018 and early 2019, followed by an analysis of a transcribed version of their audio (with the permission and prior interviewees), based on predefined analytical topics, using thematic coding. Based on these, we concluded that the realisation of the classic supplier-customer relationship within the framework of SFSC is most prevalent at the *Ízlelő Restaurant*, therefore in the third phase of data collection, we made additional expert interviews with the most important SFSC suppliers of this restaurant. We managed to get in touch with three of the five most important suppliers. In the supplier interviews, we described the relationship between the restaurant and its SFSC supplier, including both economic (e.g. the supplier’s sales level for the restaurant) and social (the role of the social mission of the restaurant) characteristics.

Our study tries to address several research questions. First, what are the main characteristics of the selected companies, with a special attention given to their business models? Second, how do these enterprises perform compared to each other, based on business indicators adjusted with the unique characteristics of the sector? Finally, how can the benefits of local sourcing and participation in SFSCs contribute to the economic and social performance of these companies?

Results

The para-gastro movement in Hungary is a network of organisations that have at least three similarities in their membership: continuation of gastronomic activity, the integrated employment of disabled and/or disadvantaged workforce, and furthermore, they operate as social enterprises (Jakubinyi, 2017). More than 75% of the employees in these businesses are disabled and/or disadvantaged people describe their activities well (Jakubinyi, 2017). Based on preliminary investigations, the members of the network include three companies that (also) engaged in the catering business in the classical sense, and the SFSC-concept played a decisive role during their operation.

Ízlelő Restaurant was founded in Szekszárd in 2007 by a foundation which is helping the social inclusion of disadvantaged people. However, its operation has been carried out by a non-profit company since the beginning. The building located in the central part of Szekszárd (the proximity of public institutions greatly assists the lunch menu profile) was provided by the local government through a concessional rental scheme. At the same time, refurbishment (accessibility for consumers and employees) and equipment were financed from EU funds. The main profile of *Ízlelő Restaurant* is the lunch menu, and because of the proximity of the well-known Hungarian wine region, the organisation of wine dinners is also determinative. Initially, they were involved in public catering, but this has now been overshadowed. The restaurant's supply has always been in the spirit of health awareness, closely linked to the SFSC-concept, as its locally sourced, fresh and unprocessed ingredients are of high quality and conducive to healthy living. However, everything comes at a price. The restaurant has always worked at a higher price level than its direct competitors; therefore, they won the "title" of Szekszárd's most expensive lunch menu among the consumers.

Nevertheless, it appears that a niche market has been found which accepts this price level, so long as they are indeed receiving better quality care. The success of the strategy is well illustrated by the fact that more than a decade has passed since it was opened, and it was not the *Ízlelő Restaurant* that had to be lowered in terms of quality and price, but instead, their direct competitors in Szekszárd started to follow them. The restaurant has been profitable since its first year, confirming that this concept is also economically sustainable. This is further supported by the fact that in June 2019, the second restaurant was opened in Budapest, the capital, which is the next step of establishing a long-planned franchise system. In addition, small-scale food processing is increasingly becoming a part of the activities, including

handmade chocolate manufactory and artisanal fruit processing, also targeting to reach both local consumers and tourists visiting the region of their restaurants.

The non-profit company operating *Hatpötyvös Restaurant*, was founded in 2009 in Székesfehérvár by families with disabled children. After overcoming the initial difficulties, the restaurant itself opened in late 2012. The concept was similar to the *Ízlelő*: the building in the central part of the city was obtained under a concessional and long-term lease scheme, and some of the investment needed for the opening could be financed from EU sources. The main target group of the lunch menu concept is public officials from the public institutions around the restaurant. One of the main clients in the field of event organisation is the local mayor's office. The kitchen's motto is to make delicious homemade meals from high-quality ingredients while providing livelihood jobs for employees with disabilities. The restaurant is working with raw, completely unprocessed ingredients, preserving (preservation and pickling), and preparing the pasta on site. However, the focus of activity has recently shifted towards public catering, mainly because the lunch menu business alone does not provide sufficient and predictable revenue. 2020 was a turbulent year for the business, as after a 10 year long rental period the restaurant had to leave its central-located building and almost closed. However, after two migrations and the help of community support and fund raising, the restaurant survived even among the difficulties of the COVID-19 restrictions.

The *Batyu-Téka* was established by a foundation in 2014, since then it is operated by a non-profit company, which can be linked to the foundation. The foundation promotes the employment of people with disabilities. The "holding" of the foundation also includes many other organisations; among others a "social farm" aimed at employing people with disability or autism and/or disadvantaged workforce (for more information, see: Kajner and Jakubinyi (2015)), which operates horticulture and a goat cheese manufactory, and also a restaurant. Based on the capacities of this restaurant, *Batyu-Téka* was opened in the downtown of Miskolc, where people provided lunch service with disabilities, and the restaurant building served as a venue for various community and social activities. The property was obtained from the municipality under a favourable rental scheme, and the necessary infrastructure investments were also solved with EU subsidies and loans. *Batyu-Téka* closed in the spring of 2018 due to an increase in the rent of the restaurant space. However, the management plans to reopen it soon, using a changed business model (own kitchen on-site and possibly owning the real estate).

Regarding the *SFSC-binding* of each of the investigated actors, the picture is quite diverse. In the case of *Ízlelő Restaurant*, the focus was initially on organic ingredients. Still, with insufficient local supply, they did not want to source their products from (international) chains, and therefore they turned to quality and locally available inputs. The preference of local suppliers (30-40 km catchment area of Szekszárd in their case) is also stated in their procurement rules. From spring to summer, the proportion of local suppliers reaches nearly two thirds, including the dairy products of a big local dairy processing company. Due to the insufficient quantity

and variety of supply, vegetable and fruit suppliers are the least local, especially during winter season the proportion of local raw ingredients is only one-third of the total inputs. Meat, dairy, and bakery products are the ones that come into the kitchen only and exclusively from local producers (processors) almost all year round. The relationship between suppliers (producers) and the restaurant is basically ad-hoc in terms of volume and frequency of purchases, but cooperation can be considered stable. The interviews with local suppliers also confirm this. In most cases, they can sell to the restaurant without formalised frameworks (supplier contracts) based on personal relationships, and they can sell ingredients to the restaurant seasonally, which accounts for only a tiny percentage of their annual turnover. It is also important to mention that the fact they deliver to a social enterprise restaurant while enhancing personal relationships and commitment does not affect other parameters of the transaction.

When the *Hatpötyös Restaurant* started the business, it totally followed the SFSC-concept, which has been manifested, in addition to local sourcing of raw ingredients, that they served as a pick-up point of a local community supported agriculture initiative (box scheme) on Saturday mornings. However, this approach did not prove to be viable in the long term. In the CEO's view, this is mainly due to the lack of consistent quality and the small number of potential local suppliers. Currently, their most important supplier is a local trader who purchases a significant part of its goods from the wholesale market of the capital city. The local suppliers are determinative only among meat products, and seasonally some of the fruits also come from the area of the region.

In the case of *Batyu-Téka*, the SFSC-relation was prevalent since the beginning, as the restaurant-related social farm provides a significant quantity of raw ingredients. The kitchen provides 300 servings a day, which, besides the delivery to the *Batyu-Téka*, are sold primarily for the public and social catering of their own and other institutions. Due to the large number of portions, the self-produced raw ingredients have a share of around 20%; the rest is sourced mainly through restaurant suppliers, while they are also cooperating with regional producers wherever possible (for example, neighbouring organic social farms). However,

local raw ingredients are not a priority, as the price level of social catering can bear the cost increase of neither organic nor small-scale purchases.

Based on the above, it can be concluded that the social focus of the examined enterprises is the same: providing employment for disabled and/or disadvantaged workforce. However, how their business model is attained and what their relation is to SFSC-concept, is quite different (for a summary, see Table 1).

If we examine the business models of the examined enterprises, according to the previously described Grassl's classification all three enterprises clearly put employment at the centre of their business model, as the employment of workers targeted by the social mission plays a vital role in the life of the businesses.

However, the enterprises provide a quite different picture when analysing their business performance and economic sustainability (Table 2). *Ízlelő Restaurant* has an outstanding performance in the para-gastro sector with positive Earnings Before Interest and Taxes (EBIT) in every year since the beginning. On the other hand, the two other restaurants generated significant losses in the first years and had a positive EBIT only in every second year, on average.

Social enterprises are quite dependent on subsidies (both local, national and EU funds), therefore it is interesting to measure the share of the market-based activities and subsidies in the enterprises' income. In this regard, *Ízlelő Restaurant* has her own path as only less than one fourth of the total income was subsidy, while for *Hatpötyös* and *Batyu-Téka* this share was almost double (44% and 54%, respectively).

