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Economía Coyuntural

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CONTENIDO

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PALABRAS INSTITUCIONALES

Las autoridades de la facultad de Ciencias Económicas y Empresariales (FCEE) de la Universidad Autónoma 'Gabriel René Moreno' (UAGRM), tienen el agrado de presentar la revista institucional: '***Economía Coyuntural, revista de temas de coyuntura y perspectivas'***, que es totalmente legítima y perteneciente a nuestra universidad, elaborada con un proceso riguroso en la evaluación y dictamen científico de calidad en cada uno de sus artículos presentados.

Dentro de la actual gestión académico-facultativa, se prioriza la asignación de recursos económicos para la investigación, teniendo en cuenta que es el segundo pilar importante en la misión de la universidad, a su vez complementaria con los ejes centrales del rol institucional en docencia y extensión universitaria.

La investigación científica evaluada y validada por pares académicos, es un mecanismo por el cual se construye la ciencia, con la transmisión del verdadero aporte científico, ampliando la frontera del conocimiento en ciencia básica y aplicada.

Estamos convencidos de que un mecanismo exitoso para que las universidades públicas puedan avanzar en su posicionamiento internacional educativo, es el desarrollo de productos de investigación y la incorporación de sus revistas científicas en índices nacionales e internacionales de alto prestigio. Este es nuestro estímulo institucional, lo mismo que el apoyo que brindamos a nuestros académicos-investigadores.

La facultad hace llegar un especial reconocimiento a los académicos que formaron parte en la realización de este número en particular.

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MUY ATENTAMENTE,

KENJIRO SAKAGUCHI Y.
VICEDECANO

JUANA BORJA SAAVEDRA
DECANA

PRESENTACIÓN

Economía Coyuntural es una revista de publicación trimestral, con proceso de dictamen académico a doble ciego y rigurosidad científica, que aborda temas de coyuntura en las ciencias económicas a partir de la revisión de la literatura empírica y diversos instrumentos de medición económica. De la misma forma, la revista contempla el análisis institucional a escala local, regional, nacional e internacional.

En este primer número del volumen 6, presentamos investigaciones focalizadas en sostenibilidad de gobernanza, comportamiento de la demanda y crecimiento económico, economía espacial y economía urbana.

Es así como en el primer artículo intitulado: *'Evaluación del pilar de sostenibilidad "faltante" (gobernanza): el caso de la agricultura búlgara'* de Hrabrin Bachev, se presenta un marco holístico para comprender y evaluar la sostenibilidad de la gobernanza de la agricultura búlgara.

De forma seguida, en el segundo documento: *'Demanda de turismo internacional en tiempos de COVID-19 en la región de Puno-Perú'* de Luis Francisco Laurente Blanco, se estudia el comportamiento de la demanda de turismo internacional en la región de Puno y su proyección.

Para el tercer documento: *'Crecimiento con densidad residencial, alquiler de tierras y valor de la tierra'* de Wei-Bin Zhang, se determina de forma endógena el valor de la tierra y la renta con interacciones entre la acumulación de riqueza, servicios, terrenos y condiciones de transporte.

Para finalizar, se expresa un sincero agradecimiento a la facultad de Ciencias Económicas y Empresariales (FCEE) de la Universidad Autónoma 'Gabriel René Moreno' (UAGRM), por el soporte institucional en el financiamiento de esta revista.

De la misma manera, se extiende un agradecimiento especial a los autores y colegas de instituciones externas, que dedicaron tiempo para escribir, evaluar y retroalimentar cada uno de los documentos en colaboración.

JHONNY DAVID ATILA LIJERÓN

EDITOR

EVALUACIÓN DEL PILAR DE SOSTENIBILIDAD "FALTANTE" (GOBERNANZA): EL CASO DE LA AGRICULTURA BÚLGARA

ASSESSING "MISSING" (GOVERNANCE) PILLAR OF SUSTAINABILITY – THE CASE OF BULGARIAN AGRICULTURE

Hrabrin Bachev [α]

- **RESUMEN:** La necesidad de incluir "el cuarto" pilar de la gobernanza en el concepto de comprensión y el sistema de evaluación de la sostenibilidad (general y) agraria se justifica cada vez más en la literatura académica y encuentra lugar en los marcos de gobierno, internacional, privado, etc. Organizaciones. En Bulgaria, como en muchos otros países, prácticamente no existen evaluaciones integrales de la sostenibilidad de la gobernanza de la agricultura y su importancia para el desarrollo agrario en general. Este estudio intenta llenar el vacío y sugiere un marco holístico para comprender y evaluar la sostenibilidad de la gobernanza de la agricultura búlgara. El enfoque recientemente elaborado se "prueba" en un estudio a gran escala para evaluar la sostenibilidad de la gobernanza de la agricultura del país a nivel nacional, a nivel sectorial, regional, de ecosistemas y de explotación. El estudio ha demostrado que es importante incluir el Pilar de Gobernanza "faltante" en la evaluación de la Sostenibilidad Integral de la agricultura y la sostenibilidad de los agrosistemas de diverso tipo. Principios múltiples, La evaluación de criterios e indicadores de la sostenibilidad de la gobernanza de la agricultura búlgara indica que la sostenibilidad general de la gobernanza se encuentra en un nivel "Bueno" pero muy cercano al nivel "Satisfactorio". Además, existe una diferenciación considerable en el nivel de sostenibilidad de la Gobernanza Integral de los diferentes agrosistemas del país. Por último, pero no menos importante, Los resultados de la evaluación integral de la sostenibilidad agraria basada en datos micro (finca) y macro (estadísticos, etc.) muestran algunas discrepancias que deben tenerse en cuenta en el análisis e interpretación, mientras que los indicadores de evaluación, se mejoraron aún más los métodos y las fuentes de datos. Teniendo en cuenta la importancia de evaluaciones holísticas de este tipo para mejorar la sostenibilidad agraria en general, y la sostenibilidad

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de la gobernanza de la agricultura en particular, deben gastarse y aumentarse su precisión y representación.

▪ **PALABRAS CLAVE:** Sostenibilidad de la gobernanza, evaluación, agricultura, sistemas agrícolas, Bulgaria.

▪ **ABSTRACT:** A need to include "the fourth" Governance pillar in the concept for understanding and the assessment system of (overall and) agrarian sustainability is increasingly justified in academic literature and finds place in the frameworks of government, international, private, etc. organizations. In Bulgaria, like in many other countries, practically there are no comprehensive assessments of the governance sustainability of agriculture and its importance for the overall agrarian development. This study tries to fill the gap and suggests a holistic framework for understanding and assessing the governance sustainability of Bulgarian agriculture. The newly elaborated approach is "tested" in a large-scale study for assessing the governance sustainability of country's agriculture at national, sectoral, regional, eco-system and farm levels. The study has proved that it is important to include the "missing" Governance Pillar in the assessment of the Integral sustainability of agriculture and sustainability of agro-systems of various type. Multiple Principles, Criteria and Indicators assessment of the Governance sustainability of Bulgarian agriculture indicates that the Overall Governance Sustainability is at a "Good" but very close to the "Satisfactory" level. Besides, there is a considerable differentiation in the level of Integral Governance sustainability of different agro-systems in the country. Last but not least important, results on the integral agrarian sustainability assessment based on micro (farm) and macro (statistical, etc.) data show some discrepancies which have to be taken into consideration in the analysis and interpretation, while assessment indicators, methods and data sources further improved. Having in mind the importance of holistic assessments of this kind for improving the agrarian sustainability in general, and the Governance sustainability of agriculture in particular, they are to be expended and their precision and representation increased.

▪ **KEYWORDS:** Governance sustainability, assessment, agriculture, agricultural systems, Bulgaria.

▪ **CLASIFICATION JEL:** Q12, Q18, Q56.

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INTRODUCTION

A common feature of all suggested and practically used modern systems for assessing sustainability as a whole and of agro-systems in particular is incorporation of three “dimensions” or “pillars” of sustainability - economic, social and environmental (Bachev et al, 2017; Cruz et al., 2018; EC, 2001; FAO, 2013; Hayati et al., 2010; Kamalia et al., 2017; Lopez-Ridauira et al., 2002; Lowrance et al., 2015; OECD, 2001; Sauvenier et al., 2005; Singh et al., 2009; Terziev et al. 2018; VanLoon et al., 2005). In the last years a special attention has been increasing put on the (good) “governance” as a key for achieving multiple goals of sustainable development at corporate, sectoral, national and international levels (Bachev, 2010; Bosselmann et. al., 2008; Gibson, 2006; EU, 2019; Simberova et al., 2012; Kayizari, 2018; UN. 2015). What is more, the list of sustainability objectives of (theory, policy and practice) of development has been constantly enlarged encompassing numerous governance, cultural, ethical etc. standards and goals (Bachev, 2010; Scobie and Young 2018). Simultaneously “new” (cultural, human, governance, etc.) pillars has been widely added to the modern definition of sustainability and the systems of its evaluation and management (Altinay, 2012; ASA, 2019; Bachev, 2018; Nurse, 2006; RMIT University, 2017; UCLG, 2014).

The need to include “the fourth” Governance pillar in the concept for understanding and the system of measurement of sustainability is increasingly justified in academic literature (Bachev, 2010, 2018; Baeker, 2014; Burford, 2017; Fraser et al., 2006; Monkelbaan, 2017) as well as finds place in the official documents and assessment systems of different (government, international, private, etc.) organizations (City of Brooks, 2019; EU, 2019; IFAD, 1999). The “good governance” is considered to be both a goal of sustainable development and a means to successfully realized diverse socio-economic, ecological, cultural, etc. aspects of sustainability. Accordingly, numerous indicators have been proposed to evaluate the governance aspect of sustainability mostly at national and international level. The later predominately focus on the state of formal institutional framework, content of implemented policies and strategies, quality of human resources development, quality and efficiency of established capacity, efficiency of management of public authorities, extent of stakeholder involvement in public decision-making and control, etc. (Bell and Morse 2008; Bhuta and Umbach, 2014; CoastalWiki, 2019; Ganev et al.,2018; Monkelbaan, 2017; Spangenberg et al., 2002).

Despite enormous progress in that novel direction, the building of the system for understating and assessing the "new" governance aspect (pillar) of overall and agrarian sustainability is a "work in progress". For instance, still there is no general consensus on: whether and how to include the governance as a new pillar of (agrarian) sustainability; how to define the governance (and the overall) agrarian sustainability; what are the relations between the governance sustainability of a farming enterprise and that of agriculture; what are the critical factors of governance (and overall) sustainability; how to formulate, select, measure and integrate diverse sustainability indicators; and how to properly evaluate the level of governance (and overall) sustainability in a dynamic world where hardly anything is actually "sustainable".

Furthermore, most of the suggested approaches for "assessing" governance sustainability are at conceptual and/or "qualitative" level. The few existing systems for governance sustainability measurement are focusing entirely on national and international level (comparison) without taking into consideration the specificity of the agricultural sector and the multiple and levels of governance and agri-(sub)systems of various types. In many cases, the governance aspect of agrarian (sectoral) sustainability and the farm (enterprise) sustainability are wrongly treated as identical and evaluated in the same way.

What is more, all suggested and practically used systems for governance sustainability assessment contain a list of "universal" indicators equally applicable (appropriate) for the unique (socio-economic, market, institutional, political, natural, etc.) conditions of an individual country, and a quite specific state and diverse factors of agricultural development of each country and community, and the great variety of agricultural systems within a country, region, subsector, eco-system, type of farming organization, etc.

Often the governance sustainability is evaluated on the base of qualitative analysis and "experts" estimates without applying any consistent methodology, reliable (representative, first-hand, micro, etc.) information and data, specific quantitative methods, etc. Commonly a holistic approach for sustainability assessment is not applied, and the "purely" governance, and "purely" economic, and "purely" ecological, and "purely" social aspects of agrarian development are studied (and evaluated) independently from one another. Studding and assessing the governance sustainability is usually restricted to formal institutional environment and/or "official" public modes without taking into account the important market, private, collective, and hybrid forms, and critical (and often dominating in many cases) modes of "informal" governance.

Rarely a hierarchical structure and/or systematic organization for sustainability indicators selection are applied. Principally, the individual components of the governance (and the overall) agrarian sustainability are (pre)determined by a direct and "arbitrary" selection of different indicators for sustainability evaluation. Similarly, a corresponding set of specific "reference values" is not adequately incorporated in the sustainability assessment framework for a particular (national, regional, sectoral, eco-system, farming, etc.) agro-system.

Generally, there is no any system (approaches, priorities, weights, interpretation modes, etc.) for the "integration" of the governance sustainability indicators in different (distinct) areas into an Integral (Overall) governance and sustainability level. The later prevents the proper understanding and assessment the specific role of various aspects of governance sustainability in the overall governance and agrarian sustainability as well as effective improvement ("management") of the governance and the overall sustainability.

Finally, most of the proposed systems of sustainability assessment cannot be practically used by the managerial bodies at different decision-making levels since they are very complex and difficult to understand, calculate, monitor, correctly interpret and used in everyday activity of individual agents, organizations and agencies.

In Bulgaria, like in many other countries, there are a very few studies on governance issues related to agrarian sustainability (Bachev, 2010, 2018; Bachev et al., 2016; Bachev and Treziev, 2018; Georgiev, 2013; Marinov, 2019). There are also very few attempts to analyze the governance aspect (pillar) of agrarian sustainability and practically incorporate it into overall sustainability evaluation and measurement (Bachev, 2016, 2017, 2018; Bachev et al. 2018; Bachev and Treziev, 2017; Bachev, Ivanov, Sarov, 2020). Moreover, practically there are no comprehensive assessments of the governance sustainability in the agrarian sector and its importance for the overall agrarian sustainability at present stage of development.

This paper tries to fill the gap and suggests a holistic framework for understanding and assessing the governance sustainability of Bulgarian agriculture. The newly elaborated approach is applied (tested) in a first in kind large-scale study for assessing the governance sustainability of country's agriculture at national, sectoral, regional, eco-system and farm levels, and its contribution to the overall agrarian sustainability in Bulgaria.

2. PROPER UNDERSTANDING OF THE GOVERNANCE SUSTAINABILITY OF AGRICULTURE

In academic literature, managerial and assessment practices still there is no consensus about "what is" (how to define) agrarian sustainability which is commonly defined as "alternative ideology" (Edwards et al., 1990.; VanLoon et al., 2005); "new strategy" (Mirovitskaya and Ascher, 2001); "characteristic of agrarian system like „ability for achieving multiple goals" (Brklacich et al., 1991; Hansen, 1996) or "capability (potential) for maintain and improve its functions" (Lopez-Ridaura et al., 2002; Lewandowski et al., 1999); "process of understanding and adapting to changes" (Raman, 2006), etc.

We have proved that sustainability of agriculture is a "system characteristic" and has to be perceived as "ability to continue over time" (Bachev, 2005; Hansen, 1996). It characterizes the ability (internal capability and adaptability) of agriculture and ago-systems of different type to maintain its managerial, economic, social and environmental functions in a long period of time (Bachev, 2018). Agrarian sustainability has four major aspects ("pillars") which are equally important and have to be always accounted for –

the governance sustainability, the economic sustainability, the social sustainability, and the environmental sustainability. Thus agriculture is sustainable if it is:

- *economically viable and efficient* – i.e. provide enough employment and income for farm and rural households, good or high productivity of utilization of natural, personal, material, and financial resources, economic efficiency and competitiveness, and financial stability of activity;

- *socially responsible regarding farmers, workers, other agents, communities, consumers and society as a whole* - i.e. contribute to amelioration of welfare and living standards of farmers and rural households, conservation of agrarian resources and traditions, and sustainable development of rural communities and society;

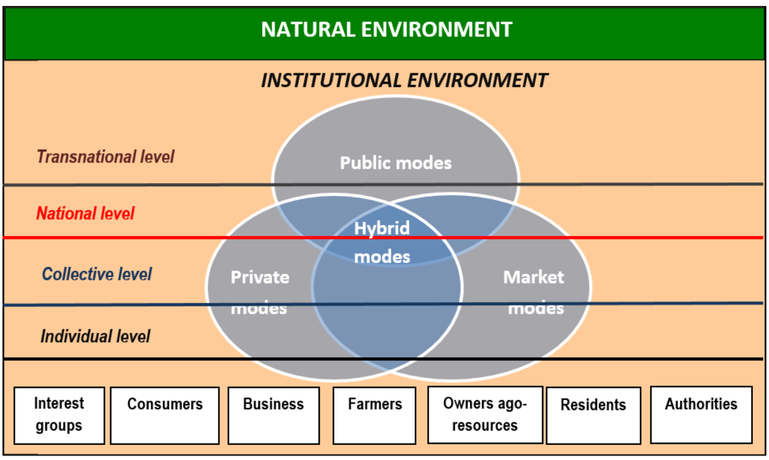
- *ecologically sustainable* – i.e. activity is associated with conservation, recovery and improvement of components of natural environment (landscape, lands, waters, biodiversity, atmosphere, climate, etc.), respecting "rights" of farm and wild animals ("animal welfare"), etc.

- and *has a "Good" system of governance put in place* – i.e. effective formal and informal institutional rules and public management, working markets, private and collective modes, and adequate enforcement systems, etc.

More particularly, the "governance sustainability" characterizes the efficiency of the specific system of governance in an evaluated agro-system being national, subsector, ecosystem, regional, farming enterprise, etc. Accordingly, a "good governance" means a superior governance sustainability, while a "bad" (inefficient) governance corresponds to inferior governance sustainability. Governance sustainability is simultaneously a major system feature as well as a means to achieve other multiple goals of the system and the "states" of economic, social and environmental sustainability. Having in mind its important role for achieving, maintain and improving the overall agrarian sustainability, it could be underline that the governance sustainability is the "first" (pillar) among (four) "equals".

Maintaining multiple functions (sustainability) of agriculture requires an effective social order - a system of diverse (governing) mechanisms and forms regulating, coordinating, stimulating, and controlling the behavior, actions and relations of individual (agrarian and non agrarian) agents (resource owners, farm managers, labor, input suppliers, buyers of farm products, investors, interest groups, residents and visitors of rural areas, state, local and agrarian authorities, policy makers, final consumers etc.) at various levels (farm, local, regional, national, transnational, and global) (Figure 1).

Figure 1: Mechanisms and Modes of Agrarian Governance



Source: authors

The system of governance includes a number of district components (governing mechanisms and modes) (Williamoson, 1996) all of which have to be included in the sustainability assessment:

First, *institutional environment* ("rule of the game") - that is the distribution of rights and obligations between individuals, groups, and generations, and the system(s) of enforcement of these rights and rules (North).

Second, *market mechanisms and modes* ("invisible hand of market", "market order") – those are various decentralized initiatives governed by the free market price movements and market competition – e.g. spotlight exchange of resources, products and services; classical purchase, lease or sell contract; trade with high quality, organic etc. products and origins, agrarian and ecosystem services, etc.

Third, *private mechanisms and modes* ("private or collective order") – diverse private initiatives, and special contractual and organizational arrangements (long-term supply and marketing contracts, voluntary eco-actions, voluntary or obligatory codes of behavior, partnerships, cooperatives and associations, brads and trademarks, labels). For instance, conservation of natural resources is a part of the managerial strategy of many green (eco, green) farms.

Forth, *public mechanisms and modes* ("public order") – various forms of public (community, government, international) interventions in market and private sector such as public guidance, regulation, assistance, taxation, funding, provision, property right modernization, etc.

Fifth, *hybrid forms* – some combination of the above three modes like public-private partnership, public licensing and inspection of private organic farms, etc.

In a long run the specific system of governance of agrarian sector and sustainability (pre)determine the type and character of social and economic development (Bachev, 2010). Depending on the efficiency of system of governance of agrarian sustainability "put in place", individual farms, subsectors, regions and societies achieve quite dissimilar results in socio-economic development and environmental protection, and there are diverse levels and challenges in economic, social and ecological sustainability of farms, subsectors, regions and agriculture.

Agriculture consists of many agro-systems – from individual "farming plot", a "farm enterprise", an "agri-ecosystem", an "agro-region", up to a "national", "European" and "global". In this study we focus on the assessment of the (governance) sustainability of agriculture at national level as well and for the principle agricultural systems in the country – main type of farming organizations, major subsectors of agriculture, general kinds of agro-ecosystems, and all administrative (agro)regions (Figure 2).

Many holistic sustainability assessment frameworks put a smaller ecosystem (e.g. "individual farming plot", "a pond", etc.) as the lowest (first) level of sustainability assessment in agriculture (Sauvenier et al., 2005). We have proved that *the farm* is the lowest level, where the management and organization of agricultural activity (and sustainability) is carried out, and where all aspects of the agrarian sustainability are "realized" and could be feasibly assessed (Bachev, 2005). That is why the farm (agro-system) rather than the smaller agro-systems within a farm boundary is to be the first level of agrarian (economic, governance, integral, etc.) sustainability assessment.

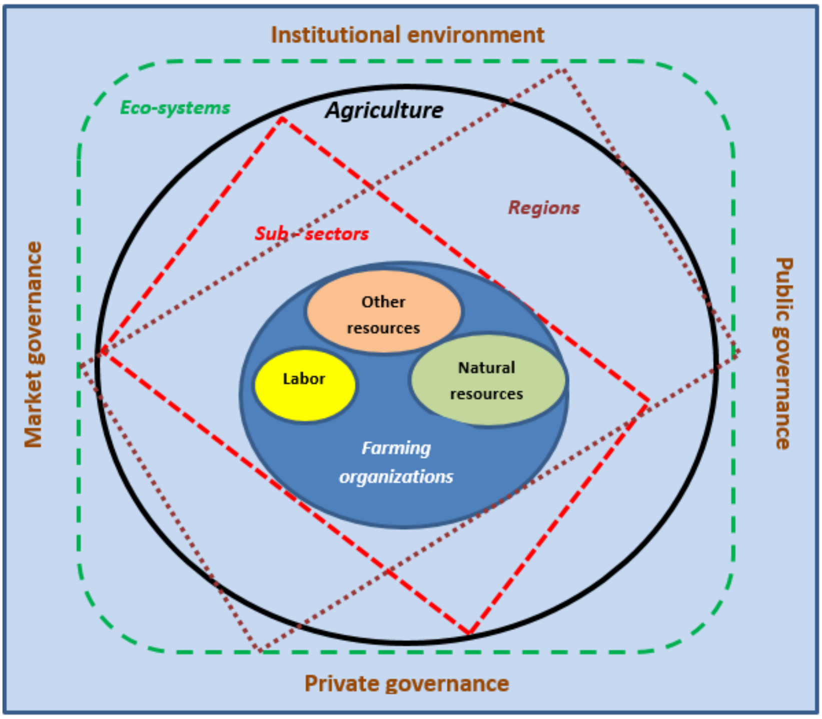
Furthermore, a special distinction is made between the governance sustainability of agriculture and the sustainability of management ("governance") structures in agriculture[1]. While sustainability of certain type of farms (e.g. "family holding") is included as major criteria for assessing the "social" (pillar) of agrarian sustainability, the specific level of sustainability of the individual governing structures (different type of farms, producers organizations, administrative bodies, etc.) is not a part of or related to the agrarian sustainability evaluation. It is well known that sustainable development is commonly associated with the adaptation of farms and other governance structures to constantly evolving socio-economic, market, institutional and natural environment which process is associated with diminishing importance ("sustainability") and/or liquidation of certain type of farms (public, cooperative, small-scale), restructuring and modernization of farming enterprises and agrarian administration, and emergence of diverse complex, vertically integrated and hybrid forms of governance, etc.

On the other hand, the Governance sustainability of agriculture expresses the ("working") state and contribution (toward sustainability goals) of the principle governing mechanisms and forms in the evaluated agro-system. Most of these mechanisms and modes of governance concern (affect) the specific governing structures used by individual agents (including farms, farming organizations, contractual and vertically integrated forms) and their sustainability but many are related to (farms' relations with and) other agrarian agents (resource owners, labor, inputs suppliers, processors, retailers, final

[1] A comprehensive modern framework for assessing sustainability of farming enterprises is suggested by Bachev (Bachev, 2017, 2018).

consumers, agrarian administration, etc.), while other are associated with intra-entity/farm elements (e.g. enforcement of work, food safety, animal welfare, and environment standards, etc.).

Figure 2. Components and Levels of Assessment of Governance Sustainability in Agriculture



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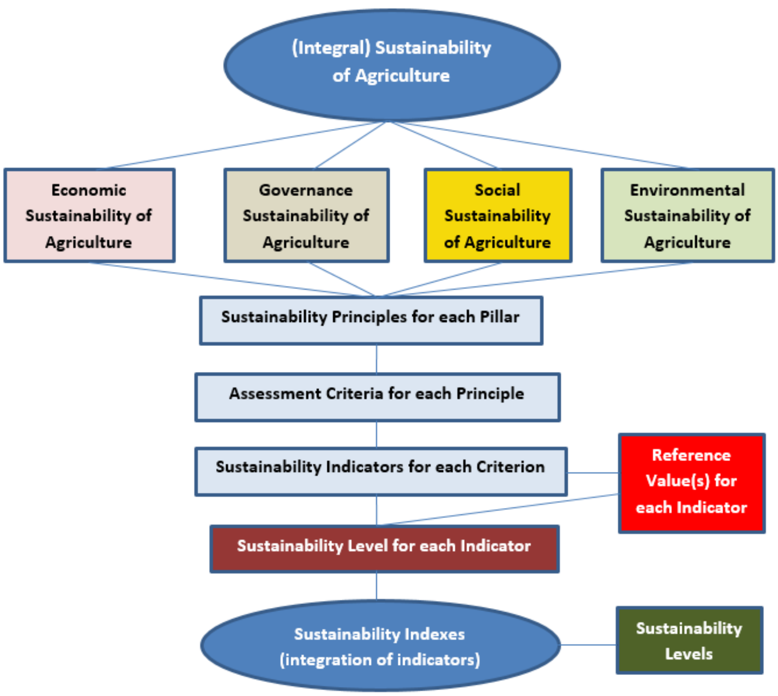
3. INCORPORATING THE "NEW" GOVERNANCE PILLAR IN THE ASSESSMENT FRAMEWORK OF AGRARIAN SUSTAINABILITY

In order to identify the individual indicators for assessing the (governance) sustainability of agriculture a hierarchical system of well-determined Principles, Criteria, Indicators, and Reference Values for each Aspect (Pillar) of sustainability is elaborated. Detailed justification of that *new* approach, and the ways and criteria for selection of sustainability Principles, Criteria, Indicators and Reference Values are presented in other publications by Bachev (2017, 2018), and Bachev et al. (2017, 2018).

The *Governance Sustainability Principles* are "universal" and relate to the multiple functions of the agriculture representing the states of the sustainability, which is to be achieved (Figure 3). For instance, for the "specific" contemporary conditions of Bulgarian (and European Union) agriculture following five (governance sustainability) principles related to the generic (five) mechanisms and modes of governance are identified: "Good legislative system", "Democratic management", "Working agrarian administration", "Working market environment", and "Good private practices" (Table 1).

Figure 3. Framework for Assessing Sustainability of Agriculture



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3.1. Female Participation Rate (FPR)

The *Governance Sustainability Criteria* are precise standards ("measurement approaches") for each of the Principle representing a resulting state of the evaluated system when the relevant sustainability Principle is realized. For instance, for the contemporary conditions of the Bulgarian agriculture 20 Criteria for assessing diverse aspects of the governance sustainability are specified. For example, for the Principle "Good legislative system" four Criteria are selected: "Harmonization with the European Union policies", "Extent of the European Union policies implementation", "Beneficiaries' satisfaction of the European Union policies", and "Policies effects" (Table 1).

The *Governance Sustainability Indicators* are quantitative and qualitative variables of different types which can be assessed in the specific conditions of the evaluated agri-system allowing measurement of compliance with a particular Criterion. The set of Indicators provides a representative picture for the agrarian sustainability in all its aspects. For the selection of the Sustainability Indicators a number of criteria, broadly applied in the sustainability assessment literature and practices, were used: "Relevance to reflecting aspects of sustainability", "Discriminatory power in time and space", "Analytical soundness", "Intelligibility and synonymity", "Measurability", "Governance and policy relevance", and "Practical applicability" (Sauvenier et al., 2005).

For instance, for assessing the Governance sustainability of the Bulgarian agriculture at micro (farm) and macro (sectoral, regional, eco-system, etc.) levels a system of respectively 22 and 26 Indicators are specified. For example, for the Criteria "Policies effects" an Indicator "Level of subsidies comparing to the average for the sector" is selected for farm level, as well as two Indicators for the aggregate (sectoral) level – "Coefficient of subsidies distribution from Pillar 1" and "Coefficient of distribution of investment support comparing to share in Net Value Added" (Table 1).

Table 1. System of Principles, Criteria, Indicators, and Reference Values for Assessing Governance Sustainability of Bulgarian Agriculture

Principles	**Criteria**	**Indicators**		**Reference values**	
		Sectoral level	**Farm level**	**Sectoral level**	**Farm level**
Good legislative system	Harmonization with EU policies	Extent of policies harmonization	na	Experts estimate	
	Extent of EU policies implementation	Extent of financial implementation of policies	Extent of CAP implementation	Experts estimate	Beneficiaries estimates
		Extent of achievements of objectives indicators		Experts estimate	
	Beneficiaries' satisfaction of EU policies	Extent of beneficiary satisfaction of EU policies	Extent of beneficiary satisfaction of EU policies	Beneficiaries estimates	Beneficiaries estimates
	Policies effects	Coefficient of subsidies distribution from Pillar 1	Level of subsidies comparing to the average for the sector	High 0-0,25 Good 0,26-0,45 Satisfactory 0,46-0,6 Unsatisfactory 0,61-0,8 Unsustainable 0,81-1,0	Average for the sector

		Coefficient of distribution of investment support comparing to share in Net Value Added		High 0-0,25 Good 0,26-0,45 Satisfactory 0,46-0,6 Unsatisfactory 0,61-0,8 Unsustainable 0,81-1,0	
Democratic management	Representation	Share of producers represented in different public decision-making bodies	Producers' representativeness in state and local authorities	Experts estimate	Farm managers estimates
	Transparency	Transparency level	Level of access to information	Experts estimate	Farm managers estimates
	Impact	Share of overall support Net Value Added of agriculture	Share of subsidies in income	High 41-100% Good 26-40% Satisfactory 11-25% Unsatisfactory 6-10% Unsustainable bellow 5%	High 41-100% Good 26-40% Satisfactory 11-25% Unsatisfactory 6-10% Unsustainable bellow 5%
		Level of subsidizing in Net Income		High 41-100% Good 26-40% Satisfactory 11-25% Unsatisfactory 6-10% Unsustainable bellow 5%	
	Stakeholders' participation in decision-making process	K of real weight in the process	Farmers' participation in decision-making	Experts estimate	Farm managers estimates

Working agrarian administration	Minimum costs of using	Legitimate payments	Acceptability of legal payments	Beneficiaries estimates	Farm managers estimates
		Non-legitimate payments		Beneficiaries estimates	
	Access to administrative services	Share of digitalized services in overall number	Administrative services digitalization	Experts estimate	Farm managers estimates
			Agrarian administration efficiency		Farm managers estimates
	Information availability	Level of awareness	Extent of awareness	Beneficiaries estimates	Farm managers estimates
	Quality of services	Administration costs in Value Added of Agriculture	Administration service costs	High 0-0,01 Good 0,2-0,05 Satisfactory 0,05-0,1 Unsatisfactory 0,11-0,2 Unsustainable Bigger than 0,2	Farm managers estimates
Working market environment	Market access	Extent of market access	Market access difficulties	Experts estimate	Farm managers estimates
	Free competition	Extent of price influence	Prices negotiation possibilities	Experts estimate	Farm managers estimates
			Market competition		Farm managers estimates
	Competitive allocation of public resources	Extent of competitive distribution	Extent of competitive allocation of public resources	Experts estimate	Farm managers estimates

		Possibilities for taking part in public procurements		Experts estimate	Farm managers estimates
	Resource concentration	K of concentration of land resources	K of lands concentration	High bellow 200 xa Good 200-400 xa Satisfactory 400-600 xa Unsatisfactory 600-800 xa Unsustainable above 1000 xa	High bellow 200 xa Good 200-400 xa Satisfactory 400-600 xa Unsatisfactory 600-800 xa Unsustainable above 1000 xa
		Real possibilities of lands extension	Possibility for lands extension	Experts estimate	Farm managers estimates
Good private practices	Regulation implementation	Extent of regulations implementation	Extent of regulations implementation	Experts estimate	Farm managers estimates
	External control	Control regulation	Management Board external control	Experts estimate	Farm managers estimates
	Correctness of relationships	Extent of contract enforcement	Extent of contract enforcement	Experts estimate	Farm managers estimates
	Efficient informal system	Level of informal system efficiency	Level of informal system efficiency	Experts estimate	Farm managers estimates

Source: author

4. DEFINING, INTEGRATION AND INTERPRETATION OF SUSTAINABILITY LEVEL

For assessing the particular sustainability level a system of specific Reference Values (sustainability norms, range, and standards) for each Indicator is needed (Figure 3).

The *Governance Sustainability Reference Values* are the desirable levels for each Indicator according to the specific conditions of the evaluated agro-system. They assist the assessment of the sustainability levels giving guidance for achieving (maintaining, improving) particular aspect and the overall agrarian sustainability. Most of the Reference Values show the level(s), at which the long-term sustainability of agrarian Governance sustainability is "guaranteed" and improved. Depending on the extent of the Reference value achievement the evaluated agro-system may be with a "high", "good", or "low" sustainability, or to be "unsustainable". For instance, agrarian system with a higher than the sectoral public support (level of subsidies) is more sustainable then others as far as "Policy effects" are concerned, and vice versa.

Very often individual Indicators for each Criterion and/or different Criteria, and Principles of sustainability are with unequal, and frequently with controversial levels. That significantly hardens the overall assessment requiring a transformation into "unitless" Sustainability Index and integration of estimates (Figure 3). Diverse quantitative and qualitative levels for each indicator are transformed into a Index of sustainability (ISi) applying appropriate scale for each Indicator (Bachev et al., 2018).

The Integral Sustainability Index for a particular Criterion (SI(c)), Principle (SI(p)), and Aspect of sustainability (SI(a)), and the Integral Sustainability Index (SI(o)) for evaluated agro-system is calculated applying "equal weight" for each Indicator in a particular criterion, of each Criterion in a particular Principle, and each Principle in every Aspect of sustainability.

Using "equal" rather than differentiated weight is determined by the fact that individual Sustainability Aspects, and indeed Sustainability Principles, are "by definition" equally important for the Integral Agrarian Sustainability. At the same time, differentiation of the weights of individual Criteria within each Principle and the individual Indicators within each Criteria is difficult to justify as well as to a great extent unnecessary (practically unimportant for the Integral assessment) having in mind the big number and small relative contribution of each Indicator. Besides, we have found out that the calculations with and without differentiated weights do not led to any significant variations in the sustainability levels for the conditiopns of Bulgarian agriculture (Bachev et.al, 2019).

The Integral Index for a particular Criterion (SI(c)), Principle (SI(p)), and Aspect of sustainability (SI(a)), and the Integral Sustainability Index (SI(o)) are arithmetic averages of the Indices of composite Indicators, Criteria and Principles, calculated by the following formulas:

$SI(c) = \sum SI(i)/n$ n – - number of Indicators in a particular Criterion;

$SI(p) = \sum SI(c)/n$ n - number of Criteria in a particular Principle;

$SI(a) = \sum SI(p)/n$ n - number of Principles in a particular Aspect,

$SI(o) = \sum SI(a)/4$

For assessing the level of Governance and Integral sustainability of agro-systems in Bulgaria the following scale, defined by the leading experts in the area (Bachev et al. 2018) are used:

Index range 0,81-1 for a "High" level of sustainability;

Index range 0.50-0,8 for a "Good" level of sustainability;

Index range 0,26-0,49 for a "Satisfactory" level of sustainability;

Index range 0,06-0,25 for an "Unsatisfactory" level of sustainability;

Index range 0-0,05 for "Non-sustainable" state.

The integration of Indicators does not diminish the analytical power of suggested assessment system, since it makes it possible to compare the (specific and integral) sustainability of diverse aspects of an agro-system and of agro-systems of different types, as well as identify "critical" factors for maintaining and improving sustainability, etc. Besides, since the assessment of sustainability levels for the individual Indicators is a (pre)condition for of the integration itself, the primary information always is available and could be analyzed in details if that is necessary. Depending on the objectives of final users and the analysis, the extent of integration of Indicators could be differentiated. While farm managers, investors, researchers etc. may prefer detailed information for each Indicator, for decision-making at a higher level (government, policy-makers, etc.) more aggregated assessment are needed (sufficient).

5. ASSESSMENT OF GOVERNANCE SUSTAINABILITY OF BULGARIAN AGRICULTURE

Elaborated novel holistic framework for assessing the Governance sustainability of Bulgarian agriculture is tested using experts and stakeholders assessments, and 2018 survey data[2] from the managers of 104 "typical farms" of different size and juridical type, production specialization, and ecological and geographical locations. The structure of surveyed farms approximately corresponds to the real structure of farms in different categories in Bulgaria. Classification of the surveyed farms into juridical type, size, production specialization, and ecological and geographical location is done according to the official definitions currently used in Bulgaria (and European Union).

In Bulgaria, like in many other countries, there are no official data for calculating most of the governance, socio-economic and environmental sustainability indicators at lower (farm, eco-system, subsector, regional, etc.) level (Bachev et. al., 2018). Therefore, micro and middle level assessment of socio-economic, environmental and governance sustainability is entirely based on the "original" first-hand information collected from the farm managers. The composite (Aspect and Integral) Sustainability Index of each evaluated agri-system (farming organization, agricultural subsector, agri-ecosystem, geographical region, etc.) is calculated as an arithmetic average of the Indices of relevant farms belonging to that system.

Assessment of the Governance sustainability at national (sectoral) level is evaluated in two ways – using experts and stakeholders (farmers, producers'

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[2] The author expresses his gratitude to the National Agricultural Advisory Service for conducting the survey, and to participated farm managers for providing the valuable information.

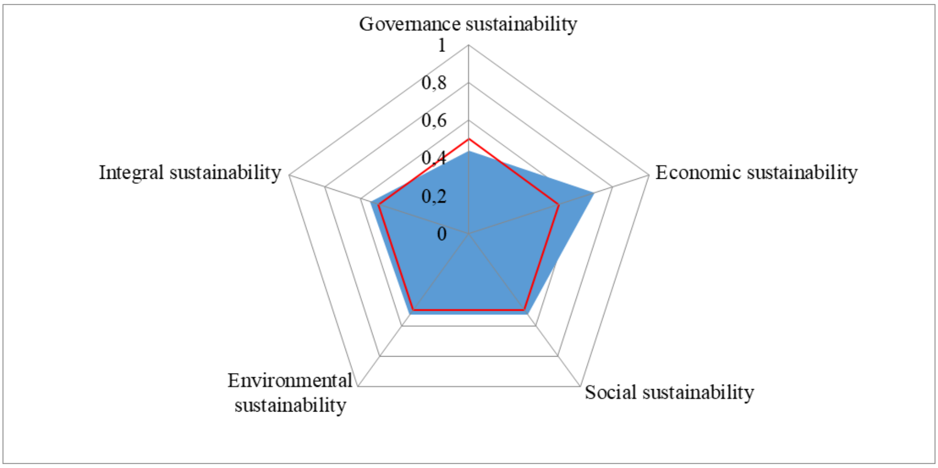
organizations, etc.) estimates, and though aggregation of the information from the conducted farms survey.

The comprehensive assessment of the Governance sustainability of the Bulgarian agriculture by using aggregate (sectoral) and farming (survey) data shows quite unlike results – "Satisfactory" level in the former case, and (close to the border with "satisfactory" level but still) a "Good" level in the later case (Figures 4 and Figure 5).

The Overall and Principles sustainability estimates based on the farm managers assessments are higher than those calculated on the base of the official (statistical, FADN, etc.) information, and experts and producers' organizations estimates (Figure 6). The discrepancies in the estimates for three Principles ("Democratic management", "Working market environment", and "Good legislative system") are crucial since they put the Governance sustainability in different (inferior) levels.

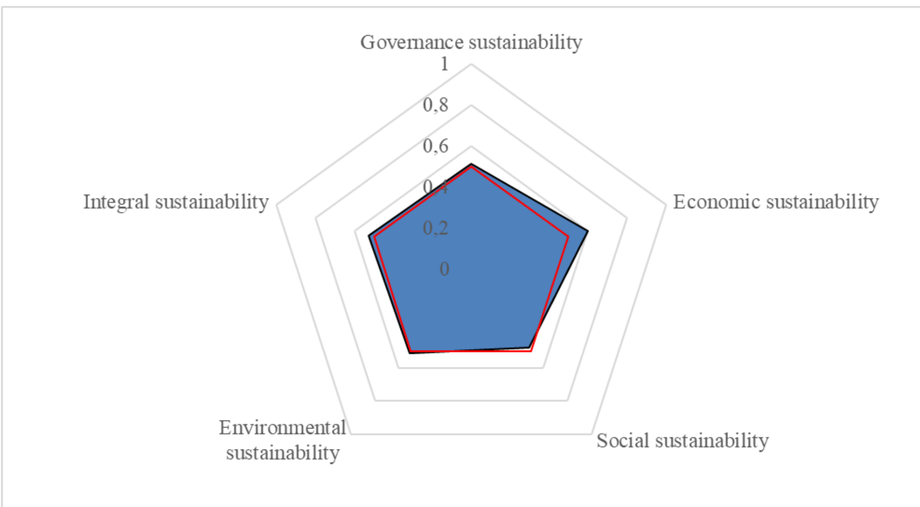
Therefore, Governance sustainability assessments always have to be based both on (complementary) macro and micro data in order to increase accuracy and extend reliability. Besides, theoretical and practical work for the improvement of the assessment methods and data sources of the sectoral sustainability assessments (especially as far as the Governance Pillar is concerned) is to continue.

Figure 4. Levels of Governance, Economic, Social, Environmental and Integral Sustainability of Bulgarian Agriculture, calculation based on aggregate (sectoral) data



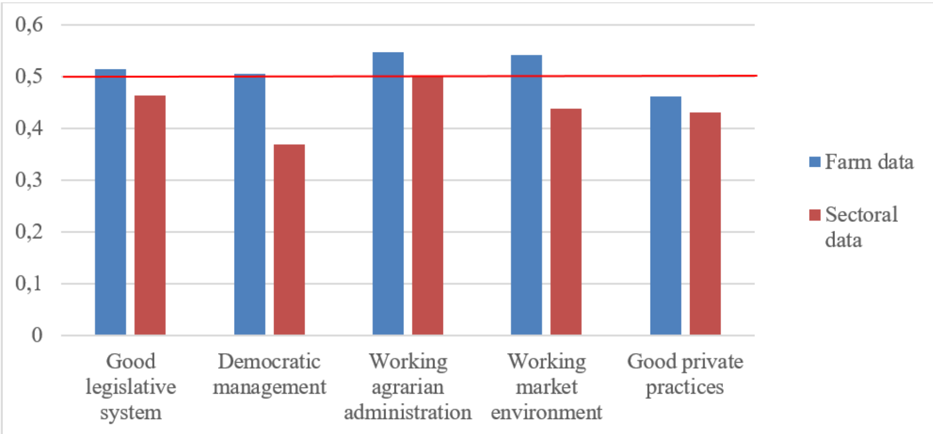
Source: Agro-statistics, experts' assessments

Figure 5. Levels of Governance, Economic, Social, Environmental and Integral Sustainability of Bulgarian Agriculture, calculation based on farm (survey) data



Source: survey with farm managers

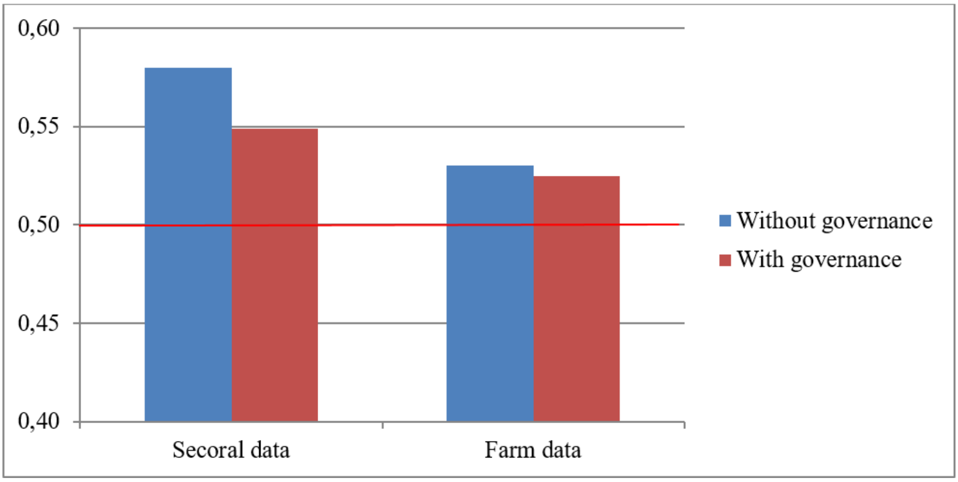
Figure 6. Sustainability Indexes for major Principles of Governance Sustainability, calculated on the base of sectoral and farm data



Source: authors

The inclusion of the "Governance Aspect" in the sustainability calculations changes the Integral Sustainability Index of Bulgarian agriculture using sectoral (with 0,03), and to a smaller extent farm (with 0,005) based estimates (Figure 7). However, taking into account the Governance aspect does not modify the overall ("Good") sustainability level using both type of information. The later is due to the fact that there are also differences in the Sustainability Indexes for the Economic, Social and Environmental aspects based on the aggregate (sectoral) and aggregated first hand farm data (Figure 3 and Figure 4), being particularly high for the Economic and Social sustainability (0,1 and 0,05 accordingly). The estimates based on the official aggregate sectoral data for the Economic, Social and Environmental aspects are higher than the corresponding levels based of micro farm data. Consequently, they do not affect the Integral sustainability "compensating" the contribution to the overall sustainability level of the Governance pillar.