As these enterprises have the primary goal of employment, it is also interesting to measure their employment and per capita performance. With her two restaurants, *Ízlelő Restaurant* was the biggest employer, providing job opportunity for 53 people (out of them 46 handicapped) in 2020. *Batyu-Téka* had 46, while *Hatpötyös Restaurant* 22 employees in the last year. In terms of per capita indicators, *Batyu-Téka* received the highest amount of subsidy, however, the per capita earnings of this restaurant were the negative, similar to *Hatpötyös Restaurant*. On the contrary, only the *Ízlelő*

Table 1: The most important characteristics of the examined restaurants.

	Ízlelő Restaurant	Hatpötyös Restaurant	Batyu-Téka
Location of the restaurant(s)	Szekszárd and Budapest	Székesfehérvár	Miskolc
Years of activity	12 and 2	12	14 (restaurant 2014-2018)
For profit activity focus	restaurant + event organization	restaurant + public catering	public catering (+ restaurant)
Social focus	employing disabled and/or disadvantaged workers		
SFSC connection	local suppliers	local suppliers (+ box system)	self-produced raw ingredients

Source: Own composition

Table 2: The most important business indicators^{a)} of the restaurants.

	Ízlelő Restaurant	Hatpötyös Restaurant	Batyu-Téka
Total income (average, million HUF)	32.0	16.2	36.2
EBIT (average, million HUF)	3.3	-2.0	0.8
Share of business years with positive EBIT	100%	50%	42%
Average share of subsidy in total income	24%	44%	54%
Number of employees (average, person)	12	14	21
Subsidy per capita (average, million HUF)	1.0	0.8	1.9
Earnings per capita (average, million HUF)	0.7	-0.2	-0.1

^{a)} Based on the closed business years of each restaurant.

Source: Own composition

Restaurant had positive and remarkable positive per capita earnings with only around half of the per capita subsidy compared to *Batyu-Téka*. Therefore, from a purely economic perspective, only the employment-based business model of the *Ízlelő Restaurant* can be considered to be sustainable.

Discussion and conclusions

Based on the analysis of interviews and background ingredients, several conclusions can be drawn regarding social enterprises operating in the Hungarian para-gastro sector, trying to apply a short supply chain in their procurement (for a summary, see Table 3).

The mission of all the examined social enterprises is to employ disabled and/or disadvantaged workers. This is also visible in their business concept, as catering, which is their primary business, is highly labour-intensive. At the same time, on the one hand, it is important to point out, that the productivity of employees in these social enterprises is typically below the competitors' productivity, which are employing non-disabled workforce. In any case, this represents a competitive disadvantage in terms of productivity, which can only be partially compensated by various training grants and other contributions and subsidies. On the other hand, however, these disabled employees are much more loyal to their employers. All three companies emphasised that high staff turnover, which was particularly observable in the Hungarian catering industry in and after the COVID-19 period, is not typical or much lower in their case, which in the long run may also compensate for slightly lower productivity. The disadvantage can also be further offset, since all three investigated companies strive to use local and/or raw ingredients to emphasise the quality, freshness and healthiness of the prepared meals, and the simpler and more monotonous workflows required to process of these raw ingredients is not a problem for their lower productivity employees. In the catering industry, when a competitor follows a conventional, purely profit-driven business model, this is unaffordable because of the cost commitment, so they chiefly use semi-prepared (and not local) raw ingredients.

If we consider the market environment, these social enterprises operating in the para-gastro sector are more confronted with the high entry barriers which is typical in the hospitality sector (building a (costly) infrastructure that meets different standards), since they are forced to bear the additional burden of accessibility for employees, in addition to the high rents and the need of purchase costly catering equipment. Based on the examined cases, it can be concluded that these businesses are not yet viable in Hungary on a purely competitive basis: in all three cases, discounted real estate rentals were needed to get started, and as both the cases of *Hatpötyös Restaurant* and *Batyu-Téka* show, in the absence of this, market-priced rentals can no longer be afforded. Accessibility for workers (e.g., infrastructure investments due to wheelchairs), which is an additional cost, can typically be (partially) covered by EU-funded sources.

The key factors identified by Dickerson and Hassanian (2017) in the UK are also well identifiable in the case of these three Hungarian companies. The practical implemen-

tation of similar business models based on employment differs significantly for the examined Hungarian restaurant. With the help of the lunch menu target group and the events, *Ízlelő* has found a regular customer base that provides the liquidity needed for continuous operation, and the company is profitable continuously despite having the lowest subsidy rate. In the case of *Hatpötyös*, the lunch menu focus is no longer able to truly generate the level of income that would be sufficient to cover the incremental cost of the social mission and the SFSC's purchase. The most striking thing in the case of *Batyu-Téka* is the dependence on subsidies: despite that on average more than half of its revenues in recent years have been (state) subsidies, the company is barely able to close its business year with a positive result. At *Batyu-Téka*, public catering is clearly not capable of extracting the extra costs of their individual nature. Most subsidy is project-based and therefore does not generate revenue in the long term so that various shocks on the cost side (e.g., a drastic increase in restaurant rentals) represent a difficult challenge for them.

In all the examined cases, it has become clear that SFSC can only bring real benefits to restaurants if they are trying to target a niche market. In the case of customers who were more committed to health consciousness and sustainability and therefore willing to accept higher prices, it may be expedient to use local ingredients (see the *Ízelelő* case), but at the same time, it is not appropriate for business models which focus on public and social catering because they are forced to compete on price (see the other two cases). Currently, in Hungary, the additional costs of SFSC-sourcing are only recoverable for businesses operating in the lunch menu system (primarily in logistics and processing), if these costs can be compensated by higher margins, for which the business must find its niche market. The SFSC-connection, which is not directly related to the basic activity of the restaurant, is also the possibility of small-scale food processing in all three cases. In this case, free workforce capacity is available for labour-intensive processing of locally sourced, often unique quality raw ingredients. The higher value-added food, which is produced locally, can be used for own use (e.g., home-

Table 3: Potential interactions between social enterprises and short food supply chains.

Challenge/Possible Solution	Social Innovation	SFSC
High entry barriers	(local) government support (discount in rental fees)	-
Employee accessibility	EU's subsidies	-
Low unit productivity/efficiency of the workforce	Training grants Low fluctuation	(exclusive) use of raw and/or local ingredients
Target niche markets	-	higher margins due to healthy, sustainable raw ingredients
Additional, labour-intensive activities	-	food processing factories

Source: Own composition

made pickles in the *Hatpötyös Restaurant*) and for resale (e.g., Szekszárd's chocolate in the case of *Ízlelő* or goat cheese in the social farm connected to *Batyu-Téka*), in the latter case, the company's social message can be sent with these products.

Examining their relationship with their partners reveals that these businesses cannot live on their social mission alone. By itself, employing disabled and/or disadvantaged workers is not enough to achieve their business objectives. For consumers and suppliers, this is only an additional aspect: consumers are affected by the quality of food and service, while suppliers are influenced by the volume and reliability of purchases, which are only marginally affected by the social dimension. In the case of all three companies, primarily, they do not want to catch the consumers with their social mission. In the case of *Ízlelő*, the business strategy is to reach the customers with quality service, and through this, they try to sensitise customers to their social purpose. In all three enterprises, SFSC's suppliers are characterised by seasonality, even though *Ízlelő* was not a dominant business partner that there was the highest proportion of local ingredients.

Finally, it can be stated that the social enterprises participating in the Hungarian para-gastro movement face all the challenges of the catering industry, which are made more difficult by their unique characteristics. In addition, to help achieving the social goal (e.g. various subsidies, discounts), the potential of SFSC can only be exploited if they are able to target the niche market with the uniqueness of local suppliers, where all this goes hand in hand with solvent demand, contributing to the business sustainability of enterprises. It is important to emphasise that our study is based on three cases so that a relatively small sample cannot be used to draw general conclusions about the situation of social enterprises in Hungary which are trying to use short supply chains; however, they clearly illustrate all the opportunities and challenges these companies are facing. Therefore, the main conclusions of the research might provide valuable lessons for stakeholders, mainly for enterprises that would like to achieve social innovation that includes SFSC initiatives, both in Hungary and in Central and Eastern Europe.

While the research derives several findings, it also has some limitations. Firstly, though all the SFSC-related Hungarian para-gastro enterprises are included to the investigation, due to the limited size of the sample (and the sector), the findings are only valid for this specific segment of the social enterprises. Another limitation relates to the timing of the data collection, as the post-COVID-19 implications, which heavily influence the catering industry as well as the food supply chains, have not been considered. Therefore, our research needs to be replicated after a while, possibly also examining new entrants to the Hungarian para gastro sector, with a strategic focus on both social innovation and SFSCs.

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Climate Factors and Maize Price Volatility in Developing Countries: Evidence from Benin

Changes in climate conditions are expected to significantly alter food production patterns and increase food price volatility, leading to challenges for food and nutrition security. Thus, this paper aims to investigate the extent to which climate factors contribute to the volatility of maize price in Benin, using monthly data from 7 markets. To this end, an autoregressive conditional heteroskedasticity in mean (ARCH-M) model is estimated. Mean and variance equations of monthly maize price are specified as functions of temperature, rainfall of the growing season and a set of control variables including a policy variable and the international price of maize with an ARCH(1) term in the variance equation. The findings from the mean equation suggest that rainfall has a negative effect on maize prices. Moreover, the estimation results from the variance equation indicate that rainfall and temperature are negatively associated with price volatility. Therefore, the findings indicate that climate change will affect maize price volatility.

Keywords: ARCH model; price volatility; rainfall; temperature; maize; climate change

JEL classifications: D40, O55, Q54

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Introduction

A change in climate factors constitutes one of the causes of food price volatility and variability; affecting productivity, production, and transaction costs (IFPRI, 2015; Springmann *et al.*, 2016; Chen and Villoria, 2019). Indeed, recent spikes in world food prices have often occurred owing to extreme weather events in major producing countries, and they are likely to become recurrent due to climate change (Lobell *et al.*, 2011). Oxfam (2012) reports that climate change somehow affects the occurrence of extreme events (e.g. droughts, floods and hurricanes), leading to an increase in the prices of agricultural commodities. Thus, markets will be destabilised, and there will be more food price spikes due to the increase in the occurrence of extreme weather events (Oxfam, 2012). Nevertheless, Headey and Fan (2008) argue that although climatic factors undoubtedly play a role, they are not in themselves convincing causes of the price spikes of 2007-2008 and the resulting food crises. Other factors such as economic reforms, market conditions, and deforestation may affect agricultural commodity price volatility (Shively, 1996; Barrett, 1997; Kilima *et al.*, 2008; Lundberg and Abman, 2021). In addition, epidemics and pandemics can lead to huge food price volatility and food crises. Historically, agricultural commodities prices dynamics are assumed to be driven by real shocks (based on rational expectations framework), and to stem from forecasting errors (based on the coordination issues caused by price instability) (Gouel, 2012). Moreover, studies including Nelson *et al.* (2010) and Baldos and Hertel (2014) argue that price variations give only a very partial indication of the socio-economic impact of climate change. Baldos and Hertel (2014) find that due to climate change, the malnourished population will increase by 27 million in 2050 compared to a baseline scenario without climate change.

Food price spikes can intensify and contribute to broader social risks in terms of food and nutrition security, human development, and political stability. For instance, the Intergovernmental Panel on Climate Change (IPCC, 2007)

earlier reported that climate change has amplified the effects of droughts, floods and storms and exposes many people to food poverty resulting from the high volatility of agricultural commodities prices. The decrease in food availability due to climate change leads to an increase in food prices, *ceteris paribus*. As illustration, Nelson *et al.* (2010) find that climate change will lead to an increase in malnutrition in 2050 of between 20 and 25 million for children under 5. These results are partly due to a more unfavourable scenario of yield change than that adopted by studies such as Baldos and Hertel (2014). Without climate change, world prices are expected to increase during the period 2000-2050 for the main agricultural commodities (rice, wheat, corn, and soybeans) due to the increase in population and demand for biofuels; this highlights the competition between food crops and biofuels in terms of land use (Nelson *et al.*, 2010). Consequently, even without climate change, the price of rice would increase by 62%, that of corn by 63%, that of soybeans by 72% and that of wheat by 39%. However, climate change could induce additional price increases; overall from 32% to 37% for rice, from 52% to 55% for maize, from 94% to 111% for wheat and from 11% to 14% for soybeans. Thus, the maize price would be more affected by climate change compared to crops such as rice, wheat and soybeans.

It should be noted that, in both rural and urban areas, poor populations will be the most affected, given that they devote a much larger share of their income to food consumption. Moreover, smallholder family farmers will also suffer, as most of them are net food buyers (Zezza *et al.*, 2008; IPCC, 2014). Although conceptually higher prices may lead to an increase in the area under cultivation on less fertile land, and therefore a reduction in yield, several empirical studies have shown that the positive effect outweighs the negative one (Haile *et al.*, 2016; Miao *et al.*, 2016). It is worth noting that the volatility of crop prices discourages agricultural production because it introduces a producer price risk. Moreover, price risk has negative consequences for producers' resource allocation and investment decisions (Sandmo,

1971; Moschini and Hennessy, 2001). Actually, it is hard for poor farmers to take advantage of rapid price increases due to many factors such as lack of access to credit, land and other necessary inputs to expand production (Oxfam, 2012). This is the case for agricultural producers in low- and middle-income countries, due to poor risk management (Binswanger and Rosenzweig, 1986) and these producers are not well protected from the consequences of price volatility (Miranda and Helmerger, 1988). It should also be noted that episodes of food crises trigger concerns about the peculiarities of agriculture and the need for public intervention in agricultural markets (Gouel, 2012).

Maize is the most consumed cereal in Benin and is produced all over the country. In terms of food insecurity, in 2017, 45.5% of the population are food insecure, with food insecurity more pronounced in rural areas (République du Bénin, 2017). This low-middle income country ranks among those developing nations that are acknowledged as having a low capacity to adapt to climate change. Thus, it is of paramount importance to investigate the relationship between climate factors and food price volatility. This study aims to analyse the extent to which climate factors affect the volatility of maize prices in Benin. To this end, an autoregressive conditional heteroskedasticity in mean (ARCH-M) model is estimated. The study contributes to the literature by analysing how climate factors and in time, climate change could result in food price volatility in developing countries. The findings can guide policymakers in designing appropriate economic policies to mitigate the effects of climate factor on the welfare of both producers and consumers. It is also worth noting that beside climate factors, the extent to which the food price stabilisation policy implemented in the country starting from July 2008, which consists of assembling grain stocks after harvests and selling them during periods of scarcity, influences maize price volatility.

The remainder of the study is proceeds as follows. Section 2 present a synthesis of the literature on the drivers of agricultural commodity price volatility. The methodology (analytical tools and data) is presented in Section 3. Section 4 presents the empirical findings and the discussion. Finally, there are the conclusion and policy implications.

Drivers of agricultural commodity price volatility: a synthesis of the literature

Many factors are identified in the literature as having the potential to drive agricultural commodity price volatility. These include market fundamentals like yields and stock levels, weather and changing weather patterns with their related impacts, cycles in key markets, policy driven developments including large purchases by the governments, developments outside the agricultural sector (e.g. exchange rate and oil price movements), trade policies and their transmission, and lastly, investments in agricultural production (Tothova, 2011). According to Tothova (2011), the following factors contribute to greater volatility: i) low levels of stocks; ii) climate change and weather-related

events; iii) policies; iv) strong co-movements with energy and other agricultural prices.

As market fundamentals driving agricultural commodity price volatility, there are supply, demand, storage with their relative shocks including weather, technological progress, and population growth (Williams and Wright, 1991; Piot-Lepetit and M'Barek, 2011; Karali and Power, 2013; Algieri, 2014; Ott, 2014). For Piot-Lepetit and M'Barek (2011), the shocks are caused by other structural factors that simultaneously influence different crops at the same time (e.g. energy and fertiliser prices, exchange rates, interest rates). Policies are also found to affect the volatility of food prices (Piot-Lepetit and M'Barek, 2011). For instance, market price volatility depends to a large extent on trade policies designed to isolate domestic markets from international markets (Tigchelaar *et al.*, 2018). Studies such as Diffebaugh *et al.* (2012); Schaub and Finger (2020) and Putra *et al.* (2021) identify climate change and extreme events such as droughts as driving factors of price volatility. They report that the volatility of US corn prices is more sensitive to short-term changes in climate conditions. The impact of climate change is mainly due to the intensification of severe heat conditions in the cultivation of primary corn in the United States, which has led to a sharp increase in the volatility of corn prices. For these authors, there is a closer integration between agriculture, energy, and markets. They underline the crucial importance of the interactions between energy policies, the links between energy and agriculture and climate change. In addition, agronomic factors as well as the historically low levels of world cereal stocks are found to drive food price volatility (Ngare *et al.*, 2014). It should be noted that Chen and Villoria (2019) highlight the effects of food imports on the variability of domestic maize prices in 27 net-importing countries. Meanwhile, Lundberg and Abman (2022) find strong empirical evidence showing that there is negative association between maize price volatility and forest loss, using data from 26 countries in Sub-Saharan Africa.