Figure 7. Integral Sustainability of Bulgarian Agriculture "with" and "without" Including Governance Aspect



Source: Bachev et al, 2019; authors calculations

Nevertheless, the inclusion of the missing "new" and important Governance aspect is crucial since it ameliorates adequacy and precision of the sustainability assessment of Bulgarian agriculture. At the same time, all dynamics and discrepancies in the estimates between sustainability pillars and the estimates based of different (statistical, farm, etc.) type of data have to be taken into consideration in the analysis and the interpretation of results, while assessment indicators, methods and data sources further improved (Bachev et.al., 2019).

6. Unpacking the Governance Sustainability of Bulgarian Agriculture

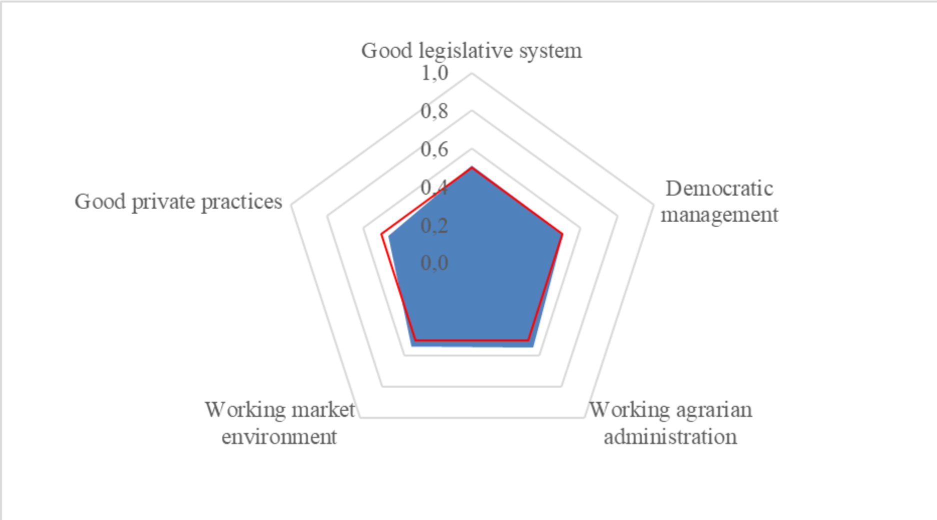
Micro data collected from the farm managers are particularly important for the proper assessments and "unpacking" of different aspects of the Governance Sustainability of agriculture. Following is a detailed assessment of the Governance sustainability of Bulgarian agriculture based of the original farm survey data.

A multiple indicators assessment of the Governance sustainability level of Bulgarian agriculture indicates that the Index of Overall Sustainability is 0,51 - this represents a close to the lower ("Satisfactory") but still a "Good" level of Governance sustainability of the sector (Figure 5).

Analysis of individual Indexes for the primary sustainability Principles, Criteria, and Indicators allows identifying individual components contributing to the Governance sustainability of this important sector of Bulgarian economy.

For instance, the Governance sustainability of Bulgarian agriculture is relatively low because the Index for the Principle "Good Private Practices" is at "Satisfactory" level (0,46) and compromises the Pillar's Integral sustainability. Moreover, Indices for "Good Legislative System" and "Democratic management" are quite low and at the border with the "Satisfactory" level - 0,5 and 0,51 accordingly (Figure 8). At the same time, Indices for the Principles "Working agrarian administration" (0,55) and "Working market environment" (0,54) are highest and contribute most for elevating (ensuring) the Governance Sustainability of the sector.

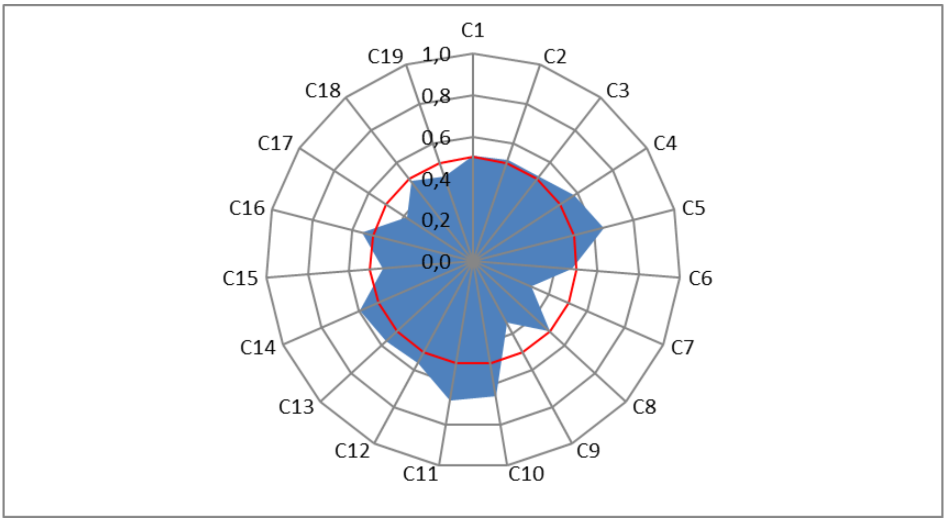
Figure 8. Indices of Sustainability for Major Principles of Governance Sustainability of Bulgarian Agriculture



Source: author's calculation

In depth analysis of the levels of the individual Criteria and Indicators further specifies the elements that enhance or reduce country's agricultural Governance sustainability. For instance, the insufficient "Good Private Practices" is determined by the low "External control" (over management) (0,38), weak "Contracts enforcement" (0,49) and inferior "Informal system efficiency" (0,43) (Figure 9). Similarly, despite that the Integral Index for "Democratic management" Principle is at a "Good" level, Indices for two criteria (policies) "Impact" and "Stakeholder participation in decision-making") are quite low at satisfactory territory. Likewise, "Working agrarian administration" seems "Good" but "Access to administrative services" is actually very low (0,34) at "Satisfactory" sustainability level. The same is true for the "Working market environment" which is "Good" while Index for the Criteria "Resource concentration" reviles low sustainability (0,43).

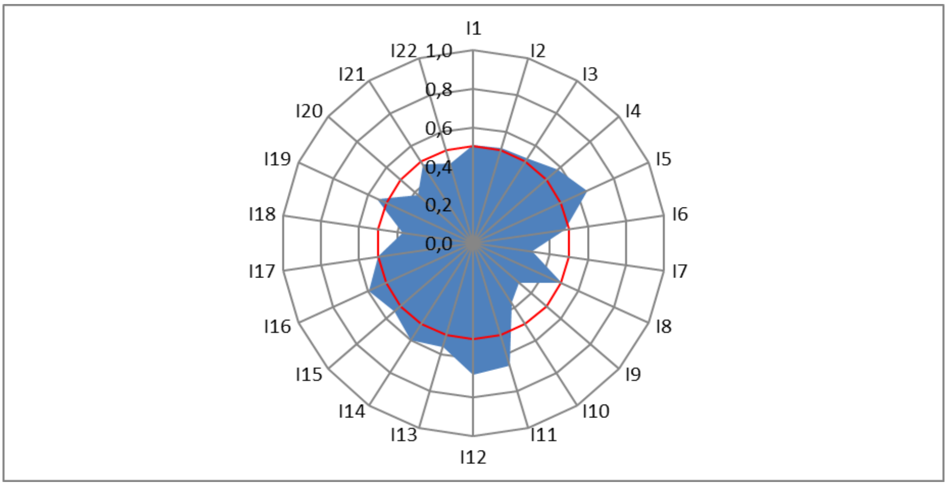
Figure 9. Indices of Sustainability for Major Criteria* of Governance Sustainability of Bulgarian Agriculture



*C1-Extent of policies implementation; C2-Extent of beneficiary satisfaction of EU policies; C3-Policies effects; C4-Representation; C5-Transparency; C6-Impact; C7-Stakeholder participation in decision-making; C8-Minimum costs of using; C9-Access to administrative services; C10-Information availability; C11-Quality of services; C12-Market access; C13-Free competition; C14-Competitive allocation of public resources; C15-Resource concentration; C16-Regulation implementation; C17-External control; C18-Contracts enforcement; C19-Informal system efficiency.
Source: author's calculation

Individual sustainability Indicators give precise information about the specific factors determining one or another values of a particular Criteria. For example, ineffective "Access to administrative services" is determined accordingly by the insufficient "Agrarian administration efficiency" (0,31) and undeveloped "Administrative services digitalization" (0,37) (Figure 10). Likewise "Satisfactory" sustainability for the "Resource concentration" is a consequence of the (low) "Possibility for lands extension" (0,37).

Figure 10. Indicators* for Assessing the Governance Sustainability of Bulgarian Agriculture



* I1-Extent of CAP implementation; I2-Extent of beneficiary satisfaction of EU policies; I3-Subsidies distribution; I4-Representativeness of state and local authorities; I5-Access to information; I6-Subsidies in Income; I7-Farmer's participation in decision-making; I8-Acceptability of legal payments; I9-Agrarian administration efficiency; I10-Administrative services digitalization; I11-Extent of awareness; I12-Administration service costs; I13-Market access difficulties; I14-Market competition; I15-Prices negotiation possibilities; I16-Extent of competitive allocation of public resources; I17-Lands concentration; I18-Possibility for lands extension; I19-Extent of regulations implementation; I20-Management Board external control; I21-Extent of contract enforcement; I22- Level of informal system efficiency.
Source: survey with farm managers

The low values for the Indicators help identify specific areas that require improvement through adequate changes in the institutional environment, public policy, modernization of agrarian administration, collective actions and/or management strategies. At the current stage of the development the most critical for increasing the Governance sustainability of country's agriculture are progressive improvements in following directions: "Farmer's participation in decision-making" (0,31), "Agrarian administration efficiency" (0,31), "Administrative services digitalization" (0,37), "Possibility for lands extension" (0,37), "Management Board external control" (0,38), "Level of informal system efficiency" (0,43), "Subsidies in Income" (0,48), "Extent of contract enforcement" (0,49), "Acceptability of legal payments" (0,5), and "Lands concentration" (0,5).

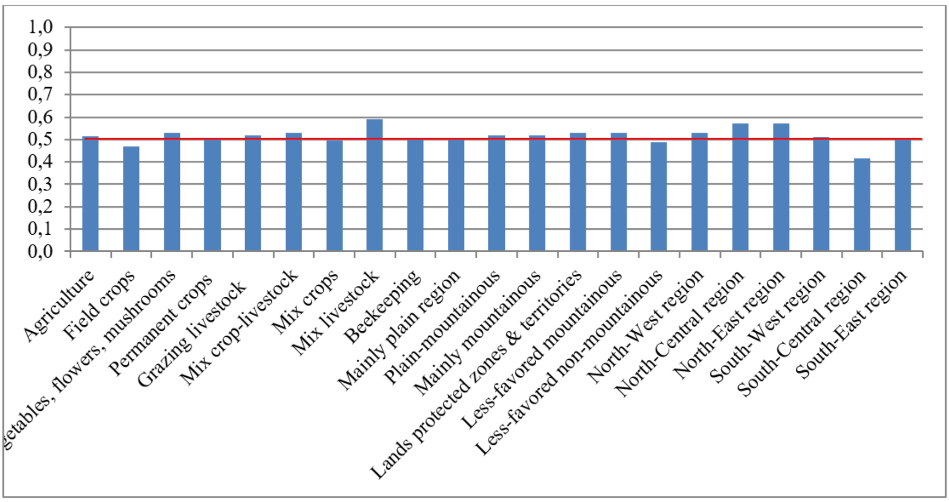
The higher levels of certain Indicators show the absolute and comparative advantages of the Bulgarian agriculture in terms of good governance and sustainable development. At the current stage of development, the most prominent of these include: "Representativeness of state and local authorities" (0,58), "Market competition" (0.6), "Extent of competitive allocation of public resources" (0.6), "Access to information" (0.65), "Extent of awareness" (0.66), and "Administration service costs" (0.68). Nevertheless, the top value(s) of the Governance sustainability Indicators in Bulgarian agriculture is relatively low. Therefore, there is a great potential for improvement of governance efficiency and further elevate the Governance and Overall sustainability.

7. GOVERNANCE SUSTAINABILITY IN MAJOR SUB-SECTORS OF AGRICULTURE

The analysis of the Governance sustainability of different sub-sectors of Bulgarian agriculture shows that there is a great variation in the sustainability level. The highest ("Good") level of Governance sustainability is demonstrated in the "Mix livestock" production (0,59), followed by the "Vegetables, flowers, mushrooms" and "Mix crop-livestock" sectors (0,53) (Figure 11). Therefore, these three subsectors contribute to greatest extent for improving (maintaining) the overall Governance sustainability of Bulgarian agriculture.

On the other hand, the level of Governance sustainability in the "Grazing livestock" (0,52), "Permanent crops" (0,5), and "Beekeeping" (0,5) is close to the average in the sector. Finally, in some major subsectors like "Field crops" (0,47) and "Mix crops" (0,49), the level of the Governance sustainability is "Satisfactory" and far below the general one. This means that the later subsectors decrease in a biggest degree the Integral Governance sustainability of country's agriculture.

Figure 11. Governance Sustainability in Different Sub-sectors of Agriculture, Agri-ecosystems and Agrarian Regions of Bulgaria



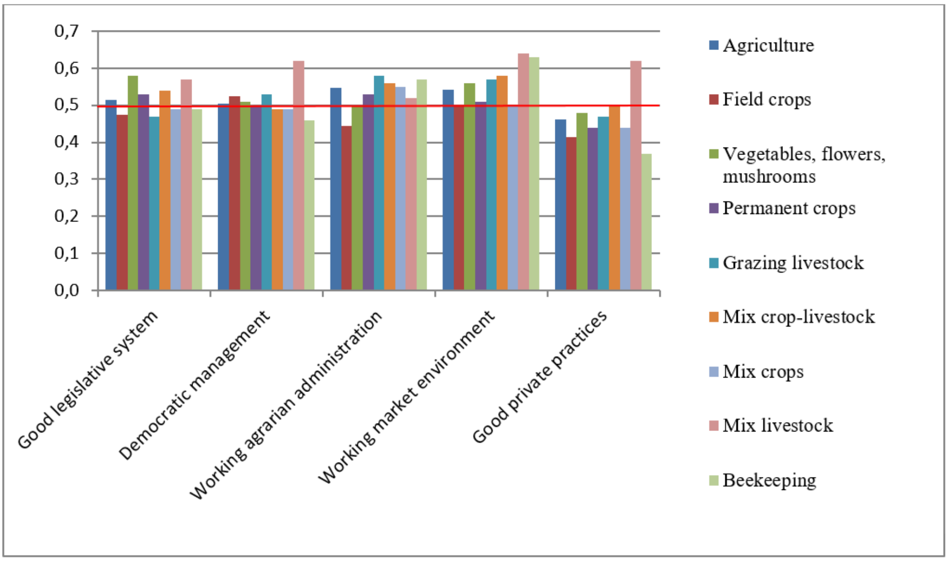
Source: survey with farm managers

The different sub-sectors of Bulgarian agriculture are characterized by significant variation of the levels of Indices of the main Principles of the Governance sustainability (Figure 12). For instance, the Principle "Good legislative system" is the best realized in the "Vegetables, flowers, mushrooms" production (0,58) and "Mix-livestock" operations (0,57), and the worst in "Field crops" and "Grazing livestock" sub-sectors (0,47). The

Principle of "Democratic management" is the best applied in the "Mix livestock" production (0,62), while it is not "Satisfactory" in the "Beekeeping" (0,46), and "Mix crops" and "Mix crop-livestock" sub-sectors (0,49). The interior and superior levels of the Governance sustainability for particular Principles show the directions for improving the Governance sustainability in the relevant sub-sectors of agriculture.

The Principle "Working agrarian administration" is effectively applied in "Beekeeping" (0,57), and "Grazing livestock" and "Mix crop-livestock" (0,56), while agrarian administration does not "work" well in the sector of "Field crops" (0,44). The sustainability for the Principle "Working market environment" is the highest in "Mix livestock" (0,64), "Beekeeping" (0,63) and "Mix crop-livestock" (0,58). Simultaneously, market mechanisms are not working very well for the "Field crops" producers (0,5). Finally, "Good private practices" are the best implemented in the subsector of "Mix livestock" (0,62) and "Mix crop-livestock" (0,5), while in all other subsectors they are applied only "Satisfactorily", being particularly inferior in the "Beekeeping" (0,37) and "Field crops" (0,41).

Figure 12. Indices of the Principles of Governance Sustainability in Major Sub-sectors of Bulgarian agriculture



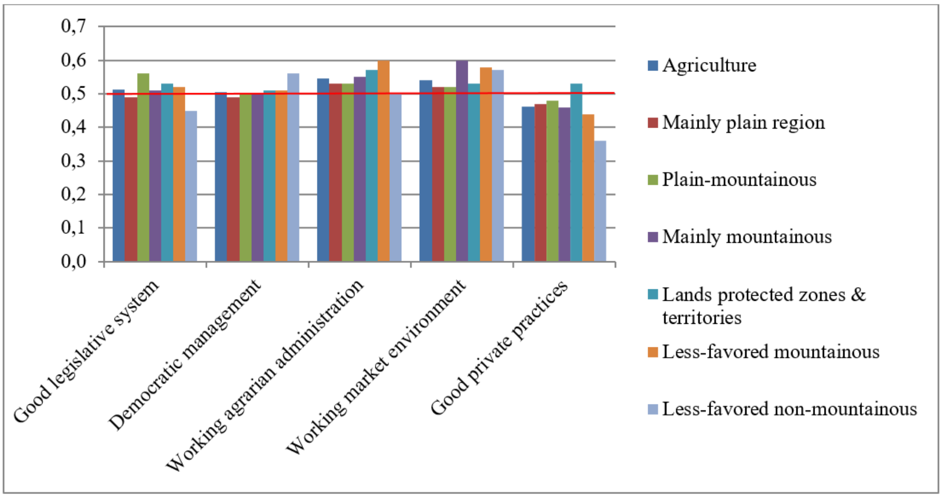
Source: survey with farm managers

In depth analysis of that type identifying inferior (critical) levels for sustainability Principles has also a high practical value since they show the specific directions (public, collective and private action areas) for improving the particular (Principle) and the Integral Governance sustainability in the evaluated subsector and agriculture in general. Further analysis of the sustainability level for the individual Indicators allows "complete" unpacking the "critical" factors enhancing and/or decreasing the Governance sustainability of each sub-sector.

The Governance sustainability of major agro-ecosystems in Bulgaria also demonstrates a great variation as the highest ("Good") ones are registered for the agro-ecosystems with "Lands in protected zones and territories" (0,53) and those in "Less-favored mountainous" regions (Figure 11). At the same time, the Governance sustainability of two agro-ecosystems - "Mainly plain" (0,5) and "Less-favored non-mountainous" (0,49) are below the national (sectoral) average, the second one being at inferior ("Satisfactory") level. Therefore, the later two type of agro-ecosystems decrease to the biggest extent the Integral Governance sustainability of Bulgarian agriculture.

The different agro-ecosystems of the country are further characterized by significant differentiations in the levels of Indices of main Principles of the Governance sustainability (Figure 13). The principle "Good legislative system" is the best implemented at "Good" level in the "Plain-mountainous" agro-ecosystems (0,56), while in the "Less-favored non-mountainous" (0,45) and "Mainly plain" regions it is at "Satisfactory" level (0,49). On the other hand, the principle of "Democratic management" is the best realized in "Less-favored non-mountainous" agro-ecosystems (0,56), in the most other type it is the same or close to the sectoral average (0,5), and in the "Mainly plain" regions it is at "Satisfactory" level (0,49). Furthermore, the principle "Working agrarian administration" is better applied in the agro-ecosystems in "Less-favored mountainous" regions (0,6), those with "Lands in protected zones and territories" (0,57), and in "Mainly mountainous" regions (0,55) while in all other types it is in below the national level. Similarly, the Principle "Working market environment" is with the highest value in the agro-ecosystems in "Mainly mountainous" regions (0,6), "Less-favored mountainous" regions (0,58), and "Less-favored non-mountainous" regions (0,57), while in other agro-ecosystems it is worse than national one. Finally, the Governance sustainability for the Principle "Good private practices" is best implemented in the "Lands protected zones and territories" (0,53), while in all other agro-ecosystems it is at "Satisfactory" level, being far worse than the sectoral average in the "Less-favored non-mountainous" regions (0, 36).

Figure 13. Indices of the Principles of Governance Sustainability in Major Agri-ecosystems in Bulgaria

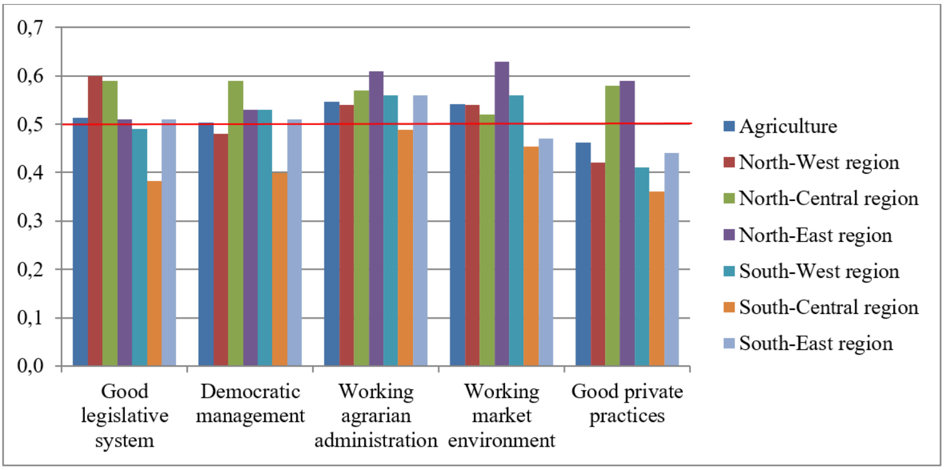


Source: survey with farm managers

There is a significant variation in the different aspects of Governance efficiency among administrative (and agricultural) regions of the country. The Principle of the Governance sustainability "Good legislative system" dominates in the "North-West region" (0,6) and "North-Central region" (0,59), while in the "South-Central region" (0,38) and "South-West region" (0,49) it is only applied "Satisfactorily" (Figure 14).

The Principle of "Democratic management" is the best realized in the "North-East region" (0,53) and "South-West region" (0,53), and insufficiently in the "South-Central region" (0,4) and "North-West region" (0,48). The Principle "Working agrarian administration" is effectively applied in the "North-East region" (0,57) and "North-East region" (0,61). Simultaneously, that Principle is "Satisfactory" applied in the "South-Central region" (0,49). Similarly, the Principle "Working market environment" are highly regarded in the "North-East region" (0,63) while in the "South-Central region" (0,45) and "South-East region" is inferior (0,47). Finally, the "Good private practices" are the best carried out in the "North-Central region" (0,58) and "North-East region" (0,59) while in the three south regions of the country they are enforced "Satisfactorily" (0,41, 0,36, 0,44 accordingly).

Figure 14. Indices of the Principles of Governance Sustainability in Agro-regions in Bulgaria



Source: survey with farm managers

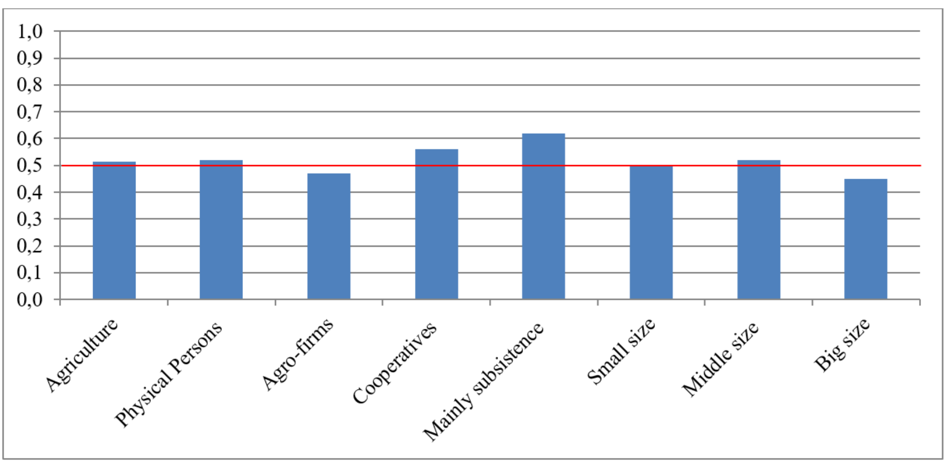
Last but not the least important, our approach let us assess what is the Governance sustainability for the various farming structures in the country, and how dominating institutional environment and modes of governance affect (contribution toward) sustainable development of major type of Bulgarian farms.

The system of governance of Bulgarian agriculture does not impact equally farms with different juridical type and size of operations. The Governance sustainability of agriculture is the highest for the "Semi-market" ("Mainly subsistence farms") and "cooperative" ("Cooperatives") sectors –

the Integral Governance Sustainability Index for these type of farming organizations is much higher than the sectoral average - 0,62 and 0,56 accordingly (Figure 15). Other main juridical type of farms like "Physical Persons" and the "Middle size" farming enterprises also have higher than the average Governance Sustainability Index (0,52). Therefore, all these four types of farming organizations contribute to the greatest extent to increasing (maintaining) the "Good" Governance sustainability of Bulgarian agriculture.

At the same time, for the "Small size" farms the Governance sustainability is below the national one and at the border with the "Satisfactory" level (0,5). Furthermore, for the "Agro-firms" and "Big size" farming enterprises the Governance sustainability is at "Satisfactory" level - 0.47 and 0.45 accordingly. Consequently, these major type of farming enterprises diminish to the greatest extent the overall Governance sustainability of country's agriculture.

Figure 15. Governance Sustainability for Major Type of Farming Organizations in Bulgaria

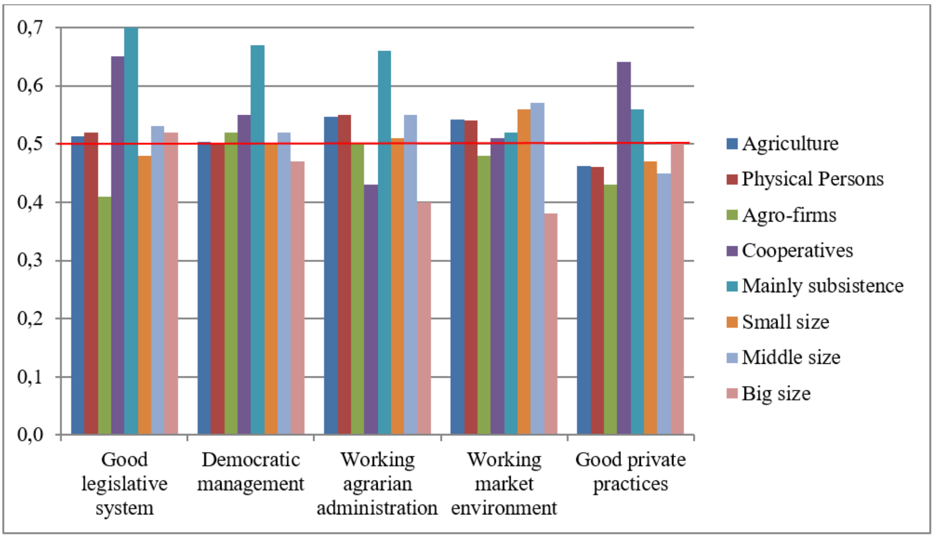


Source: survey with farm managers

The main Principles of the Governance sustainability are applied ("work") differently in relations to various type of Bulgarian farms. The Governance Sustainability Principles "Good legislative system", "Democratic management" and "Good private practices" the most favorably affect the "Cooperatives" and "Mainly subsistence" farms (Indices of Sustainability accordingly 0,65 and 0,7; 0,55 and 0,67; 0,64 and 0,56) (Figure 16). The Governance Sustainability Principle "Working agrarian administration" is the most effectively implemented in regards to "Mainly subsistence" holdings (0,66), "Physical Persons (0,55) and Middle size farms (0,55). The Governance Sustainability Principle "Working market environment" is more favorable for the "Middle size" (0,57) and "Small size" (0,56) farms.

On the other hand, the individual Principles for the Governance sustainability of agriculture are worse applied in and adversely impact different type of farms. The Sustainability for the "Good legislative system" Principle is at "Satisfactory" level for the "Agro-firms" (0,41) and "Small size" farms (0,48). The sustainability Principle "Democratic management" is at "Satisfactory" level only for the "Big size" farming enterprises (0,47). Implementation of the Principle "Working agrarian administration" is inferior ("Satisfactory") for the "Big size" farms (0,4) and "Cooperatives" (0,43); the sustainability Principle "Working market environment" does not work well for the "Big size" farms (0,38) and "Agro-firms" (0,48); and "Good private practices" are not applied sufficiently and badly affect "Agro-firms" (0,43), "Middle size" farms (0,45), "Physical Persons" (0,46), and "Small size" holdings (0,47).

Figure 16. Indices of the Principles of Governance Sustainability for Major Type of Bulgarian Farms



Source: survey with farm managers

8. CONCLUSIONS

This study has proved that it is important to include the "missing" Governance Pillar in the assessment of the Integral sustainability of agriculture and sustainability of agro-systems of various type. Furthermore, it has demonstrated that (and how) the Governance sustainability level can be quantitatively "measured" and "integrated" in the system of overall sustainability assessment. Finally, the elaborated holistic framework has been successfully tested in Bulgarian conditions and showed promising results for proper understanding and fully "unpacking" the Governance sustainability of country's agriculture.

This first in kind comprehensive assessment of the Governance sustainability of Bulgarian agriculture let make some important specific conclusions about the state of (Governance) sustainability of diverse agro-systems, and recommendations for improvement of the managerial and assessment practices. The elaborated and experimented holistic approach gives a possibility to improve the overall and Governance sustainability assessment. Therefore, it has to be further discussed, experimented, improved and adapted to the specific conditions of evaluated agricultural systems and needs of decision-makers at different levels.

Multiple Principles, Criteria and Indicators assessment of the Governance sustainability of Bulgarian agriculture indicates that the Overall Sustainability is at a "Good" but very close to the "Satisfactory" level. Besides, there is a considerable differentiation in the level of Integral Governance sustainability of different agro-systems in the country – agricultural sub-sectors, agro-ecosystems, agro-regions, and type of farming organizations. Last but not least important, results on the integral agrarian sustainability assessment of this study based on micro (farm) and macro (statistical, etc.) data show some discrepancies which have to be taken into consideration in the analysis and interpretation, while assessment indicators, methods and data sources further improved.

This study reviled that much of the needed information for calculating the Governance sustainability is not readily available and have to be collected though experts' assessments, farm managers and professional associations surveys, etc. Nevertheless, a big challenge is the (level of) competency and willingness for "honest" estimated of the interviewed agents. For instance, for some highly "sensitive" questions in the conducted ("anonymous") survey many of the farm managers did not respond due to lack of opinion, experience, capability and/or reluctance for assessment, etc.

Having in mind the importance of holistic assessments of this kind for improving the agrarian sustainability in general, and the Governance sustainability of agriculture in particular, they are to be expended and their precision and representation increased. The later requires improvement of the precision through enlargement of surveyed farms and stakeholders, and incorporating more "objective" data from surveys, statistics, expertise of professionals in the area, etc.

REFERENCES

Altinay H. (2012): Global Governance Audit, Global Economy & Development, Working Paper 49, Brookings Institution, Washington, DC.

ASA (2019): More than Green, ASA, http://www.morethangreen.es/en/ideology/four-sustainabilities-cultural-economic-social-environmental-sustainability/#sthash.IjtNJlyH.dpbs

Bachev H. (2010): Governance of Agrarian Sustainability, New York: Nova Science Publishers.

Bachev H (2016): A Framework for Assessing Sustainability of Farming Enterprises, Journal of Applied Economic Sciences, Spring Issue, Vol XI, 1(39), 24-43.

Bachev H. (2016): Defining and Assessing the Governance of Agrarian Sustainability, Journal of Advanced Research in Law and Economics, Volume VII, Issue 4(18), 797-816.

Bachev H. (2017): Sustainability of Bulgarian Farming Enterprises during EU CAP Implementation, Journal of Applied Economic Sciences, 2(48), 422-451.

Bachev H. (2018): The Sustainability of Farming Enterprises in Bulgaria, Cambridge Scholars Publishing.

Bachev H., B. Ivanov, D. Toteva, E. Sokolova (2016): Agrarian Sustainability and its Governance – Understanding, Evaluation, Improvement, Journal of Environmental Management and Tourism, Vol. 7, issue 4 (16), 639-663.

Bachev, H., Terziev, D. (2019): Sustainability of Agricultural Industries in Bulgaria, Journal of Applied Economic Sciences, Volume XIV, Issue 1(63) Spring 2019, 118-129.

Bachev H., B. Ivanov, A. Sarov (2020): Unpacking Governance Sustainability of Bulgarian Agriculture, Economic Studies, 5.

Baeker G. (2014): Fourth Pillar of Sustainability, Economicdevelopment.org, February 18, 2014, http://economicdevelopment.org/2014/02/fourth-pillar-of-sustainability-2/

Bhuta N. and G.Umbach (2014): Global Governance by Indicators, European University Institute, http://globalgovernanceprogramme.eui.eu/global-governance-by-indicators/

Bell S. and Morse S. (2008): Sustainability Indicators: Measuring the Immeasurable? Earthscan: London.

Brklacich M., Bryant C. and B.Smith (1991): Review and appraisal of concept of sustainable food production systems, Environmental Management, 15(1): 1-14.

Bosselmann K., R. Engel, and P. Taylor (2008): Governance for Sustainability – Issues, Challenges, Successes, IUCN, Gland, Switzerland.

Burford G., E. Hoover, I. Velasco, S. Janoušková, A. Jimenez, G. Piggot, D. Podger and M. Harder (2013): Bringing the "Missing Pillar" into Sustainable Development Goals: Towards Intersubjective Values-Based Indicators, Sustainability 2013, 5, 3035-3059; doi:10.3390/su5073035

City of Brooks (2019): Municipal Sustainability Plan, Five Pillars, City of Brooks https://www.brooks.ca/211/Sustainability

Cruz F., Y. Mena, V. Rodríguez-Estévez (2018): Methodologies for Assessing Sustainability in Farming Systems, in S. Gokten and P. Okan Gokten

Sustainability Assessment and Reporting,, IntechOpen, DOI: 10.5772/intechopen.79220.

CoastalWiki (2019): Measuring sustainability: The self-assessment of sustainability using indicators and a means of scoring them, Coastal Wiki, http://www.coastalwiki.org/wiki/Measuring_sustainability

EC (2001): A Framework for Indicators for the Economic and Social Dimensions of Sustainable Agriculture and Rural Development, European Commission.

Edwards C.,R.Lal, P.Madden, R.Miller and G.House (editors) (1990): Sustainable Agricultural Systems, Soil and Water Conservation Society, Iowa.

EU (2019): European Governance, EU, https://eur-lex.europa.eu/summary/glossary/governance.html

FAO (2013): SAFA. Sustainability Assessment of Food and Agriculture systems indicators, FAO.

Fraser E., Dougill A., Mabee W., Reed M., McAlpine P. (2006): Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal Environment Management, 78, 114–127.

IFAD (1999): Good Governance: An Overview, IFAD, Executive Board – Sixty-Seventh Session, Rome, 8-9 September 1999, EB 99/67/INF.4.

Ganev G. M. Popova, F. Bönke (2018): Bulgaria Report, Sustainable Governance Indicators 2018, SGI 2018, 2, Bertelsmann Stiftung.

Georgiev, M. (2013): Impact of the Administration Structure and Transaction Costs on the Agricultural Land Market, Trakia Journal of Sciences, 11(11), 527-534.

Gibson R. (2006): Beyond the Pillars: Sustaibaility Assessment as a Framework for Effective Integration of Social, Economic and Ecological Considerations in Significant Decision-Making, Journal of Environmental Assessment Policy and Management, Vol. 8, No. 3, 259-280.

Hansen J. (1996): Is Agricultural Sustainability a Useful Concept, Agricultural Systems 50: 117-143.

Hayati D. Z. Ranjbar, and E. Karami (2010): Measuring Agricultural Sustainability, in E. Lichtfouse (ed.), Biodiversity, Biofuels, Agroforestry and Conservation Agriculture, Sustainable Agriculture Reviews 5, Springer Science, 73-100.

Kayizari C. (2018): Good Governance as a pillar of Sustainable Development in Africa, PPP https://www.aydin.edu.tr/tr-tr/arastirma/arastirmamerkezleri/afrikam/Documents/Oturum%203%20-%20Good-Governance-as-a-pillar-for-sustainable-Development-in-Africa_CaesarKayizari.pdf

Marinov P. (2019), Index of localization of agricultural holdings and employees in the rural areas of the South Central Region for Bulgaria, Volume 25, Issue 3, Bulgarian Journal of Agricultural, pp. 464-467.

Mirovitskaya N. and W.Ascher (editors) (2001): Guide to Sustainable Development and Environmental Policy, Duke University Press, London.

Kamalia F., J.Borges, M.Meuwissen, I. Boer, A.Lansink (2017): Sustainability assessment of agricultural systems: The validity of expert opinion and robustness of a multi-criteria analysis, Agricultural Systems, Vol. 157, 118-128.

Lewandowski, I., Härdtlein M., Kaltschmitt M. (1999): Sustainable crop production: definition and methodological approach for assessing and implementing sustainability. Crop science 39:184-193.

Lopez-Ridauira S., O. Masera, and M. Astier (2002): Evaluating the sustainability of complex socio-environmental systems. The MESMIS framework. Ecological indicators 2: 135-148.

Lowrance R., P, Hendrix, and E. Odum (2015): A hierarchical approach to sustainable agriculture, American Journal of Alternative Agriculture.

Monkelbaan J. (2017): Achieving the Sustainable Development Goals: Theoretical insights and case studies for making sustainability governance more integrative, V. R. F. Series, No. 499, INSTITUTE OF DEVELOPING ECONOMIES, JAPAN EXTERNAL TRADE ORGANIZATION.

Monkelbaan J. (2018): Governance for the Sustainable Development Goals Exploring an Integrative Framework of Theories, Tools, and Competencies, Springer.

North D. (1990): Institutions, Institutional Change and Economic Performance, Cambridge: Cambridge University Press.

Nurse K. (2006): Culture as the Fourth Pillar of Sustainable Development; Commonwealth Secretariat: London, UK.

OECD (2001): Environmental indicators for agriculture. Volume 3: Methods and Results. OECD, Paris.

Raman, S. (2006). Agricultural Sustainability. Principles, Processes and Prospect., New York: The Haworth Press Inc.

RMIT University (2017): The four pillars of sustainability. RMIT University https://www.futurelearn.com/courses/sustainable-business/1/steps/157438

Angel Sarov A. (2019): Assessment of the governance sustainability of farms located in mountain areas with natural constraints, BJAEM, 2, 51-59.

Simberova I., A. Kocmanova, P. Nemecek (2012): Corporate Governance Performance Measurement – Key Performance Indicators, Economics and Management, Vol 17, No 4, http://158.129.0.15/index.php/Ekv/article/view/3033/0

Scobie S. and O. Young (2018): Integrating Governance into the Sustainable Development Goals, Post2015, UNU-IAS, Policy Brief 3.

Sauvenier X., J. Valekx, N. Van Cauwenbergh, E. Wauters, H.Bachev. K.Biala, C. Bielders, V. Brouckaert, V. Garcia-Cidad, S. Goyens, M.Hermy, E. Mathijs, B.Muys, M.Vanclooster. and A.Peeters (2005): Framework for Assessing Sustainability Levels in Belgium Agricultural Systems – SAFE, Belgium Science Policy, Brussels.

Singh R., H.Murty, S. Gupta, A.Dikshit (2009): An overview of sustainability assessment methodologies, Ecological indicators, 9, 189–212.

Spangenberg J., Pfahl S. Deller K. (2002): Towards indicators for institutional sustainability: Lessons from an analysis of Agenda 21. Ecological Indicators, 2, 61–77.

Terziev D., D. Radeva, & Y. Kazakova (2018): A new look on agricultural sustainability and food safety: Economic viability, in H. BACHEV, S. CHE, S. YANCHEVA (Editors) Agrarian and Rural Revitalisation Issues in China and Bulgaria, KSP Books, 231-242.

UCLG (2014): Culture: Fourth Pillar of Sustainable Development, United Cities and Local Governments, Barcelona.

VanLoon G., S. Patil, and L.Hugar (2005): Agricultural Sustainability: Strategies for Assessment. London: SAGE Publications.

UN (2015): The Sustainable Development Goals (SDGs), United Nation.

Williamson, O. (1996). The Mechanisms of Governance. New York: Oxford University Press.

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DEMANDA DE TURISMO INTERNACIONAL EN TIEMPOS DE COVID-19 EN LA REGIÓN DE PUNO-PERÚ

DEMAND FOR INTERNATIONAL TOURISM IN TIMES OF COVID-19 IN THE PUNO-PERU REGION

Luis Francisco Laurente Blanco [ρ]

- **RESUMEN:** La industria del turismo es de importancia en la región de Puno pues de ella se benefician cientos de personas. Sin embargo, ante la medida de aislamiento social producto de la pandemia mundial del COVID-19, este sector de la economía se perjudicó drásticamente ya que para el segundo trimestre de 2020 el total de arribos cayó en 100%. En este sentido es necesario conocer los arribos futuros ante ausencia de la pandemia para la estimación de las pérdidas y estrategias de reactivación. El objetivo del trabajo es conocer el comportamiento de la demanda de turismo internacional en la región de Puno y proyectarla a futuro haciendo uso de modelos de series de tiempo con información mensual del período 2003 a 2019. Los resultados de la investigación revelaron que el modelo $SARIMA\ (6,1,24)(1,0,1)_{12}$ es el de mayor eficiencia para el modelamiento y proyección del turismo en Puno.

- **PALABRAS CLAVE:** Estacionalidad del turismo, lago Titicaca, turismo en el Perú, modelos $ARIMA$, aislamiento social.

- **ABSTRACT:** The tourism industry is important in the Puno region as hundreds of people benefit from it. However, in the face of the measure of social isolation resulting from the global pandemic of COVID-19, this sector of the economy was drastically damaged, since for the second quarter of 2020 the total arrivals fell by 100%. In this sense, it is necessary to know the future arrivals in the absence of the pandemic to estimate the

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losses and reactivation strategies. The objective of the work is to know the behavior of the demand for international tourism in the Puno region and forecast it into the future using time series models with monthly information from the period 2003 to 2019. The results of the investigation revealed that the $SARIMA(6,1,24)(1,0,1)_{12}$ model is the most efficient for the modeling and forecasting of tourism in Puno.

- **KEY WORDS:** Seasonality of tourism, Lake Titicaca, tourism in Peru, $ARIMA$ models, social isolation.

- **CLASIFICACIÓN JEL**: C21, M21, Z32.

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INTRODUCCIÓN

Disponer de un conocimiento preciso de la evolución de la tasa de inflación es una actividad clave a la que se enfrentan los bancos centrales y hacedores de política económica, debido a que el efecto de las políticas monetarias solo afecta a la evolución dinámica de los precios con un considerable retardo de tiempo. La discusión y el análisis comparativo de diferentes procedimientos para explicar y mejorar las variables que influyen en la explicación y la predicción de la inflación han adquirido una especial relevancia en las ultimas décadas. De forma general, el debate se ha centrado en los siguientes puntos fundamentales. El 31 de diciembre de 2019 se identificaron los primeros casos de una neumonía de origen desconocido en Wuhan (China). El patógeno era un nuevo betacoronavirus de ARN del síndrome respiratorio severo SARS-COV-2 llamado posteriormente como COVID-19 (OMS, 2020). A finales de enero de 2020 se reportaron cerca de 80 mil casos y más de 3 mil muertes en China por lo que la Organización Mundial de la Salud (OMS) declaró el brote SARS-COV-2 como una Emergencia de Salud Pública de Importancia Internacional. La velocidad de contagio del virus hizo que la OMS declare la pandemia global el 11 de marzo del 2020 (OPS, 2020). En este sentido, esta alarma general hizo que el Estado peruano se vea obligado a tomar medidas drásticas para frenar el avance de esta pandemia (PERU, 2020); es así que el 16 de marzo comienza el Estado de Emergencia en el Perú que incluía un cierre de fronteras para transporte de pasajeros e inamovilidad nacional entrando el país en un estado de cuarentena y aislamiento social obligatorio. Esta medida afectó severamente a todas las actividades económicas en especial a la actividad turística pues la contribución del turismo al PBI para el segundo trimestre del año 2020 cayó en 100% en todo el país; es decir, desaparece por completo la actividad turística en las regiones del Perú como consecuencia de las restricciones globales al movimiento de personas. Para el caso de la región Puno, esta medida de aislamiento social obligatorio, trajo un impacto negativo al mercado laboral y una incertidumbre para los empleados del sector formal relacionados directa e indirectamente a la actividad del turismo (RPP, 2020) debido que este sector de la economía es de mucha importancia, pues al ser Puno la décima región más pobre del Perú con una tasa de pobreza cercana al 24% (INEI, 2018), es una economía muy dependiente del sector turismo ya que genera más de 90 mil puestos de trabajo directo e indirecto. En este sentido es de importancia conocer el número de arribo de turistas internacionales que hubieran llegado a la región en ausencia de la pandemia para realizar la previsión de los ingresos que se dejaron de percibir y el cálculo de pérdidas sobre el número de arribos y en seguida, trabajar las diversas estrategias de reactivación de esta industria.