Material and Methods

Modelling maize price volatility accounting for climate factors

This study estimates mean and variance equations of monthly maize prices as functions of climate factors (rainfall and temperature), a policy variable, seasonal and regional variables with the ARCH term in the variance equation following studies such as Engle *et al.* (1987) and Kilima *et al.* (2008). This modelling approach is choosing drawing on Kilima *et al.* (2008) who state that theoretically storable commodity prices have an ARCH process, and distinct from standard time-series models, conditional volatility can directly influence the conditional mean in an ARCH in mean (ARCH-M) model. Note that there are other methods of volatility analysis such as the standard generalized autoregressive conditional heteroskedasticity (GARCH) model and its variants like the Spline-GARCH model – that can decompose daily price volatility into high- and low frequency

components with the latter plausibly being driven by slowly-changing common and commodity-specific macroeconomic factors (Engle and Rangel, 2008), and the regime switching GARCH-MIDAS model (Pan *et al.*, 2017). Thus, the specification of the empirical model is as follows:

$$\begin{aligned} LnPrices_{it} = & \beta_0 + \beta_1 LnPrices_{it-1} + \beta_2 Trend_t + \\ & + \beta_3 LnR_{it} + \beta_4 LnT_{it} + \beta_5 Policy_t + \\ & + \beta_6 Price_International_t + \sum_m 0_m \times M_{tm} + \sum_k \gamma_k A_{ik} + \\ & + \delta h_{it}^{1/2} + \epsilon_{it}, \epsilon_{it} | \varphi_{t-1} \sim i.i.d N(0, h_{it}) \end{aligned} \quad (1)$$

$$\begin{aligned} h_{it} = & \alpha_0 + \alpha_1 \epsilon_{it-1}^2 + \alpha_2 LnPrices_{it-1} + \alpha_3 Trend_t + \\ & + \alpha_4 LnR_{it} + \alpha_5 LnT_{it} + \alpha_6 Policy_t + \\ & + \alpha_7 Price_International_t + \sum_m \rho_m \times M_{tm} + \sum_k \tau_k A_{ik} \end{aligned} \quad (2)$$

where $LnPrices_{it}$ and $LnPrices_{it-1}$ are current and one-month lagged of the natural logarithm of the real maize prices in market i , respectively, $Trend$, R , T , $Policy$, $Price_International$, M and A refer to monthly trends, rainfall, temperature, a dummy variable capturing the policy implemented in the country starting from July 2008 consisting of assembling grain stocks after harvests that are to be sold during period of scarcity (food price stabilisation policy), the international maize price, monthly dummies, and regional dummies, respectively. The error term ϵ is assumed to be independently, identically, and normally distributed, conditional on the information set φ_{t-1} with mean zero and variance h . It should be noted that monthly rainfall and temperature are not used directly in the model. Rather, seasonal values are computed; April-July and September-November average temperature and total rainfall are calculated. April-July values are assigned to August, September, October, and November, and September-November ones to January, February, March, April, May, June, and July. Using these climate variables instead of monthly data helps to capture data for the growing period.

In this modelling framework, the short-term trend of price volatility is represented by α_3 and the short-term difference in price volatility before and after the grain stock policy is represented by α_6 in the variance equation. One can obtain the long-term effects as follows:

$$\omega_{LT}^1 = \frac{\alpha_3}{1 - \left(\alpha_2 / Prices_{it-1} \right)} \quad (3)$$

$$\omega_{LT}^2 = \frac{\alpha_6}{1 - \left(\alpha_2 / Prices_{it-1} \right)} \quad (4)$$

From the ARCH-M risk term, δ , which is the observed price attributable to risk premium, one can estimate the short-term relative risk premium defined as:

$$RRP = \frac{\delta h_{it}^{1/2}}{Price_t} \quad (5)$$

The long-term relative risk premium is obtained by dividing the short-term relative risk premium (based on equation 5) by $(1 - \beta_1)$.

The data are pooled into a panel data structure to enable an estimation of the aggregate effects of climate factors and the policy variable included, as well as to ascertain the extent to which maize price volatility is due to the specified regional factors in the variance equation. Prior to the estimations, the variables must be tested for stationarity. Indeed, the order of integration of the variables is of paramount importance for the modelling. Moreover, prior to run the unit root tests, it is of paramount importance to test for cross-sectional dependence for the continuous variables except for the international maize price as it does not vary across markets included in the analysis. In fact, cross-sectional dependence can be due to the presence of common shocks and unobserved components in the series (de Hoyos and Sarafidis, 2006) and panel unit root tests are sensible to that. The selection of the appropriate panel unit root test should be motivated by the results of the cross-sectional dependence test; either first-generation or second-generation panel unit root tests should be adopted. Second-generation panel unit root tests should be used when the hypothesis of cross-sectional dependence is not rejected instead of using first-generation panel unit root tests (Pesaran, 2007). This paper makes use of the Pesaran cross-sectional dependence test (Pesaran, 2004) to test for cross-sectional dependence in the series. Although, the paper relies on an ARCH-M modelling approach, the Engle's Lagrange multiplier test for ARCH effects has been conducted for the individual markets to test for the presence of ARCH effects.

Data and summary statistics

The data used in this paper are monthly maize prices and are from the Ministry of Agriculture of Benin. The dataset covers the period from August 1998 to December 2016 and are relative to several principal markets of the country. These are consumer prices and are measured in local currency per kg (F CFA, in 2016 1 US\$=593.01 CFA F). The markets included in the paper are Banikoara, Bohicon, Dassa, Djougou, Malanville, Parakou, and Savalou. These markets capture the regional distribution of the country and are chosen due to data availability. Cotonou is not included as it is not concerned by maize production; it is the main city of the country. Consumer Price Index (CPI) of agricultural products collected from the Food and Agriculture Organization of the United Nation (FAO) is used to deflate the monthly maize prices. Monthly international maize prices are from the Economic Research Division of the Federal Reserve Bank of St. Louis and are in US\$ per metric ton. Monthly rainfall and temperature data are from the Meteorological service of Benin.

Table 1 reports summary statistics for deflated maize prices in the eight markets included in the analyses. One can notice that means prices and standard deviations differ across markets. As a result, there are differences in the coefficients of variation; the highest is from Djougou and the lowest in Parakou. It should be noted that Djougou is located in the North-West of the country, and that maize is more consumed in the South compared to the North. Parakou is the main city of the northern part of the country. These differences in the coefficients of variation, suggest the heterogeneities of the

Table 1: Summary of deflated monthly maize prices in the markets included in the analyses.

Markets	Mean	Standard Deviation	CV	Skewness	Kurtosis
Banikoara	331.023	187.997	0.568	0.503	1.921
Bohicon	330.860	176.096	0.532	0.558	2.005
Dassa	350.007	188.016	0.537	0.585	1.968
Djougou	363.267	444.903	1.225	11.457	157.778
Malanville	357.146	196.604	0.550	0.569	1.926
Parakou	331.654	173.403	0.523	0.436	1.809
Savalou	354.462	189.049	0.533	0.521	1.907

Source: Own composition

markets in terms of price volatilities. In fact, the volatility of commodities prices affects the population, compromising food security and nutritional status.

Results and Discussion

As previously indicated, cross-sectional dependence tests results are important to guide the choice of the appropriate unit root test. The results of cross-sectional dependence (Table 2) indicate the presence of cross-sectional dependency in the series, and so suggest the use of second-generation panel unit root tests to the detriment of first-generation panel unit root tests. Consequently, a Pesaran (2007) panel unit root test has been used. It should be noted that it is the Im-Pesaran-Shin unit root test which is used for the international maize price. The panel unit root test results (Table 3) show that the three variables are stationary at level; at level the null hypothesis of a unit root can be rejected (the variables are thus integrated of order zero). The Engle's Lagrange multiplier test for ARCH effects conducted for the individual markets suggest the presence of ARCH effects. Thus ARCH(1) is estimated.

The estimation results are reported in Table 4. The findings from the mean equation suggest that rainfall has a negative effect on maize prices. However, the effect of temperature on maize prices is not significant. These findings suggest that maize price will be sensible to climate change and are in line with those of previous studies such as Diffenbaugh *et al.* (2012); Schaub and Finger (2020) and Putra *et al.* (2021). So,

Table 2: Pesaran cross-section dependence test for the series.

Variables	CD-test	P-value	Average joint T	Mean ρ	Mean abs(ρ)
Ln(maize price)	65.887***	0.000	221.00	0.95	0.95
Ln(Precipitation)	36.878***	0.000	221.00	0.54	0.54
Ln(Temperature)	46.896***	0.000	221.00	0.69	0.69

*** Significant at the 1% level of significance.

Source: Own composition

Table 3: Panel unit root test results.

Variables	Intercept	Intercept and Trend
Ln(maize price)	-6.149***	-6.345***
Precipitation	-5.978***	-6.141***
Temperature	-5.157***	-5.898***
Ln(world maize price)	-1.959*	-2.877***

*** Significant at the 1% level of significance.

Source: Own composition

Table 4: ARCH-M estimation results.

Variable	Mean equation	Variance equation
Constant	1.112 (0.875)	28.429** (10.573)
$\ln Price_{t-1}$	0.949*** (0.009)	-0.448*** (0.099)
$\ln Rainfall$	-0.030** (0.014)	-0.647*** (0.162)
$\ln Temperature$	-0.229 (0.256)	-8.363** (3.178)
$\ln World\ maize\ price$	0.036** (0.016)	0.914*** (0.195)
$Policy$	-0.021 (0.017)	0.191 (0.233)
$h^{1/2}$	-0.662** (0.284)	
β_1 , ARCH(1) term		0.092*** (0.0264)
Market dummies (Reference = Bohicon)		
Banikoara	-0.019 (0.013)	-0.288* (0.171)
Dassa	-0.006 (0.012)	-0.212 (0.151)
Djougou	0.007 (0.015)	0.435*** (0.177)
Malanville	-0.011 (0.013)	-0.181 (0.165)
Parakou	-0.014 (0.012)	-0.451** (0.167)
Savalou	-0.008 (0.012)	-0.190 (0.154)
Monthly dummies (Reference = January)		
February	-0.120*** (0.025)	-1.264*** (0.186)
March	-0.035** (0.014)	-2.726*** (0.211)
April	-0.058*** (0.014)	-2.773*** (0.201)
May	-0.031** (0.014)	-2.693*** (0.196)
June	0.002 (0.014)	-2.548*** (0.201)
July	0.004 (0.018)	-1.831*** (0.231)
August	0.023 (0.017)	-2.258*** (0.238)
September	0.012 (0.017)	-2.207*** (0.233)
October	0.128*** (0.030)	-1.275*** (0.274)
November	-0.037** (0.016)	-2.771*** (0.260)
December		-2.814*** (0.196)
Trend	-3.61e-05 (1.239e-04)	-0.006*** (0.001)
Observations		1,547
Wald chi2(16)		25,561.92
Prob > chi2		0.000

Notes: Standard errors are in parentheses. ***P<0.01, **P<0.05, *P<0.1.

Source: Own composition

adaptation policies are necessary to limit food price spikes attributable to climate change. Maize prices differ in some extent across months as shown by the significant coefficients associated with several monthly dummies. This suggests that some months are abundance periods, while others are scarcity periods. Thus, maize prices decrease in abundance periods, and increase in scarcity periods. As with normal goods, an increase in supply should lead to a decrease in prices, *ceteris paribus*. In addition, the findings indicate that the policy implemented to assemble grain stocks after harvesting does not have any significant effect on maize prices.

The estimation results from the variance equation indicate that rainfall and temperature have a negative effect on price volatility. Price volatility decreases with rainfall and temperature. Therefore, maize price variance depends also on climate factors and by extension, climate change. This indicates that climate change will somehow affect maize price variance. It can be concluded that the decrease in seasonal rainfall associated with the increase in seasonal temperature could lead to increase in volatility in maize prices with implications for food and nutrition security, and this is consistent with the findings of previous studies such as Diefenbaugh *et al.* (2012); Schaub and Finger (2020) and Putra *et al.* (2021). These findings suggest that maize price volatility will increase or decrease depending on the changes in rainfall and temperature. However, an increase in rainfall, *ceteris paribus*, will lead to a decrease in maize price volatility. Price volatility decreases in all other months compared with January: it can be observed that maize prices are more volatile in January relative to the remaining months of the year. The findings also reveal that the grain stock policy does not affect significantly maize price volatility. This indicates that this policy does not contribute to stabilising prices. This may be because certain persons may buy maize from the shops where public authorities sell the commodity during scarcity periods to sell it back. Price volatility is significantly higher in Djougou, and significantly lower in Banikoara and Parakou relatively to Bohicon. These findings confirm the heterogeneities of the markets in terms of price volatilities. As production decision is somehow linked to prices, high price volatilities may affect the level of production. The short-term trend of price volatility is equal to 6 and the short-term difference in price volatility before and after the grain stock policy is equal to in the variance equation. One can obtain the long-term effects using the equations (3) and (4) that are and , respectively. These figures indicate that both short-term and long-term price volatility have been decreasing and there is no difference between these two effects. In addition, the grain stock policy has contributed to an increase in maize price volatility but the effect is not significant, indicating that this policy has not had the expected effect on price volatility.

Moreover, the value of short-term and long-term relative risk premia are estimated as -0.004 and -0.073, respectively. These negative relative risk premia are consistent with previous findings such as those of Barrett (1997) and Kilima *et al.* (2008). It should be noted that for Barrett (1997), negative risk premia in staple food pricing could indicate consumers' dedication to keep diet and food preparation habits around staple foods. Moreover, Domiwitz and

Hakkio (1985) argue that a negative risk premium could mean that price risk widens the marketing cost wedge between wholesale and retail maize prices. Higher costs for traders resulting from price risk might lead to upward pressure on retail prices and lower wholesale and producer prices (Domowitz and Hakkio, 1985). Price fluctuations have always been viewed as unfavourable to the expectations of economic agents. They exacerbate the vulnerability of both producers and consumers that depend on the commodities whose prices are volatile. High food prices lead to a reduction in food consumption (Zezza *et al.*, 2008; Springmann *et al.*, 2016), thereby exacerbating food and nutrition insecurity. One of the means to reduce vulnerability and poverty in rural areas as well as in urban and peri-urban areas is to guarantee stable prices. In addition, food price volatility undermines growth prospects and poverty reduction in low-income countries. Thus, stabilisation policies have the role of ensuring the stability of agricultural commodities for the population, especially for the poor. Commodity price volatility affects people, compromising their food security and nutrition status.

Conclusion and policy implications

Climate change is expected to significantly alter food production patterns and increase food price volatility, leading to challenges for food security and poverty. The objective of this paper was to investigate the extent to which climate factors contribute to increase the volatility of maize price in Benin. To achieve the objective, an ARCH-M model has been estimated. Mean and variance equations of monthly maize price are specified as functions of temperature, rainfall of the growing season and a set of control variables including a policy variable and the international maize price with an ARCH(1) term in the variance equation. The findings from the mean equation suggest that rainfall has a negative effect on maize prices. The findings indicate also that the policy implemented to assemble grain stocks after harvest does not significantly affect the price of maize. Moreover, the estimation results from the variance equation indicate that rainfall and temperature are negatively associated with price volatility, so the net effect of climate factors will depend on the direction of the changes in those factors. The findings also reveal that the grain stock policy does not significantly affect price volatility. Furthermore, the short-term and long-term relative risk premia are negative. From the findings the following policy implications can be drawn: (i) Policymakers should design policies that aim to control for maize price volatility based on their goals (targeting either producers or consumers), but also need to have a clear understanding of the situation of farm households (whether they are net buyers or net sellers of maize); (ii) As food security is more pronounced in rural settings, public policies could target producers (farm households) in terms of maize price stabilization related to climate factors; (iii) Adaptation policies could also be designed to increase maize production and limit price volatility. This research does not assess volatility transmission across markets; future research could focus on this aspect.

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Access to credit for rice farmers and its impact on productivity: the case of Ebonyi State, Nigeria

This study examines the impact of access to bank and non-bank credit on rice productivity and output. It employed the coarsened exact matching (CEM) model and qualitative methods for primary data on a purposive sample of 450 rice farmers across three Local Government Areas of Ebonyi State, Nigeria. Pre-matching results suggest that access to non-bank credit and access to total credit significantly affected labour productivity and output, while access to bank credit significantly affected output. However, the post-matching results show that access to all three categories of credit has no significant effect on either output or capital, labour, and total factor productivity. This study therefore recommends that for an improved production and productivity yield among rice farmers in the state, policies should focus on the issues of improved quality of education and constraints in accessing loans/credits.

Keywords: Access to credit, Rice farmers, Productivity, Coarsened exact matching model, Ebonyi State, Nigeria.

JEL classification: Q14

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Introduction

Nigeria has long been classified as a mono-product economy as revenue from oil dictates the fate of the economy. This dependence became so high that in 2006, revenue from oil accounted for over 87% of the total federal government revenue and the just witnessed economic recession in the country was attributed to the decline in the international oil price. Given the danger of this oil dependency, efforts have recently been made to improve the diversification of the economy with a focus on the agricultural sector at both the national and state levels.