El objetivo de esta investigación es conocer el comportamiento de la demanda de turismo internacional en la región de Puno y proyectarla a futuro para realizar un balance entre el ambiente de aislamiento social debido a la pandemia COVID-19 y un escenario normal sin aislamiento que permita realizar la previsión y trabajar en la reactivación de este sector para minimizar las pérdidas ocurridas por causa del aislamiento social. Para este fin, se hace uso de un análisis de serie temporal de los arribos con periodicidad mensual de los años 2003 a 2019. Para la estimación de los modelos econométricos se utiliza los modelos autorregresivos y medias móviles $ARIMA$ planteadas por Box & Jenkins (1976). El documento se estructura de la siguiente manera. En la sección dos se presenta una revisión de la literatura haciendo hincapié a las metodologías de modelamiento y proyección aplicados al turismo. En la sección tres se muestran los materiales y métodos, donde se describe la información estadística y la metodología de estimación. En la sección cuatro se presenta los resultados más resaltantes del trabajo. En esta sección se da una explicación al procedimiento para hallar el modelo de eficiencia para el arribo de turistas a Puno siguiendo de cerca el trabajo de Laurente & Machaca (2020) y ampliando la discusión para tiempos de aislamiento social debido a la pandemia COVID-19 mediante un balance entre la proyección del modelo de turismo reportado y la situación actual de la demanda por turismo. Finalmente, en la sección cinco se presentan las principales conclusiones del estudio que servirán para conocer el comportamiento del turismo y para prever las estrategias de reactivación tras el aislamiento social.

2. REVISIÓN DE LITERATURA

Para la realización de los modelos de pronóstico del sector turismo existen diversos trabajos de investigación a nivel internacional que utilizan la familia de modelos $ARIMA$. En este sentido se señalan los trabajos de Choden & Unhapipat (2018), Msofe & Mbago (2019), Makoni & Chikobvu (2018), Petrevska (2017) y Kulendran & Wong (2005) que utilizan el modelamiento $ARIMA$ para el sector turismo. Los trabajos de Chhorn & Chaiboonsri (2017), Borhan & Arsad (2014), Ying-Fang et al., (2014), Uwilingiyimana et al., (2016) y Jiménez et al., (2006) utilizan los modelos $ARIMA/GARCH$ de turismo. Por su parte, Chokethaworn et al., (2010), Flores-Muñoz et al., (2019), Al-Shboul & Anwar (2017), Castaño (2016) y Aladag et al., (2012) utilizan los modelos $ARFIMA$ o llamados también modelos de series de tiempo con memoria larga para el modelamiento del turismo internacional. Para medir la eficiencia de los modelos de series de tiempo dentro de un grupo de modelos de estimación; los trabajos de Mishra et al., (2018) y Lee et al., (2008) realizan la construcción de los estadísticos MAPE, MAE y RMSE. Chokethaworn et al., (2010) y Ray (1993) utilizan modelos $ARFIMA/FIGARCH$ para el modelamiento del turismo y con modelamiento $X12/ARIMA/ARFIMA$ el trabajo de Chaitip & Chaiboonsri (2015). En el mismo contexto, Akal (2004) y García (2017) utiliza los modelos $ARMAX$ para la proyección del turismo; y Laurente & Machaca (2020), Mishra et al., (2018) y Peiris (2016) utilizan la metodología $SARIMA$ para el modelamiento y proyección de la demanda de turismo. Respecto a los modelos de riesgo VaR aplicados al sector turismo, Pérez-Rodríguez & Santana-Gallego (2020) utilizan para sus aproximaciones.

3. MATERIALES Y MÉTODOS

En esta sección se presenta lo siguiente: la descripción de los datos que se utilizan en la estimación, el desarrollo de la metodología $ARIMA$ y las pruebas estadísticas utilizadas para la evaluación de los modelos estimados.

3.1. Datos

Los datos empleados en la presente investigación consta de información mensual de los arribos de turistas internacionales a la región Puno para el período 2003 a 2019. Esta información estadística se adquirió de la página web del Banco Central de Reserva (BCRP, 2020) en un total de 204 observaciones.

3.2. Metodología $ARIMA$

Box & Jenkins (1976) plantea el modelamiento $ARIMA$ o en español denominado como el modelo autorregresivo de medias móviles que consiste en el análisis de series temporales permitiendo conocer la ecuación de comportamiento para su futuro tratamiento. Esta puede ser estacional, de baja frecuencia, de alta frecuencia, entre otros según la naturaleza de la serie de tiempo. Como se señaló en la sección anterior, existen diversos trabajos de estimación que emplean los modelos ARIMA para el modelamiento y proyección del turismo pues son muy eficientes. Los pasos de la esta metodología se organizan de la siguiente manera. En primer lugar se realiza el análisis preliminar de la información. En este paso inicial se realiza el análisis preliminar a toda la información disponible con la finalidad que la información se comporte como un proceso estacionario; en este sentido, se emplea la inspección visual del comportamiento de la serie, su evolución, sus posibles quiebres, su volatilidad, entre otros. En segundo lugar, se identifica el orden (p, d, q) del modelo $ARIMA$ donde se hace uso de la existencia de raíz unitaria para determinar el orden de integración d; y de los estadísticos de Correlograma y funciones de correlación (parcial y simple) para la determinación más precisa del orden autoregresivo (p) y de medias móviles (q). En tercer lugar se realiza la estimación de los modelos autorregresivos del paso anterior. Esta estimación se puede hacer mediante mínimos cuadrados ordinario (*lest squared*) o máxima verosimilitud (*loglikelihood*). En cuarto lugar, se realiza la selección de los modelos estimados del paso anterior y el diagnóstico de los resultados. Para la selección del modelo de mayor ajuste se emplea el criterio de información de Akaike (AIC) y el criterio de Schwarz (SC), seleccionándose aquel que posea el mínimo valor de estas pruebas. Por otro lado, para verificar el ajuste de un modelo de eficiencia se utiliza los estadísticos: MAPE (media porcentual del error), Z (porcentaje de resultado), y el estadístico r de correlación. En la selección se toma aquel modelo que cuenta con el menor valor del estadístico MAPE y el menor valor de los estadísticos Z y r de correlación. Finalmente, en quinto lugar el modelo $ARIMA$ seleccionado puede ser usado para proyección de la demanda del turismo. Este modelo se asume que es el de mayor ajuste y eficiencia dentro del grupo de modelos estimados.

Para el modelado $ARIMA$ de turismo internacional se define el proceso autorregresivo $AR(p)$ de orden p y el proceso de medias móviles $MA(q)$ de orden q siguientes:

$$AR(p):\quad arribos_t = \sum_{i=1}^{p} \phi_i arribos_{t-i} + \varepsilon_t,$$

$$MA(q):\quad arribos_t = \varepsilon_t + \sum_{i=1}^{q} \theta_i \varepsilon_{t-i}.$$

donde $arribos_t$ es el número total de visitas de turistas internacionales a Puno en el período t. El valor p y q es el valor óptimo de retardo en el proceso AR y MA, respectivamente. Los valores $\phi_i, i = 1, \dots, p$ son los parámetros que indican el efecto de la variable retardada $arribos_{t-i}, i = 1, \dots, p$ sobre la realización presente, y los valores $\theta_i, i = 1, \dots, q$ son los efectos de los errores retardados $\varepsilon_{t-i}, i = 1, \dots, q$ sobre la realización presente. La formulación general de un modelo $ARIMA(p, d, q)$ para el turismo se denomina *proceso integrado de medias móviles* de orden (p, d, q) y escribimos como

$$\Delta^d arribos_t = arribos_t - arribos_{t-d} = \sum_{i=1}^{p} \phi_i arribos_{t-i} + \varepsilon_t + \sum_{i=1}^{q} \theta_i \varepsilon_{t-i}, \quad (1)$$

donde el valor d representa el orden de integración del modelo, es decir, el número de veces que necesita diferenciarse para convertirse en un proceso estacionario $I(0)$ o de ruido blanco. La ecuación (1) también se puede expresar en su forma compacta,

$$\left(1 - \phi_1 L - \phi_2 L^2 - \cdots - \phi_p L^p\right)(1 - L)^d arribos_t = \left(1 - \theta_1 L - \theta_2 L^2 - \cdots - \theta_q L^q\right)\varepsilon_t.$$

donde L es el operador de retardo. Si el modelo ARIMA es un modelo que captura estacionalidad, esta se puede representar como $SARIMA(p, d, q)(P, D, Q)$, donde el primer paréntesis (p, d, q) señala al proceso autorregresivo de tendencia secular o de parte regular y el segundo paréntesis (P, D, Q) señala a las variaciones estacionales o cíclicas de la serie temporal.

3.3. Tests de significancia y de selección del modelo óptimo de turismo

Para determinar el orden de integración d del modelo $ARIMA$ es necesario realizar pruebas de raíz unitaria a la variable de series de tiempo. Como se indicó, el orden de integración identificado permitirá convertir una serie no estacionaria a una estacionaria después de diferenciarla d veces. Para llegar a este objetivo, utilizaremos tres estadísticos de raíz unitaria que son muy utilizados en la ciencia económica y están respaldados por investigaciones empíricas que las utilizan. Los tests descritos son: la prueba de Dickey & Fuller (1979) aumentada (ADF), la prueba PP de Phillips & Perron (1988) y la prueba

KPSS de Kwiatkowski, Phillips, Schmidt, & Shin (1992) de KPSS. La hipótesis nula H_0 de la prueba ADF es la existencia de raíz unitaria en la variable temporal. En este contexto, dado un proceso autorregresivo de primer orden para el turismo $AR(1){:}\, arribos_t = \rho arribos_{t-1} + \mu_t$ con la variable temporal $arribos_t$ que describe los arribos internacionales de turistas en el período t, ρ es un coeficiente, y μ_t es el término de error, la existencia de raíz unitaria $I(1)$ se da cuando el valor $\rho = 1$, lo que indica que la serie no es estacionaria y tiene un orden de integración $I(1)$, lo que es lo mismo, que la serie necesita el cálculo en su primera diferencia para convertirse en un proceso $I(0)$ o estacionaria. Por lo tanto, el modelo de regresión para el turismo se modifica en términos de primera diferencia a la forma $\Delta arribos_t = (\rho - 1)arribos_{t-1} + \mu_t = \delta arribos_{t-1} + \mu_t$ donde Δ es el operador de primera diferencia relacionado a $I(1)$. Este modelo puede ser estimado y la prueba para verificar la existencia de una raíz unitaria es equivalente a un valor $\delta = 0$ (donde $\delta = \rho = -1$). Dado que la prueba ADF se estima a partir de los residuos de un modelo original, la utilización de la distribución Gaussiana estandarizada generaría una subestimación (o sobreestimación) del comportamiento normal de los errores; es por ello que la prueba ADF viene incorporada con una tabla de probabilidad dada en Dickey & Fuller (1979). Por otra parte, la prueba de raíz unitaria PP de Phillips & Perron (1988) se utiliza en el análisis de series de tiempo para contrastar la hipótesis nula de estacionariedad que es similar a la prueba ADF.

Para la selección de modelos óptimos hacemos uso del Criterio de Información de Akaike (AIC) desarrollado por Akaike (1974) y el Criterio de Schwarz (BIC) formulado por Schwarz (1978). Ambos estadísticos es una medida para la selección del modelo óptimo. Para el caso general del estadístico de Akaike se tienen: $\mathrm{AIC} = 2k - 2\ln(L)$, donde k es el número de parámetros en el modelo y L es el valor de la función de máxima verosimilitud en el modelo. Por otra parte, la prueba BIC es un criterio para elección de modelos dentro de un grupo de modelos con diferente número de parámetros. Esta prueba estadística se escribe en modo general como $-2\ln p(x|k) \approx \text{BIC} = -2\ln(l)$, donde n es el tamaño de la muestra empleada, k es el número de parámetros que incluye la constante y L es el valor máximo de la función de verosimilitud. El criterio de decisión para ambos modelos cuando se tiene un grupo de modelos estimados es tomar aquel modelo que presente los menores valores de ambas pruebas. Los criterios AIC y SBIC son seleccionados para algún modelo que cuente con los menores valores de estos.

Por otro lado, diversos estudios de modelamiento y proyección utilizan estadísticos que miden la eficiencia dentro de un conjunto de modelos. Estos estadísticos son calculados con la finalidad de conocer cuánto es el desbalance entre la variable observada y la variable proyectada. A diferencia de las pruebas AIC y SBIC, estos estadísticos de eficiencia se basan en la información actual y proyectada de la variable de estudio, mientras que SBIC y AIC se basan en la información del modelo estimado, como por ejemplo sula función L de verosimilitud, su error estándar y los valores de los coeficientes del modelo estimado. Los modelos de eficiencia mencionados son: la prueba MAPE o media ponderada del error; el estadístico Z de medida del resultado; y el coeficiente r de correlación normalizada. La prueba MAPE es una medida de la serie temporal y se expresa en porcentajes. Su fórmula matemática para el arribo de turistas es la siguiente:

$$\text{MAPE} = \frac{1}{n}\sum_{i=1}^{n}\left|\frac{arribos_i - arribosf_i}{arribos_i}\right| * 100\%$$

donde $arribos_i$ es el valor actual de los arribos de los turistas internacionales y $arribosf_i$ es el valor de proyección de la misma serie para las observaciones $i = 1, \dots, n$. El estadístico MAPE es adimensional, donde al multiplicarse por 100% nos muestra un valor de porcentaje donde Lewis (1982) señala una clasificación por intervalos del estadístico. Así si el valor de MAPE es inferior al 10% se considera que el modelo es un pronóstico de alta precisión; si el estadístico se encuentra entre el 10-20% se considera que el modelo tiene un pronóstico bueno. Además, si el valor de MAPE está entre 20-50% se considera un pronóstico razonable; y si el estadístico es mayor al 50% se asume que el modelo objeto de estudio posee un pronóstico inexacto. En este sentido, es lógico la aceptación del estadístico cuanto menor sea y si se compara entre dos o más modelos se debería elegir aquel que presente el menor MAPE para considerarse más eficiente que los otros modelos objetos de comparación. Análogamente, el estadístico Z se usa como una medida relativa y para su análisis es recomendable compararla con un valor de 5%. En este sentido, el estadístico Z para la variable $arribos_i$ queda definida como:

$$Z = \frac{\sum_{i=1}^{n} j}{n} * 100\% \text{ para } \begin{cases} j = 1 \text{ si } \left| \frac{arribos_i - arribosf_i}{arribos_i} \right| < 0.05, \\ j = 0 \text{ si } otro\ caso. \end{cases}$$

Para la selección del modelo de eficiencia se debe considerar aquel que cuente con el mayor valor de Z. Similarmente, el estadístico de ajuste para modelo de eficiencia es el estadístico r de correlación normalizado. Para el caso del turismo, el estadístico r queda definido como:

$$r = \frac{\sum_{i=1}^{n} arribos_i * arribosf_i}{\sqrt{\sum_{i=1}^{n} arribos_i^2 * \sum_{i=1}^{n} arribosf_i^2}}.$$

En la selección del mejor modelo de eficiencia se opta por seleccionar aquel modelo cuyo estadístico r sea el mayor.

4. RESULTADOS

Esta sección del documento presenta el desarrollo de la estimación de los modelos autoregresivos *ARIMA* Box & Jenkins (1976) y su aplicación a la demanda del turismo internacional a Puno. Dándole un orden a los resultados se considera en primer lugar la identificación de los modelos autorregresivos presentando para tal fin las estadísticas descriptivas, el comportamiento gráfico y las pruebas de raíz unitaria aplicada a la variable de estudio. En segundo lugar, se presenta la estimación de los modelos de mayor ajuste de arribo de turistas y la selección del modelo de eficiencia. En tercer lugar, se presenta el cálculo para el modelo de eficiencia dentro del grupo de modelos y su selección. EN cuarto lugar, se presenta el examen de diagnóstico al modelo seleccionado de eficiencia, finalmente se presenta la proyección a 18 meses de los arribos de turistas y se hace un balance entre un período normal y un período de aislamiento social por causa de la pandemia COVID-19.

Para el procesamiento de la información se hizo uso del software econométrico Eviews 9®, con un total de 204 observaciones mensuales del al arribo de turistas internacionales a la región de Puno para el período 2003-2019. De esta información se tiene una media de 20,018 arribos de turistas; un mínimo de 4,650 arribos; y un máximo de 36,147 para el período indicado. Estos resultados se muestran el Tabla 1.

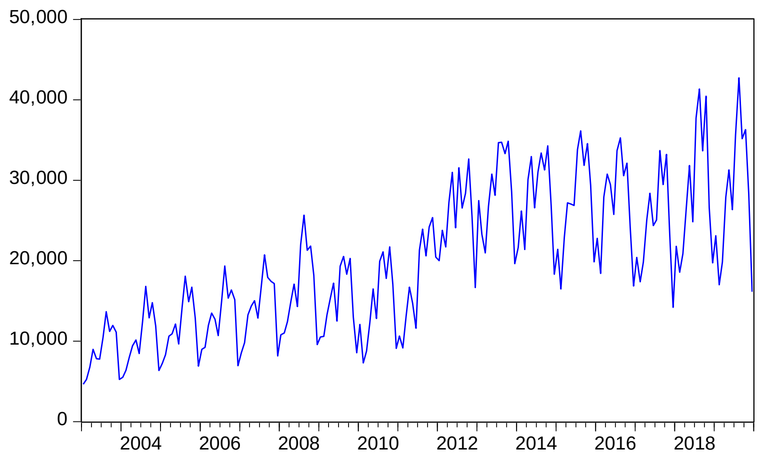
Tabla 1: Estadística descriptiva

Lista de variables	Abreviatura	Obs.	Media	Desv. Estánd.	Mínimo	Máximo
Arribo de turistas internacionales a Puno	$arribos$	204	20,018	8,860	4,650	42,716

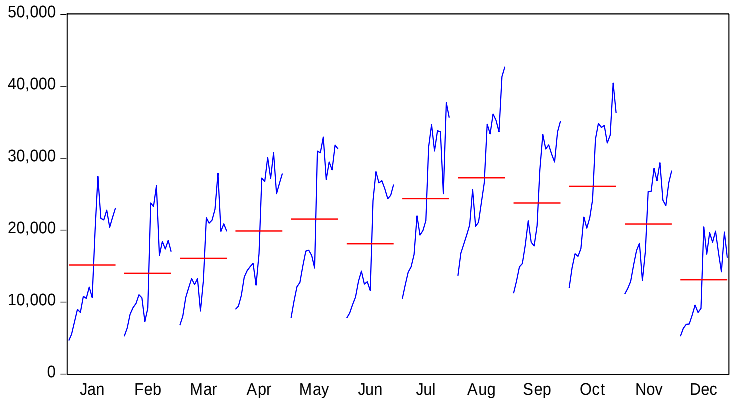
Fuente: Elaboración propia

En la identificación del comportamiento de los arribos de turistas, la Figura 1(a) presenta la evolución del arribo mensual y el arribo por estaciones. De la figura se observa que la serie temporal tiene un comportamiento creciente y clasificándola por estaciones se observa de la Figura 1(b) que posiblemente haya un comportamiento estacional con un máximo de arribos en el mes de agosto y una disminución en el mes de diciembre.

Figura 1: Arribo mensual de turistas internacionales a Puno, 2003-2019



(a)Arribo mensual



(b)Arribo por estaciones

Fuente: Elaboración propia

Para el análisis de estacionariedad se utilizó las pruebas de raíz unitaria ADF, PP y KPSS mostradas en la Tabla 2. En los resultados de los *tests* evaluados en niveles se reportan que el arribo de turistas no es estacionaria al 1% de significancia lo que evidencia la existencia de una raíz unitaria. Seguidamente, realizando el cálculo de la serie en primeras diferencias se observa de los *tests* que la serie presenta estacionariedad al 1% de significancia, lo que indica que la serie es integrada de orden $I(1)$ o estacionaria en primera diferencia. Como consecuencia de los resultados de los *tests* de estacionariedad, se afirma que la ecuación (1) tiene un valor en el orden de diferenciación $d = 1$. En este sentido la variable dependiente $arribos_t$ será expresada en primera diferencia como $\Delta arribos_t$ donde Δ indica la primera diferencia.

Tabla 2: Pruebas de raíz unitaria

Variable	Ninguno		Con intercepto		Con intercepto y tendencia	
	Nivel	Primera diferencia	Nivel	Primera diferencia	Nivel	Primera diferencia
Test de ADF	0.456	-3.043**	-1.465	-3.203*	-2.423	-3.243*
	(0.812)	(0.003)	(0.549)	(0.021)	(0.366)	(0.079)
Test de PP	-0.820	-20.126**	-4.022**	-20.175**	-6.378**	-20.173**
	(0.359)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
Test de KPSS	--	--	1.758	0.122**	0.143*	0.051**
	--	--	(0.739)~	(0.463)~	(0.216)~	(0.216)~

Notas: *Describe significancia estadística al 5% de significancia. **Describe significancia estadística al 1% de significancia. ( ) Indica el *p-value* de Mackinnon (1996) al 5% de significancia estadística. ~ Indica el valor crítico asintótico al 1% para la prueba de KPSS de Kwiatkowski et al., (1992).
Fuente: Elaboración propia

La estimación de modelos $ARIMA$ se muestra en la Tabla 3 donde la información de arribo de turistas se encuentra en base logarítmica. En las estimaciones de la tabla se utilizaron los estadísticos FAS/FAP de autocorrelación simple y parcial para verificar el orden adecuado del proceso AR/MA. Seguidamente, se seleccionaron los cuatro mejores modelos de un grupo de combinaciones de modelos según los estadísticos FAS/FAP y AIC/SC. Para la estimación se hace uso de la metodología de mínimos cuadrados. De estos resultados de la tabla se observa que estos modelos de mejor ajuste no presentan problemas de autocorrelación ya que el estadístico DW se encuentra cerca de 2 como lo indica (Durbin & Watson, 1950). Luego, en la selección del mejor modelo, se observa que el Modelo 1 presenta los menores valores de AIC y SBIC, lo que conlleva la aceptación del Modelo 1 como el modelo de mayor ajuste dentro del grupo de modelos estimados. El Modelo 1 seleccionado es el modelo $SARIMA(6,1,24)(1,0,1)_{12}$ útil para representar a los arribos de turistas internacionales que visitan Puno en el período 2003-2019. Los resultados encontrados del modelo de mayor ajuste respecto de los arribos de turistas internacionales son similares a lo encontrado por Laurente & Machaca (2020) quienes trabajan el modelamiento en un escenario de intervención considerando la crisis financiera internacional y un segundo escenario libre de intervención.

Tabla 3: Modelos $ARIMA$ para arribos de turistas internacionales a Puno

Variable	Coeficiente	t-Statistic	AIC/SBIC	DW
Modelo 1				
$constante$	0.006153	2.228600		
$AR(1)$	0.479268	4.403580		
$AR(3)$	0.217050	2.470416		
$AR(6)$	-0.153538	-2.350674	AIC = -1.233120 SBIC = -1.086229	2.037750
$SAR(12)$	0.985803	149.813000		
$MA(1)$	-0.909474	-7.543715		
$MA(24)$	-0.089658	-2.235825		
$SMA(12)$	0.013806	13.176410		
Modelo 2				
$constante$	0.006095	2.192491		
$AR(24)$	0.737995	14.470560		
$MA(1)$	-0.452179	-5.467121	AIC = -1.056130 SBIC = -0.925561	2.029174
$MA(2)$	-0.160793	-2.014071		
$MA(6)$	-0.243845	-3.230278		
$MA(25)$	-0.143183	-1.999761		
$SMA(12)$	0.739738	14.695220		
Modelo 3				
$constante$	0.005758	1.447469		
$AR(7)$	-0.221618	-2.895774		
$MA(1)$	-0.296425	-4.259616		
$MA(2)$	-0.164090	-2.271024	AIC = -0.793838 SBIC = -0.630626	2.152267
$MA(8)$	-0.291198	-5.300864		
$MA(17)$	-0.183246	-2.539064		
$MA(20)$	-0.173945	-2.457093		
$MA(24)$	0.382207	5.963004		
$SMA(12)$	0.611510	10.042810		

Modelo 4				
$constante$	0.005980	1.053801		
$MA(1)$	-0.239321	-3.800742		
$MA(2)$	-0.219142	-3.191971		
$MA(8)$	-0.283379	-5.266428	AIC = -0.759658	
$MA(17)$	-0.230056	-3.518288	SBIC = -0.612767	2.209683
$MA(20)$	-0.126076	-1.818725		
$MA(24)$	0.409461	6.377352		
$SMA(12)$	0.622917	10.449230		

Notas: El estadístico de Durbin-Watson de autocorrelación se representa por DW. Todas las variables incluidas resultan ser significativas al 1% de significancia. Para la estimación se utilizan los estadísticos FAS y FAP de autocorrelación simple y parcial, respectivamente.
Fuente: Elaboración propia

En seguida, para evaluar la eficiencia en la selección de modelos de la Tabla 3 presenta líneas arriba, la Tabla 4 presenta una comparación de los modelos $ARIMA$ mostrando los estadísticos de eficiencia MAPE, Z y r para los cuatro modelos de estimación. Los resultados muetran que el Modelo 1 o $SARIMA(6,1,24)(1,0,1)_{12}$ es el modelo más eficiente de los modelos presentados debido que presenta un valor de MAPE igual a 0.85% menor al 10% como regla de decisión, lo que señala que este modelo es altamente preciso. Luego, por ubicarse este modelo con un valor MAPE inferior a los otros modelos de eficiencia, es claro su elección. Similarmente, para el Modelo 1 el estadístico Z es igual a 11.35 que es el mayor valor de este estadístico dentro del conjunto de modelos, lo que indica que el modelo indicado es el más eficiente. Similar resultado se observa con el estadístico de correlación normalizado r que es igual a 0.89 para el Modelo 1, siendo el mayor dentro del grupo de modelos, la conclusión es la misma que las pruebas señaladas. En efecto, el Modelo 1 dado por $SARIMA(6,1,24)(1,0,1)_{12}$ es el modelo de mayor ajuste (según los menores valores de AIC y SC) y el más eficiente (según MAPE, Z y r) dentro del grupo de modelos estimados para la representación de la demanda internacional de turismo en la región de Puno.

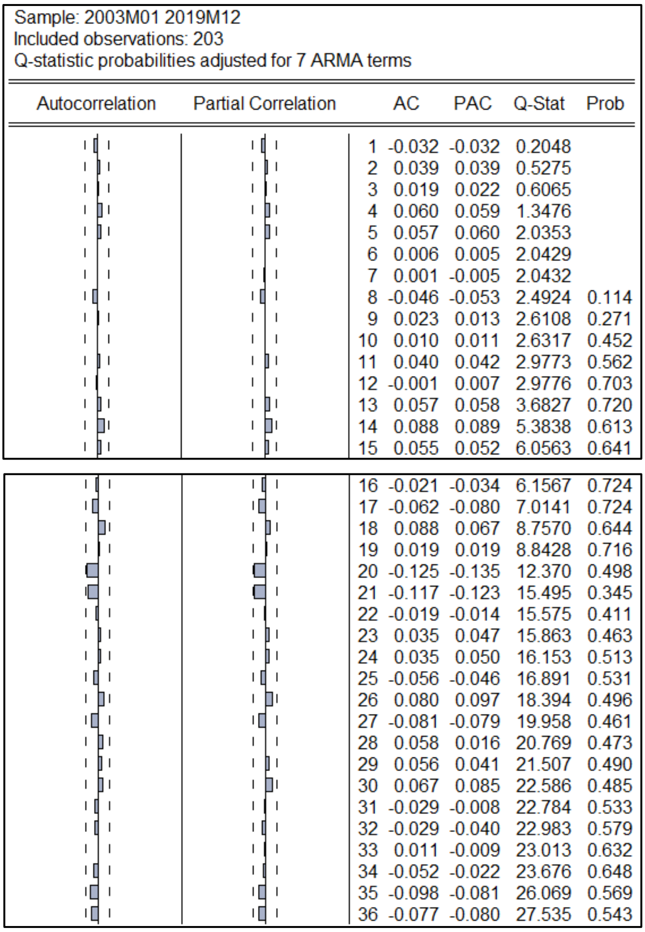
Tabla 4: Comparación de los modelos $ARIMA$ modelos para la demanda de turismo internacional en Puno

	Modelos	MAPE	Z	r
Modelo 1*	$SARIMA(6,1,24)(1,0,1)_{12}$	0.859*	11.351*	0.890*
Modelo 2	$SARIMA\ (24,1,25)(0,0,1)_{12}$	1.281	6.704	0.856
Modelo 3	$SARIMA\ (7,1,24)(0,0,1)_{12}$	1.538	3.571	0.823
Modelo 4	$SARIMA\ (0,1,24)(0,0,1)_{12}$	1.266	4.926	0.797

Nota: Los estadísticos MAPE, Z y r muestran la eficiencia de los modelos. MAPE está en porcentajes. Z y r en unidades adimensionales. *Indica el modelo seleccionado como el más eficiente por ser el menor de los MAPE y el mayor para los estadísticos Z y r.
Fuente: Elaboración propia

El diagnóstico al modelo $SARIMA(6,1,24)(1,0,1)_{12}$ se muestra en la Figura 2(a)-(d). En la Figura 2(a) muestra el correlograma Q de Ljung & Box (1978) que indica ausencia de autocorrelación en el modelo pues los valores de los coeficientes caen dentro de los valores de confianza y todos sus valores son estadísticamente significativos, lo que permite señalar que el comportamiento de los errores del modelo se comportan como un proceso de ruido blanco. En la Figura 2(b) se muestra las raíces AR/MA de los polinomios característicos, todos ellos son menores de 1 lo que indica que el modelo $SARIMA$ es estable. La Figura 2(c) presenta los valores actuales, proyectados y los residuos del modelo que claramente se puede observar una superposición entre los valores de estimación y de proyección indicando un buen ajuste con la información actual. Para la prueba de normalidad de los errores del modelo seleccionado se utiliza el estadístico de Jarque & Bera (1980) revelada en la Figura 2(d) donde indica el rechazo de la hipótesis de normalidad en el modelo al 5% de significancia. Sin embargo, debido al teorema central del límite, se espera que al aumentar el tamaño de la información con el paso del tiempo, los errores se comporten como una función normal (Laurente & Poma, 2016). El paso siguiente en la metodología $ARIMA$ indica que mediante el modelo seleccionado es posible realizar la proyección al futuro (Box & Jenkins, 1976).

Figura 2: Diagnóstico a los residuos del modelo $ARIMA(6,1,24)(1,0,1)_{12}$



Sample: 2003M01 2019M12
Included observations: 203
Q-statistic probabilities adjusted for 7 ARMA terms

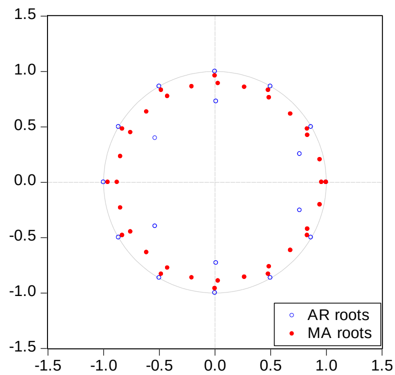
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.032	-0.032	0.2048	
		2	0.039	0.039	0.5275	
		3	0.019	0.022	0.6065	
		4	0.060	0.059	1.3476	
		5	0.057	0.060	2.0353	
		6	0.006	0.005	2.0429	
		7	0.001	-0.005	2.0432	
		8	-0.046	-0.053	2.4924	0.114
		9	0.023	0.013	2.6108	0.271
		10	0.010	0.011	2.6317	0.452
		11	0.040	0.042	2.9773	0.562
		12	-0.001	0.007	2.9776	0.703
		13	0.057	0.058	3.6827	0.720
		14	0.088	0.089	5.3838	0.613
		15	0.055	0.052	6.0563	0.641
		16	-0.021	-0.034	6.1567	0.724
		17	-0.062	-0.080	7.0141	0.724
		18	0.088	0.067	8.7570	0.644
		19	0.019	0.019	8.8428	0.716
		20	-0.125	-0.135	12.370	0.498
		21	-0.117	-0.123	15.495	0.345
		22	-0.019	-0.014	15.575	0.411
		23	0.035	0.047	15.863	0.463
		24	0.035	0.050	16.153	0.513
		25	-0.056	-0.046	16.891	0.531
		26	0.080	0.097	18.394	0.496
		27	-0.081	-0.079	19.958	0.461
		28	0.058	0.016	20.769	0.473
		29	0.056	0.041	21.507	0.490
		30	0.067	0.085	22.586	0.485
		31	-0.029	-0.008	22.784	0.533
		32	-0.029	-0.040	22.983	0.579
		33	0.011	-0.009	23.013	0.632
		34	-0.052	-0.022	23.676	0.648
		35	-0.098	-0.081	26.069	0.569
		36	-0.077	-0.080	27.535	0.543

(a)Correlograma de los residuos

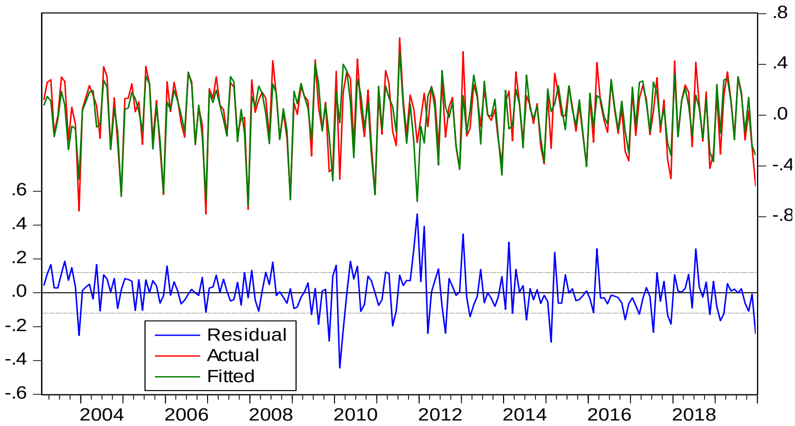
MA Root(s)	Modulus	Cycle
0.999717	0.999717	
0.942948 ± 0.202948i	0.964541	29.63854
-0.959541	0.959541	
0.959541	0.959541	
-0.479771 ± 0.830987i	0.959541	3.000000
0.479771 ± 0.830987i	0.959541	6.000000
-0.830987 ± 0.479771i	0.959541	2.400000
0.830987 ± 0.479771i	0.959541	12.00000
5.55e-17 ± 0.959541i	0.959541	4.000000
0.832693 ± 0.423259i	0.934091	13.36091
0.679854 ± 0.615458i	0.917055	8.540132
0.487524 ± 0.763430i	0.905817	6.267645
0.266301 ± 0.857336i	0.897742	4.948830
0.030183 ± 0.891187i	0.891698	4.088112
-0.205288 ± 0.863026i	0.887106	3.482289
-0.424379 ± 0.775061i	0.883638	3.032790
-0.612349 ± 0.633527i	0.881095	2.686043
-0.756508 ± 0.448281i	0.879352	2.410438
-0.847102 ± 0.232136i	0.878333	2.186122
-0.877998	0.877998	

AR Root(s)	Modulus	Cycle
-0.864994 ± 0.499405i	0.998809	2.400000
0.864994 ± 0.499405i	0.998809	12.00000
0.499405 ± 0.864994i	0.998809	6.000000
-0.499405 ± 0.864994i	0.998809	3.000000
-3.61e-16 ± 0.998809i	0.998809	4.000000
-0.998809	0.998809	
0.998809	0.998809	
0.763551 ± 0.253998i	0.804690	19.56532
0.011689 ± 0.729126i	0.729220	4.041242
-0.535606 ± 0.398788i	0.667762	2.511680

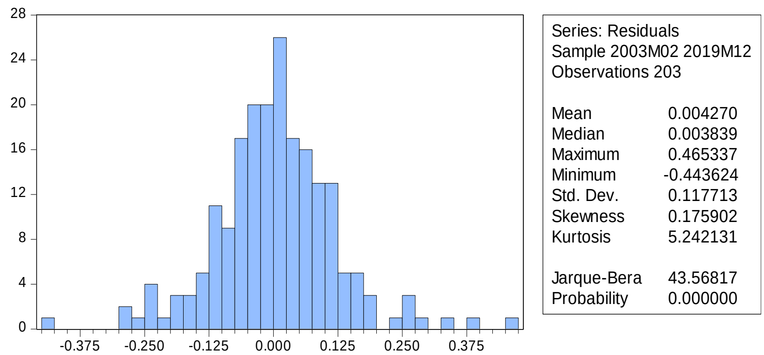
No root lies outside the unit circle.
ARMA model is stationary.



(b)Raíces inversas de los polinomios AR/MA



(c)Residuos actuales y proyectados

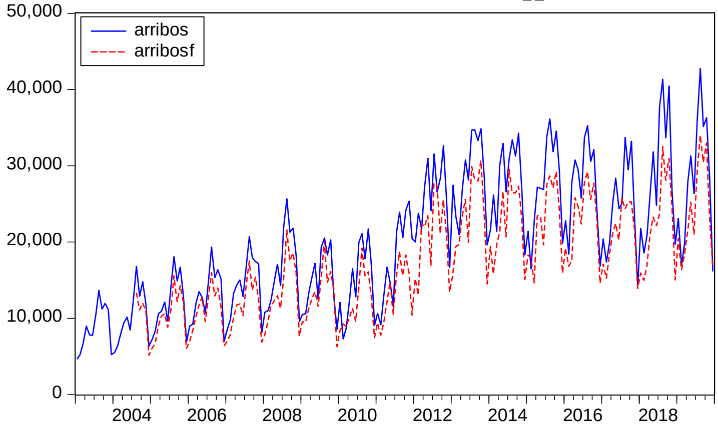


(d)Normalidad de Jarque-Bera

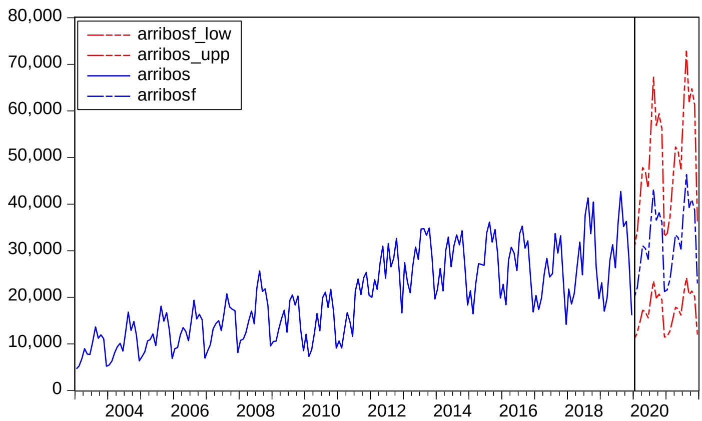
Fuente: Elaboración propia

Al realizar esta práctica, los resultados se muestran en la Figura 3 con la variable $arribos$ como variable original y la variable $arribosf$ como la variable de proyección del modelo seleccionado. Claramente se ve en la Figura 3(a) que los arribos de turistas no se encuentran muy distantes de los valores proyectados; y en la Figura 4(b) se presenta la proyección a futuro de los arribos de turistas para el período 2020-2021 con una banda superior e inferior al ±2S.E. con una significancia del 5%.

Figura 3: Arribo de turistas extranjeros actual y proyectada con modelo $SARIMA(6,1,24)(1,0,1)_{12}$



(a)Arribo mensual/proyectada 2003-2019



(b)Arribo mensual/proyectada 2020-2021

Fuente: Elaboración propia

En seguida, la Tabla 5 muestra la proyección de la demanda de turistas para el período 2020-2021. Asimismo, la tabla muestra un escenario de arribo de turistas con presencia de aislamiento social causada por la pandemia COVID-19. Además en la tabla se muestra un balance de la diferencia entre ambos escenarios que permite conocer el número de arribo de turistas que dejaron de llegar debido a las medidas de aislamiento social que se vive en la región y en el mundo. En efecto, la segunda columna de la Tabla 5 muestra los arribos de los turistas en presencia de COVID-19, que el número es de cero desde el mes de marzo de 2020 donde empezó el aislamiento en la región de Puno y el Perú. La tercera columna presenta la proyección de los arribos de turistas usando el modelo $ARIMA$ y considerando la ausencia de la pandemia. Esta proyección presenta una banda inferior y superior mostrada en las columnas siguientes. La tabla también presenta un balance para el arribo de turistas que es calculada como la diferencia entre el arribo ante la presencia de COVID-19 y sin ella, respectivamente. De los resultados de la proyección, se observa que para mayo de 2020 dejaron de llegar a Puno un total de 30,470 turistas internacionales; y de no solucionarse el problema de la pandemia, entre los meses de mayo y diciembre de 2020 estarían dejando de llegar cerca de 327,904 turistas internacionales, reflejándose en una pérdida considerable en los ingresos de este sector.

Tabla 5: Demanda de turismo internacional en Puno en tiempos de COVID-19 usando el modelo $SARIMA(6,1,24)(1,0,1)_{12}$

	COVID-19	Proyección sin COVID-19			Balance[d]		
Mes año	Turistas[a]	Turistas[b]	Inferior[c]	Superior[c]	Turistas	Inferior	Superior
Enero 2020	20,850	19,988	11,167	30,699	862	9,683	-9,849
Febrero 2020	22,185	22,060	12,304	33,907	125	9,881	-11,722
Marzo 2020	0	26,536	14,766	40,827	-26,536	-14,766	-40,827
Abril 2020	0	31,044	17,214	47,839	-31,044	-17,214	-47,839
Mayo 2020	0	30,470	16,872	46,981	-30,470	-16,872	-46,981
Junio 2020	0	28,164	15,583	43,441	-28,164	-15,583	-43,441
Julio 2020	0	36,408	20,043	56,280	-36,408	-20,043	-56,280
Agosto 2020	0	43,238	23,486	67,222	-43,238	-23,486	-67,222
Setiembre 2020	0	36,587	19,894	56,857	-36,587	-19,894	-56,857
Octubre 2020	0	38,167	20,665	59,419	-38,167	-20,665	-59,419

Noviembre 2020	0	36,078	19,487	56,224	-36,078	-19,487	-56,224
Diciembre 2020	0	21,213	11,489	33,021	-21,213	-11,489	-33,021
Enero 2021	0	21,627	11,653	33,739	-21,627	-11,653	-33,739
Febrero 2021	0	23,839	12,822	37,217	-23,839	-12,822	-37,217
Marzo 2021	0	28,603	15,345	44,701	-28,603	-15,345	-44,701
Abril 2021	0	33,391	17,846	52,266	-33,391	-17,846	-52,266
Mayo 2021	0	32,784	17,497	51,347	-32,784	-17,497	-51,347
Junio 2021	0	30,340	16,179	47,535	-30,340	-16,179	-47,535

Notas: [a]Valor presente de arribo de turistas internacionales a Puno. [b]Valor proyectado de arribo de turistas internacionales a Puno usando $SARIMA(6,1,24)(1,0,1)_{12}$ ante ausencia de la pandemia COVID-19. [c]Bandas construidas al ±2S.E. con una significancia del 5%. [d]El balance está calculado como la diferencia entre los arribos de turistas ante presencia y ausencia de COVID-19, respectivamente.
Fuente: Elaboración propia

5. CONCLUSIONES

En el presente trabajo se presenta la estimación de los modelos $ARIMA$ de Box & Jenkins (1976) para la demanda de turismo internacional en la región de Puno-Perú. Se utiliza información mensual de los años 2003 a 2019 extraídos de la página web del BCRP sucursal Puno. Para la selección de modelos eficientes se hace uso del Criterio de Información de Akaike (AIC) y el Criterio de Schwarz (SBIC). Después de una búsqueda de modelos de ajuste univariados $ARIMA$, y utilizando los menores valores AIC y SC, se seleccionó el modelo $SARIMA(6,1,24)(1,0,1)_{12}$ como el modelo de mayor ajuste dentro de un grupo de modelos para el arribo de turistas internacionales a Puno como en Laurente & Machaca (2020) que reportan un modelo $SARIMA$ sin intervención y con intervención de factores externos para Puno. Similarmente, para demostrar la eficiencia de estos modelos seleccionados por AIC y SBIC, se hace uso de las pruebas estadísticas MAPE o medida del error, el estadístico Z, y el estadístico r de correlación normalizado. De los modelos estimados y evaluados por estos estadísticos, el modelo de eficiencia es el modelo $SARIMA(6,1,24)(1,0,1)_{12}$ cuyo nivel de pronóstico a la información corriente es el de "altamente preciso", pues presenta un valor de MAPE igual a 0.85% el mínimo dentro del grupo de modelos estimados. Asimismo, este modelo presenta los valores máximos de Z (igual a 11.35) y el estadístico de correlación normalizado r igual a 0.89 dentro del grupo de modelos de buen ajuste. En seguida, este modelo de eficiencia es utilizado para la proyección del arribo de turistas bajo la presencia de la pandemia COVID-19 que afectó directamente a la demanda de turismo debido que en Puno, como en todo el mundo, el aislamiento social imposibilitó el tránsito y la visita de turistas a los diversos atractivos turísticos. Con esta finalidad, se hizo una proyección a 18 meses (de enero de 2020 a junio de 2021) de la demanda de turistas internacionales a Puno. De estos resultados se considera que para mitad del año 2020, por motivo de COVID-19, hubo una pérdida de 116,213 turistas; y de continuar la restricción por la pandemia, se estima que para fin del año 2020 habrá una pérdida de 327,904 arribos de turistas internacionales. Esta cifra es muy importante en la economía de Puno ya que el sector turismo es una de las actividades económicas más importantes en esta región. Asimismo, el trabajo presenta proyecciones mensuales (y balance) para el año 2021 bajo un escenario de aislamiento por COVID-19 en la región.