Ebonyi State is reckoned to be one of the most agrarian of all the states in Nigeria. The state comprises both savannah and semi-tropical vegetation, has humid, sandy, and marshy soil, and is blessed with moist land that is suitable for farming a variety of cash and food crops. In view of its agricultural potential, it stands out as one of the states with the greatest production of rice. Ebonyi State is geographically well endowed for rice production, yet it is still producing far below its capacity. This is unfortunate given that Nigeria is still ranked the second largest importer of rice in the world and the highest in Africa with over 3,000,000 tonnes imported annually. Rice consumption in Nigeria is at the yearly rate of 24.5 kg per citizen, which shows that the current annual production level of 3.5 million tonnes is insufficient. However, the federal government has enacted homegrown agricultural production policies with one of the essential crops being rice. With the ban on importation of rice at the national and Ebonyi State levels, homegrown rice production is now expected to rise to meet the excess demand. It is therefore imperative for rice farmers in Nigeria and Ebonyi State in particular to take advantage of this business opportunity by commercialising their products for

value addition. As is the case with most agrarian societies in Nigeria, crop production faces severe challenges ranging from low start-up capital, inadequate access to credit, inadequate infrastructure, poor mechanised systems, low technical know-how, non-affordability of high breed seeds and pesticides, low levels of investor interest in the sector, traditional subsistence practices and current changes in the weather among others (Ume *et al.*, 2016). Therefore, this study examines the extent to which access to bank and non-bank credit improved the output as well as the labour, capital and total productivity of rice farmers, using a coarsened exact matching model and qualitative methods for primary data on a purposive sample of 450 rice farmers across three Local Government Areas of Ebonyi State.

The objective is motivated by the fact that in 2015, the Central Bank of Nigeria ranked Ebonyi State highest among states in the country where individuals had no access to finance, with about 56% of its entire population having no access to financial services including owning of bank accounts (Okutu, 2015). This is a call for concern as Yuni (2017) posits that credit is the most influential means of expanding existing agro-based small and medium enterprises (SMEs) or creating new ones as it is the most elastic of the financial sources available to agro-based SMEs in Nigeria. Moreover, according to the International Investment Bank, improving financial markets helps to secure wider government objectives on investment and growth in the economy, and it has now widely been recognised how vital growth is to smaller businesses (Goldman Sachs International 2015).

Several works have analysed the relationship between credit access and production in Nigeria. Most of these works analysed these relationships at national, regional, and state levels, including Olagunju and Babatunde (2011) and Ojo *et*

al. (2019) for South-West Region as well as Obilor (2013) for Nigeria. At the state level, Ettah and Kuye (2015) made similar analysis for Cross River State as well as Mgbebu and Achike (2017) and Ume *et al.* (2016) for Ebonyi State.

However, literature that ascertains this relationship for Ebonyi State which is one of the most agrarian of all the states in Nigeria and rice production in particular is scanty. It is therefore on this premise that this study examines the extent to which, access to bank and non-bank credit improved on output as well as labour, capital and total productivity of rice farmers using the coarsened exact matching model and qualitative methods for primary data on a purposive sample of 450 rice farmers across three Local Government Areas of Ebonyi State.

The rest of this paper is organised as follows: Section 2 reviews relevant literature on access to credit and output/productivity relations. Section 3 presents the methodology, Section 4 demonstrates and discusses the empirical results, while Section 5 concludes with some policy recommendations.

Literature Review

The theory of marginal productivity updates the theory of the factors of production. The most comprehensive description of this theory is by J. B. Clark. Marginal productivity of labour and of capital could be defined as the additional output obtained by increasing the input (labour and capital) by one unit, respectively. The theory of marginal productivity proposes that the value of a product is created by the three basic factors of production (labour, capital, and land, wherein land represents all other natural resources used in production) (Clark, 1899). There exist two major conclusions that can be drawn from the theory of marginal productivity. The first refers to the concept of "perfect competition" which refers to a point, where per unit of input is best employed, or, in other words, the most efficient utilisation of productive resources. The second conclusion, which deals with the distribution of created value, claimed that the income earned by each factor is proportional to the quantity and value of its marginal product. This theory and others such as knowledge worker productivity (KWP) by Drucker (1993), quality theory by Waugh (1928) and the agricultural productivity gap theory (Golin *et al.*, 2011) show that productivity is a better concept to assess output than just production. This study employs labour, capital, and total factor productivity to determine different productivity measures, especially given that factor products have altering intensities for production.

The empirical literature features papers examining the effect of credit access on different outcome indicators, or else measuring other tools or influences on productivity. In examining credit impact from a macro perspective, Imoisi *et al.* (2012) provide evidence that commercial bank loans have contributed significantly to agricultural output. They examined credit facilities and agricultural output and productivity in Nigeria from 1970-2010. Their results showed that there was a significant relationship between Deposit Money Banks loans and advances and agricultural output. However,

credit facilities provided by these financial institutions to the agricultural sector were shown to be inadequate and to have affected the level of output provided by the agricultural sector. Similarly, Adetiloye (2012) examined the provision of credit to the agricultural sector as an assessment of the Agricultural Credit Guarantee Scheme Fund (ACGSF) in Nigeria. The results show that although credit to the agricultural sector is significant, it has not been growing relative to the economy. While Obilor (2013) used an error correction model to show that commercial banks' credit to agricultural sector for the period 1984 to 2007 had no significant positive impact on agricultural productivity in Nigeria, the ACGS loan has intentionally led to significant growth in agricultural productivity in Nigeria.

On the other hand, cross-sectional works or micro-analysis on the subject are abound. Micro-analysis is critical in observing this relationship because cross-sectional units, farms or firms offer variables that may not be readily available at the macro level. Fakayode *et al.* (2009) performed an empirical economic analysis of the on-lending loan scheme of the Agricultural Credit Agency of Ekiti State (ESACA), Nigeria. They used descriptive statistics to show that the resultant gross margin from cropping activities of loan beneficiaries was low. However, this was higher than that of non-beneficiaries because the beneficiaries were engaged in diversified crops, including a mix of food and cash crops. Similarly, Isa (2009) shows that 17% of rural women sourced credit from formal sources (commercial banks/ agricultural banks), while 83% got theirs from informal sources like friends, relatives, NGOs, and personal savings. Women encountered problems like inaccessibility of credit institution, lack of collateral security or administrative bureaucracy in accessing formal sources of credit. Problems such as high-interest rate also posed challenges in accessing informal sources of credit. The cross-tabulation/chi-square analysis showed that occupation, education, and land ownership influenced access to agricultural credit. Socio-economic factors like age, family size, farm size did not influence access to credit. Finally, the chi-square analysis proved that there was a significant relationship between the amount accessed and level of output. Women who received a high amount of credit experienced an increase in their agricultural output.

Olagunju (2011) investigated the impact of credit on poultry productivity in Ogun, Osun, and Oyo States of Southwest Nigeria. The study employed logit and multiple regression models and showed that amount of credit had a significant direct relationship with poultry productivity. Still, in the Southwest, Bolarinwa and Fakoya (2011) compared the agricultural output recorded by credit beneficiaries and non-credit beneficiaries in Nigeria. The findings from the study show inadequate provision of credit from formal credit institutions with about 40% of beneficiaries securing loan from formal credit institutions, and 60% from informal credit institutions. Beneficiaries recorded higher (80,000 tons) cocoa production compared to lower (21,000 tons) cocoa production recorded by non-credit beneficiaries. There was a positive and significant correlation between the performance of farm production operations and securing of credit for crops production level ($r=0.382$). In a similar vein, Oyeyinka and Bolarinwa (2009) examined the use of

Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) smallholder direct loan scheme to increase agricultural productivity in the rural areas of Oyo State, Nigeria. Systematic random sampling technique was used to select 130 beneficiaries and 130 non-beneficiaries for the study. The results of the study showed that the beneficiary's access to credit had enabled them to make efficient use of improved farm inputs and labour than non-beneficiaries. It could be deduced that the NACRDB smallholder direct loan scheme was capable of transforming rural agriculture.

Three empirical works in the literature are closest to the interest of this study. First, Ume *et al.* (2016) measured the level of technical efficiency and the determining factors among a sample of 120 rice farmers in Ezza South Local Government Area of Ebonyi State, Nigeria. The determinants of technical efficiency in rice production in the study area were farming experience and household size. The limiting factors to rice production in the study area were the high cost of improved inputs, inadequate access to credit, poor access to information and problem of diseases and pests. Second, Ettah and Kuye (2015) examined the socio-economic characteristics and factors affecting the output of credit beneficiaries using a sample of 108 rice farmers in Yakurr Local Government Area of Cross River State, Nigeria. The results show that farm size, income and household size positively affected the output of farmers at various levels of probability, while age negatively affected the output of farmers. Third, Mgbebu and Achike (2017) investigated the determinants of successful loan acquisition from formal financial institutions by a sample of 120 small-scale rice farmers, and the multiple regression results indicated that farm size, cost of farm inputs and interest charge were significant in determining loan acquisition.

Ettah and Kuye (2015) as well as Mgbebu and Achike (2017) examined the determinants of credit access, while Ume *et al.* (2016) showed that credit access was a weak determinant of the technical efficiency of rice production in Ebonyi State. Nevertheless, it is not enough to establish the determinants of credit access, as it is also essential to underscore to what extent the credit accessed impacts on output and productivity. This study is justified by the fact that Ebonyi State is one of the youngest states created in the Nigerian Federation and is reckoned as one of the most agrarian of all the states with great potential for rice production but ranked as the highest state without access to financial services according to the Central Bank of Nigeria (CBN). This study, therefore, employs a larger sample size of 450 small-scale farmers to ascertain the impact of access to credit from bank and non-bank financial institutions on rice output and productivity.

Methodology

Data and Descriptive Statistics

The study employed primary microdata for 450 small-scale farmers sourced from three Local Government Areas (LGAs) of Ebonyi State; Abakaliki, Ikwo and Afikpo North.

Purposive sampling was employed to survey only rice farmers in the concerned LGAs. Research assistants who understood the language of the people of the LGAs administered the questionnaires and recorded the responses. The study employed the Fisher's population proportion formula to estimate the sample size as follows:

$$\begin{aligned} \text{Sample size: } n &= \frac{z^2 \alpha \beta}{\epsilon^2} = \frac{(1.96)^2 (0.5)(0.5)}{0.00216225} = \\ &= \frac{0.9604}{0.00216225} = 444.17 \end{aligned} \quad (1)$$

where α is the proportion in the target population estimated to have a particular characteristic (the study approximates 50%); β is the complement of α which is $(1 - \alpha)$; ϵ is the margin of error (consider an error margin of 4.65% - arbitrarily determined to be less than 5%), and z is the confidence level expressed in standard deviation usually set at (95% or 1.96).

The study was carried out in November 2019 and considered three Local Government Areas in Ebonyi State with a sample of 450 farmers. There exists no statistics for the actual number of rice farmers in the three LGAs selected but all three are perceived to have similar number of rice farmers. Hence, 150 questionnaires were administered equally for each LGA. Of the 450 instruments collected, 2 were outliers especially on the amount of output, and so the study employed 448 respondents (still higher than the computed 444.17 above). The study observed all the ethics of field survey research, and the validity and reliability tests were confirmed as appropriate.

The descriptive statistics of the key quantitative variables employed by the study are presented in Table 1, which is classified into three strata: the whole sample, a sample of those who accessed credit only and those who did not. The means and standard deviations are similar across all three strata, although it is worth noting that average output, age, and distance to the closest financial institution are marginally higher for farmers that accessed credit than those who did not.

Table 1: Descriptive statistics of key quantitative variables.

Variables	All farmers	Farmers with credit access	Farmers without credit access
Output (sales)	62,727.7 (51,517.9)	67,539.3 (56,949.9)	55,629.83 (41,390)
Age	46.07 (7.7)	46.2 (7.7)	45.8 (7.97)
Experience	19.71 (8.8)	18.15 (8.35)	22 (95)
Distance to closest bank/FI	23.2 (25.9)	23.2 (27.7)	23.06 (23.14)
Capital Productivity	1.31 (1.09)	1.3 (1.32)	1.31 (0.61)
Labour Productivity	15,058.2 (11,600.6)	13,336.61 (10,947.6)	17,597.9 (12,091.4)
Total factor productivity	4.35 (3.63)	4.34 (4.39)	4.37 (2.03)

Note: Standard deviations are in parenthesis.

Source: Authors' computations based on data from survey 2019

Table 2: Descriptive statistics of key categorical variables.

Proportion of observations	All farmers	Farmers with credit access	Farmers without credit access
Credit	59.6		
Credit from bank/ Financial institution	16.52		
Non-bank credit (Esusu and cooperative)	50.2		
Sex (male = 1)	64.5	76.14	47.51
Land ownership (own land = 1)	41.29	46.4	33.7
Farmer has no education	0.2	0.23	0.2
Farmer completed primary school	0.18	0.11	0.23
Farmer completed secondary school	0.35	0.31	0.3
Farmer completed tertiary school	0.13	0.18	0.18
Farmer completed postgraduate education	0.13	0.17	0.06

Source: Authors' computations based on data from survey 2019

It is also worth noting from Table 2 that the proportion that received credit from banks or financial institutions (16.52) is about a third of those who received credit from non-financial institutions (50.2). In addition, the proportion of males and the proportion that own land are higher for those who accessed any credit than those who did not access credit.

Methods

The study employed both quantitative and qualitative methods for its analysis which was conducted using the STATA 16 econometric software. Specifically, the study employed the coarsened exact matching (CEM) model to ascertain its objective of examining the impact of access to bank and non-bank credit on rice productivity and output. The CEM methodology is a monotonic imbalance reducing matching method, that is said to mimic a randomised treatment assignment that produces 'Treatment' and 'Control' groups after the treatment has been administered (Blackwell *et al.*, 2009; Guarcello *et al.*, 2017). CEM reduces covariate imbalances for the subsequent determination of a treatment effect by matching samples of strata with exact/same signature – hence the exact matching. It is preferred to other matching methods such as the popular Propensity Score Matching (PSM) model in that it processes more efficiently and reduces model dependence, variance and bias that may apply in contemporary research (Guarcello *et al.*, 2017). The goal in CEM is to ascertain the average treatment effect on the treated (ATT).

The CEM algorithm could be classified into three key steps, as proposed by Iacus *et al.* (2012); Green *et al.* (2015) and Zhao *et al.* (2021). First, one should coarsen each control variable with the purpose of matching. Secondly, the coarsened data should be sorted and matched by the algorithm of exact matching, while the unmatched units should

be discarded. Thirdly, the coarsened data should be removed and the un-coarsened values of the matched data retained in such a way that does not include at least one treated and one control unit. Following these steps, a weighting variable is automatically generated by the CEM method to equalise the number of observations within comparison groups. Also, the imbalance measure denoted as L_1 is used to check the balancing of two comparative groups; its value usually ranges between 0 and 1.

To compute the L_1 statistic, we start by coarsening the covariates into bins, after which we cross-tabulate the control variables for the treated and control groups separately. We then record the k-dimensional relative frequencies for the treated $f_{t,\dots,k}$ and control $g_{t,\dots,k}$ units (Blackwell *et al.*, 2009). The measure of imbalance is the absolute difference over all the cell values.

$$L_1 = (f, g) = \frac{1}{2} \sum_{t,\dots,k} |f_{t,\dots,k} - g_{t,\dots,k}| \quad (2)$$

where the boundaries of 0 implies perfect global balance and 1 means perfect global imbalance. If L_1 is very low or close to zero, it depicts a good matching and if L_1 is closer to 1, then it does not show good matching.

This study employs three sets of treatment and control groups which are: access to total credit (assigned as 1 if respondent had access to any form of credit and zero otherwise), access to bank credit (assigned as 1 if respondent had access to only bank credit and zero otherwise) and access to non-bank credit (assigned as 1 if respondent had access to non-bank credit and zero otherwise). Access to any of these credit categories is dependent on the following control variables that will be employed in the model: education levels, age, experience in years, land ownership (own land = 1, 0 otherwise) and sex (1 if male, 0 otherwise). Meanwhile, the outcome variables used are output sales, labour productivity, capital productivity and total factor productivity.

In line with the literature, labour productivity is given as output (sales) divided by labour, while capital productivity is output divided by capital. The study also employs total factor productivity in an effort to examine labour and capital productivity jointly. Total factor productivity is calculated by dividing output by the weighted average of labour and capital inputs. There exist several conceptualisations of the measure of total factor productivity; however, this study adopted the approach of Nadiri (1970), according to whom the total factor productivity index is given as:

$$A = Y / (aL + bK) \quad (3)$$

where A is total factor productivity, Y is the firm's output, L is labour, K is capital while a and b are some appropriate weights for labour and capital, respectively. The standard weighting for labour and capital are 0.7 for labour and 0.3 for capital (Gordon, 2016). TFP is often regarded as the real driver of growth within an economy and studies reveal that while labour and investment are important contributors, TFP could account for up to 60% of growth in an economy (Easterly and Levine, 2001).

Table 3: Number of observations Pre- and Post-Matching.

Description	Credit		Bank Credit		Non-bank Credit	
	Control	Treatment	Control	Treatment	Control	Treatment
All	181	267	374	74	223	225
Matched	89	131	64	47	113	151
Unmatched	92	136	310	27	110	74

Source: Authors' estimations based on data from survey 2019

Table 4: Results of the Imbalance Measure and the Coarsened Exact Matching Estimation.