Los resultados de la presente investigación son de utilidad para conocer el comportamiento futuro del arribo de turistas y puede ayudar a este sector en tomar una adecuada planificación en términos de pérdida económica y en estrategias de reactivación. Luego, para futuros trabajos se sugiere utilizar la metodología empleada en el presente estudio para hacer el cálculo y proyección de las pérdidas en términos monetarios para el sector turismo en tiempos de pandemia.

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REFERENCIAS

Akaike, H. (1974). A New Look at the Statistical Model Identification. *IEEE Transactions on Automatic Control*, *19*(6), 716–723. https://doi.org/10.1109/TAC.1974.1100705

Akal, M. (2004). Forecasting Turkey's tourism revenues by ARMAX model. *Tourism Management*, *25*(5), 565–580. https://doi.org/10.1016/j.tourman.2003.08.001

Al-Shboul, M., & Anwar, S. (2017). Long memory behavior in Singapore's tourism market. *International Journal of Tourism Research*, *19*(5), 524–534. https://doi.org/10.1002/jtr.2125

Aladag, C., Egrioglu, E., & Kadilar, C. (2012). Improvement in Forecasting Accuracy Using the Hybrid Model of ARFIMA and Feed Forward Neural Network. *American Journal of Intelligent Systems*, *2*(2), 12–17. https://doi.org/10.5923/j.ajis.20120202.02

BCRP. (2020). Síntesis de Actividad Económica de la región de Puno, varios meses. Retrieved May 20, 2020, from http://www.bcrp.gob.pe/51-sucursales/sede-regional-puno.html

Borhan, N., & Arsad, Z. (2014). Forecasting international tourism demand from the US, Japan and South Korea to Malaysia: A SARIMA approach. *AIP Conference Proceedings*, *1605*(1), 955–960. https://doi.org/10.1063/1.4887719

Box, G., & Jenkins, G. M. (1976). *Time Series Analysis: forecasting and control.* Oakland, California: Holden-Day.

Castaño, E. (2016). Identification in ARFIMA models. *Revista de La Facultad de Ciencias Universidad Nacional de Colombia*, *5*(1), 12–37. https://doi.org/10.15446/rev.fac.cienc.v5n1.52890

Chaitip, P., & Chaiboonsri, C. (2015). Forecasting with X-12-ARIMA y ARFIMA: International Tourist Arrivals to India. *Annals of the University of Petroşani, Economics*, *9*(3), 147–162. Retrieved from http://repositorio.ana.gob.pe/handle/ANA/1564

Chhorn, T., & Chaiboonsri, C. (2017). *Modelling and Forecasting Tourist Arrivals to Cambodia: An Application of ARIMA-GARCH Approach* (MPRA No. 83942). *Munich Personal RePEc Archive Modelling*. https://doi.org/10.31039/jomeino.2018.2.2.1

Choden, C., & Unhapipat, S. (2018). ARIMA model to forecast international tourist visit in Bumthang, Bhutan. *Journal of Physics: Conference Series*, *1039*(1), 1–11. https://doi.org/10.1088/1742-6596/1039/1/012023

Chokethaworn, K., Chaiboonsri, C., & Chaitip, P. (2010). International Tourist Arrivals in Thailand: Forecasting With Arfima-Figarch Approach. *Annals of the University of Petrosani, Economics*, *10*(2), 75–84.

Chokethaworn, K., Wiboonponse, A., Sriboonchitta, S., Sriboonjit, J., Chaiboonsri, C., & Chaitip, P. (2010). International Tourists' Expenditures in Thailand: A Modelling of the ARFIMA-FIGARCH Approach. *The Thailand Econometrics Society*, *10*(January), 85–98.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series With a Unit Root. *Journal of the American Statistical Association*, *74*(366), 427–431. https://doi.org/10.2307/2286348

Durbin, J., & Watson, G. S. (1950). Testing for Serial Correlation in Least Squares Regression. I. *Biometrika Trust*, *58*(1), 409–428. https://doi.org/10.2307/2332391

Flores-Muñoz, F., Gutiérrez-Barroso, J., & Báez-García, A. (2019). Predictability and self-similarity in demand maturity of tourist destinations: The case of Tenerife. *Cuadernos de Economía*, *42*, 59–69. https://doi.org/10.32826/cude.v42i118.16

García, Ó. (2017). Forecasting tourism arrivals with an online search engine data: A study of the Balearic Islands. *PASOS. Revista de Turismo y*

Patrimonio Cultural, *15*(4), 943–958. Retrieved from www .pasosonline.org

INEI. (2018). Instituto Nacional de Estadística e Informática - Pobreza por departamentos del Perú. Retrieved February 4, 2019, from https://www.inei.gob.pe/estadisticas/indice-tematico/living-conditions-and-poverty/

Jarque, C., & Bera, A. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, *6*(4), 255–259. https://doi.org/10.1016/0165-1765(81)90035-5

Jiménez, J., Sánchez, R., & Gázquez, J. (2006). La capacidad predictiva en los métodos Box-Jenkins y Holt-Winters: una aplicación al sector turístico. *Revista Europea de Dirección y Economía de La Empresa*, *15*(3), 185–198.

Kulendran, N., & Wong, K. (2005). Modeling seasonality in tourism forecasting. *Journal of Travel Research*, *44*(2), 163–170. https://doi.org/10.1177/0047287505276605

Kwiatkowski, D., Phillips, P., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics*, *54*(1–3), 159–178. https://doi.org/10.1016/0304-4076(92)90104-Y

Laurente, L., & Machaca, R. (2020). Modeling and forecasting international tourism demand in Puno-Peru. *Revista Brasileira de Pesquisa Em Turismo*, *14*(1), 34–55. https://doi.org/10.7784/rbtur.v14i1.1606

Laurente, L., & Poma, R. (2016). *Introducción a la teoría de las probabilidades* (Primera Ed). Puno, Perú.

Lee, C. K., Song, H. J., & Mjelde, J. W. (2008). The forecasting of International Expo tourism using quantitative and qualitative techniques. *Tourism Management*, *29*(6), 1084–1098. https://doi.org/10.1016/j.tourman.2008.02.007

Lewis, C. D. (1982). Industrial and business forecasting methods. *London: Butterworths*. Retrieved from http://interstat.statjournals.net/YEAR/2008/articles/0810005.pdf

Ljung, G., & Box, G. (1978). Biometrika Trust On a Measure of Lack of Fit in Time Series Models. *Biometrika*, *65*(2), 297–303. https://doi.org/10.1093/biomet/65.2.297

Mackinnon, J. (1996). Numerical Distribution Functions for Unit Root and Cointegration Tests. *Journal of Applied Econometrics*, *11*(6), 601–618. https://doi.org/10.1002/(SICI)1099-1255(199611)11:6<601::AID-JAE417>3.0.CO;2-T

Makoni, T., & Chikobvu, D. (2018). Modelling and Forecasting Zimbabwe's Tourist Arrivals Using Time Series Method: A Case Study of Victoria Falls Rainforest. *Southern African Business Review*, *22*, 1–22. https://doi.org/10.25159/1998-8125/3791

Mishra, P. K., Rout, H., & Pradhan, B. (2018). Seasonality in Tourism and Forecasting Foreign Tourist Arrivals in India. *Iranian Journal of Management Studies*, *11*(4), 629–658. https://doi.org/10.22059/IJMS.2018.239718.672776

Msofe, Z. A., & Mbago, M. C. (2019). Forecasting international tourist arrivals in Zanzibar using Box–Jenkins ARIMA model. *General Letters in Mathematics*, *7*(2), 100–107. https://doi.org/10.31559/glm2019.7.2.6

OMS. (2020). Enfermedad por coronavirus (COVID-19) - Organización Mundial de la Salud. Retrieved June 28, 2020, from https://www.who.int/es/emergencies/diseases/novel-coronavirus-2019/advice-for-public/q-a-coronaviruses

OPS. (2020). La OMS caracteriza a COVID-19 como una pandemia-Organización Panamericana de la Salud. Retrieved June 28, 2020, from https://www.paho.org/es/noticias/11-3-2020-oms-caracteriza-covid-19-como-pandemia

Peiris, H. (2016). A Seasonal ARIMA Model of Tourism Forecasting: The Case of Sri Lanka. *Journal of Tourism, Hospitality and Sports*, *22*, 98–109. Retrieved from https://www.iiste.org/Journals/index.php/JTHS/article/view/33831

Pérez-Rodríguez, J., & Santana-Gallego, M. (2020). Modelling tourism receipts and associated risks, using long-range dependence models. *Tourism Economics*, *26*(1), 70–96. https://doi.org/10.1177/1354816619828170

PERU. (2020). COVID-19: El sector turismo no está solo-Gobierno del Perú. Retrieved June 26, 2020, from https://www.gob.pe/institucion/mincetur/noticias/109877-covid-19-el-sector-turismo-no-esta-solo

Petrevska, B. (2017). Predicting tourism demand by ARIMA models. *Economic Research-Ekonomska Istraživanja*, *30*(1), 939–950. https://doi.org/10.1080/1331677X.2017.1314822

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335–346. https://doi.org/10.1093/biomet/75.2.335

Ray, B. K. (1993). Modeling Long Memory Processes for Optimal Long Range Prediction. *Journal of Time Series Analysis*, *14*(5), 511–525. https://doi.org/10.1111/j.1467-9892.1993.tb00161.x

RPP. (2020). Coronavirus y el golpe al turismo: ¿Cómo impacta la crisis en el empleo?-RPP Noticias. Retrieved June 26, 2020, from https://rpp.pe/peru/actualidad/coronavirus-y-el-golpe-al-turismo-como-impacta-la-crisis-en-el-empleo-noticia-1257442

Schwarz, G. (1978). Estimating the Dimension of a Model. *The Annals of Statistics*, *6*(2), 461–464. https://doi.org/10.1214/aos/1176344136

Uwilingiyimana, C., Munga'Tu, J., & Harerimana, J. D. D. (2016). Forecasting Inflation in Kenya Using Arima - Garch Models. *International Journal of Management and Commerce Innovations*, *3*(2), 15–27.

Ying-Fang, H., Thanh-Lam, N., & Ming-Hung, S. (2014). Forecasting inbound tourism demand in thailand with grey model. *Recent Researches in Applied Economics and Management*, *13*(1), 95–104.

CRECIMIENTO CON DENSIDAD RESIDENCIAL, ALQUILER DE TIERRAS Y VALOR DE LA TIERRA

GROWTH WITH RESIDENTIAL DENSITY, LAND RENT AND LAND VALUE

Wei-Bin Zhang [λ]

- **RESUMEN:** Gran acumulación de capital, rápida urbanización, y el aumento de los precios de la tierra son los principales personajes de las economías modernas. Este estudio examina estos fenómenos dentro de un marco integrado sobre la base de la teoría del crecimiento económico, economía espacial y economía urbana. Construye un modelo de crecimiento espacial con distribución residencial mediante la integración de los modelos de crecimiento de Solow y residencial de Alonso para proporcionar algunas ideas sobre los mecanismos económicos. Una característica única del estudio es determinar de forma endógena el valor de la tierra y la renta con interacciones entre la acumulación de riqueza, servicios, terrenos y condiciones de transporte. Simulamos el movimiento de la economía en el tiempo y el espacio. Realizamos análisis dinámico comparativo con respecto a la productividad total del sector productivo, condiciones de transporte, comodidades y preferencia. El documento demuestra cómo el crecimiento económico, distribución residencial, elección de cartera, y la renta y el precio de la tierra interactúan en el tiempo y el espacio.

- **PALABRAS CLAVE:** Valor del suelo, crecimiento económico, alquiler de vivienda, distribución residencial.

- **ABSTRACT:** Huge capital accumulation, speedy urbanization, and rising land prices are main characters of modern economies. This study examines these phenomena within an integrated framework on basis of economic growth theory, spatial economics, and urban economics. It builds a spatial growth model with residential distribution by integrating the Solow growth and Alonso residential models to provide some insights into the economic

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mechanisms. A unique feature of the study is to endogenously determine land value and rent with interactions between wealth accumulation, amenity, land, and transportation conditions. We simulate the motion of the economy over time and space. We carry out comparative dynamic analysis with regards to the total productivity of the production sector, transportation conditions, amenity, and preference. The paper demonstrates how economic growth, residential distribution, portfolio choice, and land rent and price interact over time and space.

- **KEY WORDS:** Land value, economic growth, housing rent, residential distribution.

- **CLASIFICACIÓN JEL**: E13, R11, D31.

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INTRODUCCIÓN

The purpose of this study is to develop a spatial economic growth model with residential amenity and location and land value in a perfectly competitive framework. We integrate the Solow growth model (Solow, 1956), the Alonso residential models (Alonso, 1964), and Zhang's recent work on introducing determination of land value in the neoclassical growth theory (Zhang, 2016). A unique contribution of the study is to determine dynamic interdependence between land value, land rent, wealth accumulation, amenity, land use, and transportation conditions.

The necessity of analyzing urban configuration and economic growth as a connected whole has long been recognized (for instance, Lucas, 1988; Henderson and Thisse, 2004; and Capello and Nijkamp, 2004). As early as in 1980, Arnott (1980: 53) points outs: "In the last decade the static theory of residential urban location and land use has been extensively developed. The theory has generated many useful insights, but because it ignores growth and durability of housing and urban infrastructure there are many urban phenomena it cannot explain." This description is still applicable to (most of) the current literature of urban economics. On basis of Zhang's work (2002, 2008), we introduce neoclassical economic growth theory with capital accumulation to the standard land-use model of the urban economics and regional science. The growth mechanism of our model is based on the Solow growth model. It is well known that the development of the neoclassical growth theory is strongly influenced by the pioneering works of the two similar models separately proposed by Solow and Swan in 1956 (Solow, 1956; and Swan, 1956). In the literature the Solow-Swan model is often referred to as the Solow model. The Solow model considers capital and labor as substitutes for one another. The model assumes full employment of the input factors. There are numerous extensions and generalizations of the model (Burmeister and Dobell, 1970). The production side of our model is based on the neoclassical growth approach to urban growth and dynamics (e.g., Richardson, 1973, Rabenau, 1979, Henderson, 1985). We apply an alternative approach to consumer behavior proposed by Zhang (1993).

Following Zhang (2008), we apply the Alonso model to describe the spatial character of our economy. Like the Solow model in the neoclassical growth theory, the Alonso model plays a key role in the development of neoclassical urban economics (Alonso, 1964). The earlier important contributions are made by Muth (1969), Mills (1967), Beckmann (1969), Solow (1973), and others. Many studies in urban economic examine spatial structure of urban areas on the influence of the Alonso model (Mills, 1967; Muth, 1969; Fujita, 1989). As pointed out by Zhang (2002), most of the models concentrate on the residential location and urban structure and neglect production aspects of urban dynamics. Most of these studies are limited to comparative steady state analysis. They are focused on urban economic structures in static frameworks without wealth accumulation and land value determination. The main purpose of this study is to introduce endogenous land value and wealth accumulation. Leung and Teo (2011) observe that one of stylized facts on regional economic variation is related to the real estate markets. As land is an alternative way of making saving for future consumption, a proper economic model should take account of portfolio structures. Brueckner (1987) builds an urban model, taking account of the idea that commuting costs within an urban area are related to differing housing prices. The model explains the internal structure of cities as well as intercity differences in spatial structure. Sato and Xiao (2015) propose a model of interactions between labor and land markets in a city. These studies do not include portfolio equilibrium between different assets with a genuine dynamic framework as capital accumulation, which is the main determinant of economic growth, is not taken into account in urban spatial formation. As argued by Brito and Pereira (2002), the link between the housing market and long-term growth has been neglected in the literature. This study makes a contribution to linking housing market and economic growth. In association with modern economic growth and structural changes, the complexity of portfolio is increased (e.g., Uhler and Gragg, 1971; Agell and Edin, 1990; Cobb-Clark and Hilderbrand, 2009; Gaudecker, 2015). Households of contemporary economies are characterized of many assets such as housing, land, stocks, precious metals, gold, cashes in different currencies in their portfolios. As summarized in the overview by Guiso et al. (2002), "Until recently, researchers in economics and finance paid relatively little attention to household portfolios. Reasons included the tendency of most households to hold simple portfolios, the inability of the dominant asset pricing models to account for household portfolio incompleteness, and the lack of detailed databases on household portfolios in many countries until the late 1980s or 1990s. Now, however, the analysis of household portfolios is emerging as a field of vigorous study." As recently reviewed by Liu *et al.* (2011: 1), "Although it is widely accepted that house prices could have an important influence on macroeconomic fluctuations, quantitative studies in a general equilibrium framework have been scant." In the contemporary literature on land and economic growth only a few studies are concerned with determining land value, residential location and economic growth with microeconomic foundation. Our study proposes a mathematical model to deal with growth with portfolio choice equilibrium with land and physical capital within a comprehensive analytical framework with time and space.

It is well recognized that development of transportation systems has important effects on housing market, land rent, and residential distribution. This study also introduces transportation into the growth model with land value. The need for developing analytical frameworks for examining spatial economic growth with amenity is well recognized. We introduce amenity into the neoclassical growth theory in a spatial context. Issues related to interdependence between economic growth and amenity have been examined in the economic literature. There are many studies about amenities (Tiebout, 1956; Oates, 1969; Rosen, 1979; Roback, 1982; Beeson Gabriel et al. 2003; Chen and Rosenthal, 2008; Albouy and Lue, 2015). Nevertheless, only a few attempts have been made to introduce amenity into formal dynamic economic analysis with rational assumptions of profit and utility maximization in urban economics. It is well recognized that location choice is closely related to the existence and quality of such physical environmental attributes as open space and noise pollution as well as social environmental quality. Earlier introduction of amenities into spatial economics with microeconomic foundation is carried out by Zhang (1993a). As argued by Glaeser et al (2001), consumption amenities have increasingly played more important role in urban formation. Public services, accessibilities, local transportation systems, pollution, and human relations such as discrimination all involve externalities and affect amenities. In this study, we incorporate amenity into the consumer location decision by assuming that amenity is a function of residential density.

This study deals with issues related to growth, transportation systems and residential distribution in a comprehensive framework. We study dynamic interactions between capital accumulation, land, housing, amenity, transportation in an isolated linear economy, by synthesizing the main ideas in the Solow growth model in the neoclassical growth theory and the Alonso urban model with an alternative approach to household behavior proposed by Zhang. The model is a one-dimensional model of residential location with a central business center (CBD). The paper is a synthesis of the two models proposed by Zhang (2008, 2016, 2018). The main differences from the two models are that Zhang (2008) includes growth mechanisms and residential distribution without taking account of land value and without dynamic analysis and Zhang (2016) deals with portfolio equilibrium between land and physical wealth without taking account of residential location. Zhang (2018) deals with a small-open economy in which rate of interest is given in global markets, while this study treats the rate of interest as an endogenous variable. This study carries out dynamic analysis with endogenous land value and residential location. The paper is organized as follows. Section 2 defines the spatial growth model with endogenous land value and residential location. Section 3 simulates the motion of the economic system. Section 4 carries out comparative dynamic analysis with regard to the total productivity of the production sector, transportation conditions, amenity, and preference. Section 5 concludes the study. The appendix proves the main results in section 3.

2. THE MODEL

En México según datos de la Encuesta Nacional de Ocupación y Empleo (ENOE) para el "primer trimestre del 2020 existen 6.5 millones de personas que se dedican al trabajo agrícola" (INEGI, 2020), este entendido como hombres y mujeres que siembran y cultivan el campo y cosechan sus productos, de estos 5.8 millones son hombres y 0.77 millones son mujeres, con un promedio de edad en el sector de 41.7 años y el promedio de escolaridad de esta población es de 5.9 años, lo que significa primaria incompleta (por debajo del promedio nacional de 8 años), de cada 100 trabajadores agrícolas, 24 hablan lengua indígena. We now build the model of dynamic interdependence between economic growth and residential density change over space by combining the basic features of the Solow growth model and the Alonso residential model with Zhang's approach to household behavior. We describe the residential land-use by following the Alonso model. The economic system is an isolated urban economy built on a flat featureless plain. All workers reside over the city and work in the CBD. People travel only between dwelling sites and the CBD. An individual reside only at one location. The only spatial characteristic that directly matters is the distance from the residential site to the CBD. The isolated state consists of a finite strip of land extending from a fixed central business district (CBD) with constant unit width. The system is geographically linear and consists of two parts - the CBD and the residential area. We use L to stand for the fixed (territory) length of the isolated state. We assume that all economic activities are concentrated in the CBD. Let ω stand for the distance from the CBD to a point in the residential area. We use $R(t,\omega)$ and $p(t,\omega)$ to represent the land rent and land price at location ω at time t. The households occupy the residential area. As we will get the same conclusions if we locate the CBD at the center of the linear system, the specified urban configuration will not affect our discussion. The system has one industrial sector. The industrial production is the same as that in the one-sector neoclassical growth model. We assume that the industrial product can be either invested or consumed. Housing is measured by lot size. The total labor force is fully employed by the industrial sector. We select industrial good to serve as numeraire. As we assume that the transportation cost of workers to the city is dependent on the travel distance, land rent for housing should be spatially different. We use $K(t)$ to stand for the total capital stock.

The total labor input

We use $n(t, \omega)$ to denote the residential density at ω. We assume that all the workers work the same time, irrespective of where they live. The population N is homogenous and constant. In the literature of urban economics there are studies on urban structure with heterogeneous households (Beckman, 1969; Solow, 1973; Beckmann and Papageorgiou, 1989; Anas, 1990; Lucas and Rossi-Hansberg, 2002; Tabuchi and Thisse, 2002). The total labor force is the sum of the labor input over the space. The width of the urban area is assumed to be unity. According to the definition of $n(t, \omega)$, we have:

$$N = \int_0^L n(t, \omega) d\omega. \ (1)$$

The production sector

Let $F(t)$ stand for the production function. The production function is specified as follows:

$$F(t) = AK^{\alpha}(t) N^{\beta}(t), \alpha, \beta > 0, \alpha + \beta = 1, (2)$$

where A, α, and β are positive parameters. The capital goods sector employs two input factors, capital and labor force. We assume that all the markets are perfectly competitive. Labor and capital earn their marginal products, and firms earn zero profits. The rate of interest $r(t)$, and wage rate $w(t)$, are determined by markets. Hence, for any individual firm $r(t)$ and $w(t)$ are given at each point in time. The production sector chooses capital $K(t)$ and labor force $N(t)$ to maximize its profit. The marginal conditions are given by:

$$r(t) + \delta_k = \frac{\alpha F(t)}{K(t)}, w(t) = \frac{\beta F(t)}{N(t)}, (3)$$

where δ_k is the depreciation rate of physical capital. We consider that wages are independent of where households live. Some studies suggest that wages should be related to distance from the residential site to urban centers (Muth, 1969; and White, 1976).