Description	Pre-Matching			Post Matching		
	Credit	Bank Credit	Non-bank Credit	Credit	Bank Credit	Non-bank Credit
Overall	0.6866	0.8421	0.6471	0.0618	0.0872	0.1839
Age	0.1926 (0.4295)	0.1518 (1.6600)	0.1648 (0.4592)	0.0458 (-0.3026)	0.0426 (0.0234)	0.0868 (-0.2456)
Education level	0.2909 (0.6092)	0.5435 (1.7888)	0.1980 (-0.0269)	1.7e-16 (0.0000)	3.3e-16 (-2.2e-15)	4.2e-16 (8.9e-16)
Sex	0.2897 (0.2897)	0.2395 (0.2395)	0.2170 (0.2170)	9.7e-17 (-1.1e-16)	6.2e-17 (1.1e-16)	5.6e-17 (0.0000)
Experience	0.2701 (-3.8557)	0.1539 (-1.2685)	0.2538 (-2.6894)	0.0008 (-0.1948)	0.0234 (0.0213)	0.0530 (-0.2270)
Land ownership	0.2383 (0.2383)	0.6328 (0.6328)	0.0367 (0.0367)	8.3e-17 (-1.7e-16)	2.6e-16 (-4.4e-16)	3.6e-16 (2.8e-16)

 Note: Table 4 contains L_1 values while mean values are in parenthesis.

Source: Authors' estimations based on data from survey 2019

Table 5: Causal Effect Estimation of Credit Access on Output and Productivity.

Description	Pre-Matching			Post Matching		
	Credit	Bank Credit	Non-bank Credit	Credit	Bank Credit	Non-bank Credit
Labour Productivity	-4,261 (0.000)***	439 (0.7660)	-3,587 (0.0010)***	441 (0.7250)	676,057 (0.8060)	619 (0.6400)
Capital Productivity	-0.01076 (0.9180)	0.0932 (0.5010)	0.0189 (0.8550)	0.0088 (0.9230)	0.0276 (0.9450)	0.0425 (0.7980)
Total Factor Productivity	-0.03611 (0.9180)	0.3108 (0.5010)	0.0627 (0.8550)	0.0296 (0.9220)	0.0921 (0.9450)	0.1419 (0.7980)
Output Sales	11,909 (0.0160)**	10,718 (0.0970)*	15,601 (0.0010)***	5,644 (0.4660)	-8,504 (0.5300)	7,614 (0.3010)

Note: Probability values are in Parenthesis. *** means significant at 1%; ** for 5% and * for 10%.

Source: Authors' estimations based on data from survey 2019

Results and Discussion

To achieve the objective of this study, the study employed the CEM methodology specified above. The matching methodology is known for reducing the observations employed in the regression due to its ability to retain only exactly matched strata. Table 3 below shows the number of observations for the control and treatment groups pre- and post-matching. The number of observations matched remain fairly reasonable, especially considering its proportion to the treatment group, which is smaller in all 3 categories of credit access. Although there may be a reduction in the number of observations, which is to be expected, the efficiency of the estimates is well recognised in the literature (Blackwell *et al.*, 2009; Iacus *et al.*, 2012).

Table 4 shows the results of the imbalance measure and the coarsened exact matching estimation. The post matching results show much-balanced results than the pre-matched

results, given that the overall imbalance statistical measure $-L_1$ of the post-matching results for all 3 categories of credit access is less than 0.2, while those for pre-matching are all greater than 0.6. The imbalance measure, L_1 , also reduced after matching for the individual control variables when compared to the values before matching. Therefore, we conclude that there exists minimal imbalance with respect to the full joint distribution, with a record of perfect global balance in two instances.

The means (in parenthesis) of the post matching results are very small, which show that there exists a marginal difference across the control variables between farmers who access any of the three categories of credit and those who do not. This shows that the socio-economic characteristics of the farmers differ very slightly (as no mean of the post-matched estimates is greater than 1) between the treatment and control groups. This is not surprising as the exact matching algorithm ensures that the matched sample are as close as possible.

Finally, to estimate the causal effect of credit access on the different types of productivity employed as well as output sales, the study incorporated the CEM-weights in the regression estimation of credit access on output. The causal effect ascertains the ATT for the 3 credit categories across the four outcome variables. Table 5 therefore shows the results of the regression of credit access on the outcome variables before and after matching.

The results show that, prior to matching, access to non-bank credit and access to total credit significantly affected labour productivity and output sales at 5% significant level, while access to bank credit significantly affected output sales at 10% significant level. Meanwhile, the post matching results show that access to credit, bank credit or non-bank credit has no significant effect on labour productivity and output. Similarly, access to the three categories of credit has no significant effect on capital productivity and total factor productivity pre and post matching.

The results therefore imply that, though there is some level of significance on how credit affects labour productivity and output before matching, in the main post matching results, none of the credit access significantly affects any of the categories of productivity and output at 5% significant level. This may be surprising but shows the quality and quantity of credit offered to rice farmers in Ebonyi state of Nigeria. Despite the huge potential of rice production in the state, there exists no significant causal effect of any category of credit on output sales in general or productivity.

The literature suggests the following as reasons for which bank credit may not have a significant effect on output or productivity: banks and other financial institutions are usually biased in favour of large-scale farmers only, requests are made for collateral which farmers cannot provide, they levy high interest rates, loans are available only for account holders and there may also be a bias against agricultural enterprises like rice farmers that do not bring in quick returns to repay the loan: this may further disadvantage poorly educated farmers who lack technical know-how in cutting-edge farm techniques amongst other things (Samson and Obademi, 2018; Antunes *et al.*, 2015).

Though these may explain the lack of access to credit from banks and other financial institutions, non-financial institutions face similar challenges. For example, due to the lack of sustainability of these sources (family, friends, local contribution schemes, cooperatives, etc.), they have a limited time frame for loan repayment which may be shorter or inadequate for the full rice production gestation period, hence may not have the necessary impact that is expected. In addition, the amount of credit is usually small and inadequate to meet the needs of farmers. This explains why there may be three times more farmers accessing credit from non-financial sources and yet it has no significant causality on output or productivity.

The results tend to contradict several studies, including Olagunju (2011), Bolarinwa and Fakoya (2011), Imoisi *et al.* (2012) and Adetiloye (2012) and Oyeyinka and Bolarinwa (2009) who claimed to have established a significant effect of access to credit on output or production. These studies indeed agree with what was expected *a priori* as per the literature. Nevertheless, the findings of the current paper are in line with the findings of Ume *et al.* (2016) who showed that credit

access was a weak determinant of the technical efficiency of rice production in Ebonyi State. Not only does this study go beyond mere output to consider capital, labour and total factor productivity, but it also uses an advanced methodology which compares the productivity of farmers with very similar or 'exact' socio-economic characteristics. The authors of this study therefore submit that, although credit access is meant to significantly improve output and indeed productivity, it does not achieve this outcome in the case of Ebonyi state for some of the possible reasons stated above.

Conclusions

This study examines the impact of access to bank and non-bank credit on rice productivity and output in three Local Government Areas of Ebonyi State, Nigeria. The study adopted the coarsened exact matching (CEM) model and qualitative methods to determine the extent to which access to bank and non-bank credit improve output as well as the capital, labour, and total productivity of rice farmers in the three local government areas of the state. Findings reveal that, while access to non-bank credit and access to total credit significantly affected labour productivity and output sales in the pre-matching, access to bank credit significantly affected output sales only. The post-matching results show that access to all three categories of credit has no significant impact on output and productivity.

The implication of the results therefore is that the level of access to credit among rice farmers in the state is still very low despite the huge credit facilities domicile within the banking sector and the huge potential of rice production. Some of the reasons behind the poor access to credit facilities among the rice farmers are the level of education of all categories of farmers and constraints in accessing credits. Available statistics show that while the greater percentage of rice farmers in the state falls within the 'no education' and 'primary school' categories, constraints on accessing credits are high. This study therefore recommends that for an improved production and productivity yield among rice farmers in the state, a policy thrust that takes into consideration the issues of improved quality of education and constraints in accessing loans/credits are desirable. Policymakers within the state and non-state actors who are interested in promoting rice production and productivity need to engage in aggressive advocacy programmes that enlighten farmers on ways and means of participating in government programmes with a view to accessing the huge funds domicile within the banking sector, most especially within the Central Bank of Nigeria (CBN). At present, many farmers within the state are unaware of the several programmes initiated by the current administration since 2015 with the aim of strengthening agricultural production in the country. One of such programmes is the current CBN anchor-borrowers programme (ABP) for all categories of farmers in the country. The ABP is a non-interest scheme designed to boost agricultural yields, halt large food importation, and address the country's negative trade balance, however, very little is known of the programme among the farmers. Also, the state government needs to encourage the institutions to reduce conditions attached for the assessment of loans/credits by farmers. These will not only encourage more

farmers to access loans, but they will also improve outputs, productivity and will lead to inclusive growth.

Further studies could investigate the detailed reasons for access to credit not having a significant effect on production/productivity, which will be different from just investigating reasons for not accessing credit. It is therefore imperative to note that access to credit alone is not sufficient to impact on agricultural productivity and so, attention must be paid to the volume, nature and conditions of the credit received for it to realise its objective of increasing agricultural productivity.

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