The relation between the lot size and residential density

We assume that all housing is residential. For simplicity we assume that housing is measured by lot size (Anas, 1978; Fischer et al. 1996; Arnott, 1980; Arnott et al. 1999; Lin et al., 2004; and Glaeser and Gyourko, 2005). Residential housing assets play a dual in the economy. First, residential housing assets are used as a durable consumption good. They are the source of housing services. Residential housing assets are used as a mechanism for the intertemporal transfer of wealth, which generates both rents and capital gains through housing appreciation. Let us denote $l(t, \omega)$ the lot size of the household at ω. According to the definitions of l and n, we have:

$$n(t, \omega) = \frac{1}{l(t, \omega)}, 0 \leq \omega \leq L. (4)$$

Choice between physical wealth and land

Consider now a household with one unity of money. He can either invest in capital good thereby earning a profit equal to the net own-rate of return $r(t)$ or invest in land thereby earning a profit equal to the net own-rate of return $R(t,\omega)/p(t,\omega)$. As we assume capital and land markets to be at competitive equilibrium at any point in time, the two options yield equal returns, i.e.

$$\frac{R(t,\omega)}{p(t,\omega)} = r(t). \ (5)$$

These equations enable us to determine portfolio equilibrium choice between land and (physical) wealth. It is easy to see that equations (5) are established under many strict conditions. For instance, we omit any transaction costs and any time delay for buying and selling. Equation (5) also implies perfect information. It should be noted that a relation similar to (5) is used in the long-term steady state analysis in literature of urban economics (Fujita, 1989). The land value $p(\omega,t)$ is equal to the present value of anticipated land rents:

$$p(t,\omega) = \int_t^\infty R(\tau,\omega)\, e^{-r(\tau-t)} d\tau,$$

where r is the discount rate. If we assume that the land rent is invariant over time, then we have:

$$p(t,\omega) = \frac{R(t,\omega)}{r}.$$

Travel time and cost to the CBD

All the land is only for residential use. As work time is exogenously fixed equally for all the residents, a resident decides the time distribution between leisure time and travel time. We assume that work time is exogenously fixed. It is assumed that the travel time from the CBD to the residential location is only related to the distance. We neglect any other effects such on technological change, infrastructure improvement, and congestion on the travel time form the CBD to the residential area. Let T_0 and $\Gamma(\omega)$ respectively stand for the total available time and the time spent on traveling between the residence and CBD. We should require that the travel time increases in ω. We have:

$$T(\omega) + \Gamma(\omega) = T_0, (6)$$

where $T(\omega)$ is the leisure time that the household at ω enjoys. As the travel is fixed for a given distance, the leisure time is also dependent only on the location. In reality, economic activities such as retailing, goods production, services, green parks, and transportation use land. Solow and Vickery (1971), for instance, study urban land use for transportation in a similar spatial setting as in this study. At each location, land is distributed between transportation and housing as follows: $L_H(\omega) + L_T(\omega) \leq 1$, where $L_H(\omega)$ and $L_T(\omega)$ are respectively the ratios of land devoted to housing and transportation. In order to extend out study, we refer to, for instance, Oron et al (1973) who study endogenous speed and congestion, and Yang and Huang (2005) who deal with pricing and congestions. There are different types of congestions and externalities (e.g., Anas and Kim, 1996; Arnott, 2007; Ahlfeldt *et al.* 2015; and Brinkman 2016).

This study assumes that the travel cost $c_T(\omega, t)$ from location ω to the CBD is dependent on the distance as follows:

$$c_T(t, \omega) = \bar{c}(t) + c_0(\omega). (7)$$

Transport mode is an endogenous variable, which implies that like housing, transportation service should enter the utility function. Transportation cost is related to income (e.g., Train and McFadden, 1978; Rietveld et al, 2003; and De Palma et al, 2005).

Land ownership, current income, and disposable income

As in many studies in urban economics (e.g., Zhang, 2002), we use lot size to stand for housing. As argued, for instance, by Davis and Heathcote (2007), most of the fluctuations in house prices are driven by land price rather than by the cost of structures. This implies that it is acceptable to use lot size to stand for housing when dealing with dynamics of housing value. Let $\bar{k}(\omega, t)$ stand for the representative household's physical wealth, and $a(\omega, t)$ for the value of land owned by the household at location ω. The total value of land owned by the household at ω is the sum of all the value of land the household owns in the economy. We have

$$a(t, \omega) = \int_0^L p(t, \tilde{\omega}) \bar{l}(t, \omega, \tilde{\omega}) d\tilde{\omega}, (8)$$

where $\bar{l}(t, \omega, \tilde{\omega})$ is the land that the household at ω owns at $\tilde{\omega}$.

The total value of wealth $v(t, \omega)$ owned by the household at ω is the sum of the two assets' values

$$v(t, \omega) = \bar{k}(t, \omega) + a(t, \omega). (9)$$

The household at ω collects the following rent from the land that the household owns:

$$\bar{r}(t,\omega) = \int_0^L R(t,\widetilde{\omega})\bar{l}(t,\omega,\widetilde{\omega})d\widetilde{\omega} \rightleftarrows ,0 \le \omega \le L. (10)$$

The total land rent of the economy is equal to the land rent that the population owns:

$$\int_0^L \bar{r}(t,\omega)d\omega = \int_0^L R(t,\omega)d\omega \rightleftarrows ,0 \le \omega \le L. (11)$$

The household at ω has the following current income:

$$y(t,\omega) = r(t)\bar{k}(t,\omega) + w(t) + \bar{r}(t,\omega), 0 \le \omega \le L, (12)$$

from the interest payment rk, and the wage payment w, and the land rent income $\bar{r}$. We call $y(t,\omega)$ the current income in the sense that it comes from consumers' wages and current earnings from ownership of wealth. The total value of the wealth that a consumer at location ω can sell to purchase goods and to save is equal to $a(t,\omega)$. Here, we assume that selling and buying wealth can be conducted instantaneously without any transaction cost. The disposable income $\hat{y}(t,\omega)$ is then the sum of the current income and the total value of wealth. As we don't take account of possible borrowing, we have:

$$\hat{y}(t,\omega) = y(t,\omega) + v(t,\omega). (13)$$

The disposable income is used for saving and consumption. At time t the consumer has the total amount of income equaling $\hat{y}$ to distribute between consuming and saving.

The budget

At each point in time, the household at location ω distributes the total available budget between housing $l(t,\omega)$, saving $s(t,\omega)$, consumption of industrial goods $c(t,\omega)$, and travelling, $c_T(\omega)$. The total expenditure is:

$$R(t,\omega)l(t,\omega) + c(t,\omega) + s(t,\omega) + c_T(t,\omega), 0 \leq \omega \leq L.$$

The disposable income equals the total expenditure, i.e.

$$R(t,\omega)l(t,\omega) + c(t,\omega) + s(t,\omega) + c_T(\omega) = \hat{y}(t,\omega), 0 \leq \omega \leq L. (14)$$

Insert (11) and (10) in (12):

$$R(t,\omega)l(t,\omega) + c(t,\omega) + s(t,\omega) = \bar{y}(t,\omega), (15)$$

where

$$\bar{y}(t,\omega) \equiv \big(1 + r(t)\big)\bar{k}(t,\omega) + w(t) + \bar{r}(t,\omega) + a(t,\omega) - c_T(t,\omega).$$

Utility, amenity and optimal solution

Consumers make decisions on choice of lot size, consumption level of commodity as well as on how much to save. This study uses the approach to consumers' behavior proposed by Zhang in the early 1990s (Zhang, 1993). This approach makes it possible to solve many national, international, urban, and interregional economic problems, such as growth problems with heterogeneous households, multi-sectors, and preference changes, which are analytically intractable by the traditional approaches in economics. It should also be remarked that in the growth literature, for instance, in the Solow model, the saving is out of the current income y while in this study the saving is out of the disposable income which is dependent both on the current income and wealth. We assume that utility level $U(t,\omega)$ of the household at location ω is dependent on $T(\omega)$, $l(t,\omega)$, $s(t,\omega)$, and $c(t,\omega)$ as follows:

$$U(t,\omega) = \theta(t,\omega)\, T^{\sigma_0}(\omega)\, c^{\xi_0}(t,\omega)\, l^{\eta_0}(t,\omega)\, s^{\lambda_0}(t,\omega), \sigma_0, \xi_0, \eta_0, \lambda_0 > 0, (16)$$

in which σ_0, ξ_0, η_0, and λ_0 are a typical person's elasticity of utility with regard to leisure time, industrial goods, housing, and saving. We call σ_0, ξ_0, η_0, and λ_0 propensities to use leisure time, to consume goods, to consume housing, and to hold wealth, respectively.

In our approach distance from the CBD reflects two elements: the inconvenience of the distance and the value of the amenity of the surrounding area. The urban dynamics is influenced by many changing characteristics of environmental quality such as air quality, levels of noise pollution, open space, and other physical and social neighborhood qualities at each location. Environmental quality can be reflected in part by its effect on the location choice of the individual. Many kinds of externalities may exist at any location. Some may be historically given, such as historical buildings and climate; others such as noise and cleanness, may be endogenously determined by the location of residents. Households may prefer a low-density residential area to a high one, as there tend to have more green, less noise, more cleanness and more safety in a low-density area. Nevertheless, there are other factors, such as social interactions, which may make high-density area attractive. Glaeser et al (2001: 27) point out: "Most urban scholars think of cities as offering positive agglomeration benefits in the productive sphere, and as having negative agglomeration effects (or congestion effects) on non-work consumption". Their empirical study demonstrates that high amenity cities grown faster than low amenity cities and that the role of urban density in maintaining urban growth is important. In this study we assume that local amenity is dependent on local residential density. We specify the amenity $\theta(\omega, t)$ at ω as follows:

$$\theta(t, \omega) = \theta_1 n^{\mu}(t, \omega), \theta_1 > 0. (17)$$

The function $\theta(t, \omega)$ implies that the amenity level at location ω is related to the residential density at the location. This specified form is a limited case. Locational amenities or disamenities are not only affected by the residential density at the location. For instance, possible social contacts of any individual are spread over the whole space. For instance, Hoehn et al. (1987) take account of a city-wide amenity in examining wages and prices. Air pollution is not limited to locals.

Maximizing $U(\omega, t)$ subject to the budget constraint (8) yields:

$$l(t, \omega) = \frac{\eta \, \bar{y}(t, \omega)}{R(t, \omega)}, c(t, \omega) = \xi \, \bar{y}(t, \omega), s(t, \omega) = \lambda \, \bar{y}(t, \omega), (18)$$

where

$$\eta \equiv \rho \, \eta_0, \xi = \rho \, \xi_0, \lambda \equiv \rho \, \lambda_0, \frac{1}{\eta_0 + \xi_0 + \lambda_0}.$$

The above equations mean that the housing consumption, consumption of the good and saving are positively proportional to the potential available income.

Equal utility level over the residential area

To determine residential distribution, we require that all the households obtain the same level of utility at any point in time. This also comes out of our assumption that the population is homogeneous, and people can change their residential location freely without any transaction costs and time delay. The conditions that households get the same level of utility at any location at any point is represented by:

$$U(t,\omega_1)=U(t,\omega_2),0\le\omega_1,\omega_2\le L. (19)$$

Here we neglect possible costs for migration.

Wealth accumulation

According to the definition of $s(t,\omega)$, the wealth accumulation of the household at location ω is given by:

$$\dot{v}(t,\omega)=s(t,\omega)-v(t,\omega),0\le\omega\le L. (20)$$

The land market equilibrium

According to the definition the total value of the national land $V(t)$ is:

$$V(t)=\int_0^L p(t,\omega)d\omega\,. (21)$$

The total value of land owned by the population is given by:

$$V^*(t)=\int_0^L n(t,\omega)a(t,\omega)d\omega\,. (22)$$

As the land is privately owned, the two values should equal:

$$\int_0^L n(t,\omega)a(t,\omega)d\omega=\int_0^L p(t,\omega)d\omega\,. (23)$$

The equilibrium for good production and consumption

The total consumption $C(t)$ is given by:

$$C(t) = \int_0^L n(t,\omega)c(t,\omega)d\omega\,.\,(24)$$

Change in physical capital is the national production minus the national consumption and physical depreciation. We have:

$$\dot{K}(t) = F(t) - C(t) - \delta_k K(t).\,(25)$$

All the capital being owned by the population

The total capital stock employed by the production sector is equal to the total wealth owned by all the households. That is:

$$K(t) = \int_0^L n(t,\omega)\bar{k}(t,\omega)d\omega\,.\,(26)$$

We have thus built the dynamic growth model with endogenous spatial distribution of wealth, time, consumption and population, capital accumulation and residential location. From the construction process we see that if we neglect space in our model, the model is similar to the Solow growth model. If we omit wealth accumulation and capital accumulation, the model is similar to the Alonso model. We now examine dynamic properties of the system.

3. THE SPATIAL DYNAMICS

The previous section defines the model with residential structure by integrating the basic ideas in Solow's growth and Alonso's residential models with Zhang's alternative approach to household behavior. This section examines properties of the spatial model. The following lemma provides a computational procedure to plot the motion of the economic system.

Lemma

Assume $c_T = \bar{c}w(t)$, where $\bar{c}$ is a constant. The dynamics of capital stock and the wealth per household, $K(t)$ and $v(t)$, are described by the following two differential equations:

$$\dot{K}(t) = \Omega_1\big(K(t)\big),$$

$$\dot{v}(t) = \Omega_2\big(K(t), v(t)\big), (27)$$

in which Ω_1 and Ω_2 are functions of $K(t)$ and $v(t)$ defined in the appendix. For given $K(t)$ and $v(t)$, we uniquely determine all the other variables by the following procedure: $F(t)$ by (2) → $r(t)$ by (3) → $w(t)$ by (3) → $\tilde{v}(t)$ by (A11) → $K(t)$ by (A14) → $\bar{y}(t)$ by (A4) → $n(0)$ by (A11) → $n(\omega)$ by (A19) → $l(\omega)$ by (4) → $R(t,\omega)$ by (A11) → $p(t,\omega)$ by (5) → $U(t,\omega)$ by (A17) → $C(t)$ by (A13) → $c(t)$ by (18) → $s(t)$ by (18) → $\tilde{r}(t)$ by (A10).

In the lemma $\tilde{v}(t)$ is the total wealth defined by:

$$\tilde{v}(t) \equiv \int_0^L n(t,\omega)v(t,\omega)d\omega.$$

We specify the parameters as follows:

$$\alpha = 0.45, A = 0.8, N = 50, L = 1, T_0 = 1, \delta_k = 0.03, \lambda_0 = 0.8, \sigma_0 = 0.2, \xi_0 = 0.1,$$
$$\eta_0 = 0.02, \bar{c} = 0.01, \theta_1 = 1, \mu = -0.05. (28)$$

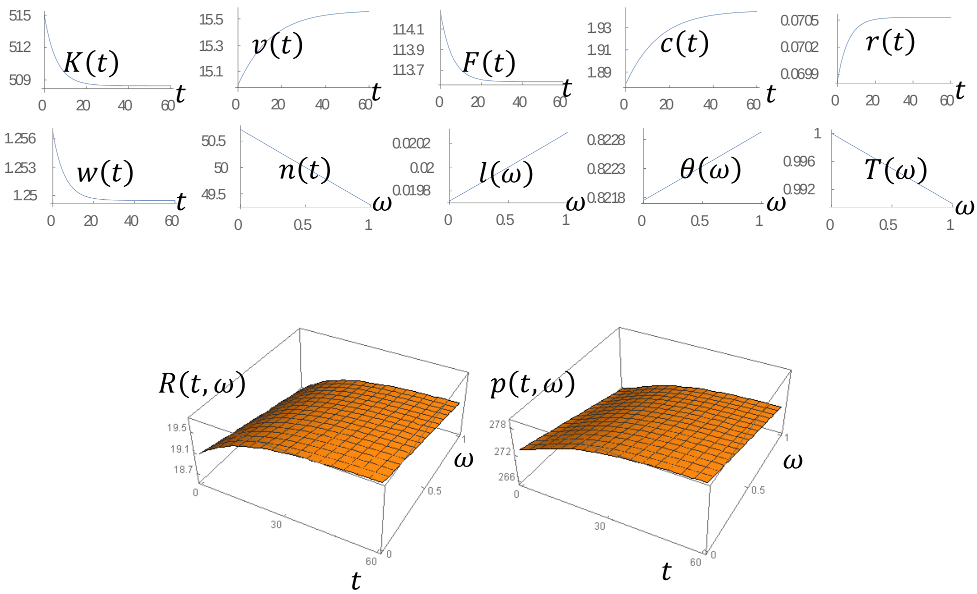
The population is fixed at 50 units and the urban length is fixed at one unit. The total available time for enjoying leisure and commuting is unit. The total factor productivity is specified with $0.8.$ We specify α with $0.45.$ These specifications will not affect our results with regards to comparative dynamic analysis. We assume that the commuting cost is only dependent on the wage and independent of the distance. As shown in the appendix this strict assumption is made only for simplicity of deriving the differential equations. The specified value of c_T implies that one percent of the wage is spent on commuting. The impact of distance on the city structure in the rest of the paper is due to the distance-related amenity and commuting time. The propensities to consume goods and consume housing are respectively specified at 0.1 and $0.02,$ which implies that the expenditures on goods is 5 times as the expenditure on housing. The propensity to use leisure is specified at $0.2.$ The amenity parameter, $\mu,$ is negative. This implies that with all the other conditions equal the household prefers to living in an area with low residential density. We fix the depreciation rate at $0.05.$

We specify the following initial conditions:

$$K(0) = 515, v(0) = 15.$$

Under (28) we plot the variables over time and space in in Figure 1. The national capital stock and national total wealth fall. The total wealth per household rises over time. The total output falls. The wage rate falls, and the rate of interest rises. The household consumes more. The residential density falls, and lot size rises in distance to the CBD. The amenity rises and leisure time falls in distance to the CBD. The land value and rent rise over time at any location and fall in distance at any time.

Figure 1. The Motion of the Economy over Space



4. Comparative Dynamic Analysis

The previous sector studies the equilibrium structure of the economic geography. First, we examine effects of change in the total productivity. We introduce a symbol $\bar{\Delta}x$ to stand for the change rate of the variable x in percentage due to changes in value of a parameter value.

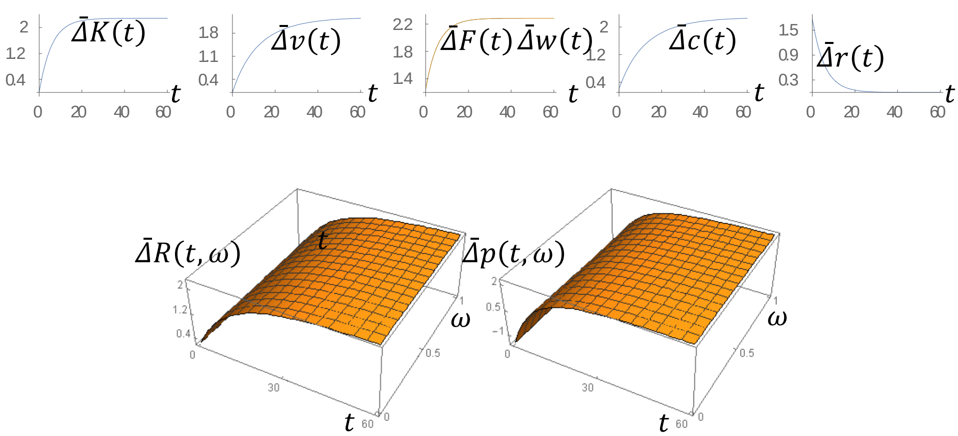
A rise in the total factor productivity

We now allow the total factor productivity to be changed as follows: $A_0: 0.8 \Rightarrow 0.81$. There are no changes in the residential density, the lot size, the amenity, and leisure time as

$$\bar{\Delta}n(\omega) = \bar{\Delta}l(\omega) = \bar{\Delta}\theta(\omega) = \bar{\Delta}T(\omega) = 0.$$

The simulation results on the other variables are plotted in Figure 2. As the productivity is improved, the rate of interest is reduced. The total capital stock, wealth per household, the total output, the wage rate and consumption level per household are increased. The land value and rent are increased over time and space.

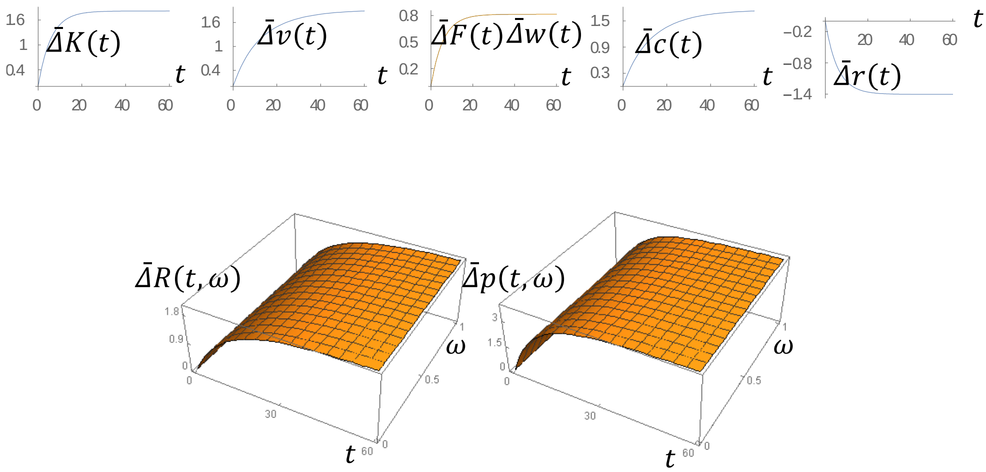
Figure 2. A Rise in the Total Factor Productivity



A rise in the propensity to save

We now examine what happen to the economic system when the propensity to save is changed as follows: $\lambda_0: 0.8 \Rightarrow 0.81$. There are no changes in the residential density, the lot size, the amenity, and leisure time. The simulation results on the other variables are plotted in Figure 3. As the propensity to save is improved, the rate of interest is reduced. The total capital stock, wealth per household, the total output, the wage rate and consumption level per household are increased. The land value and rent are increased over time and space.

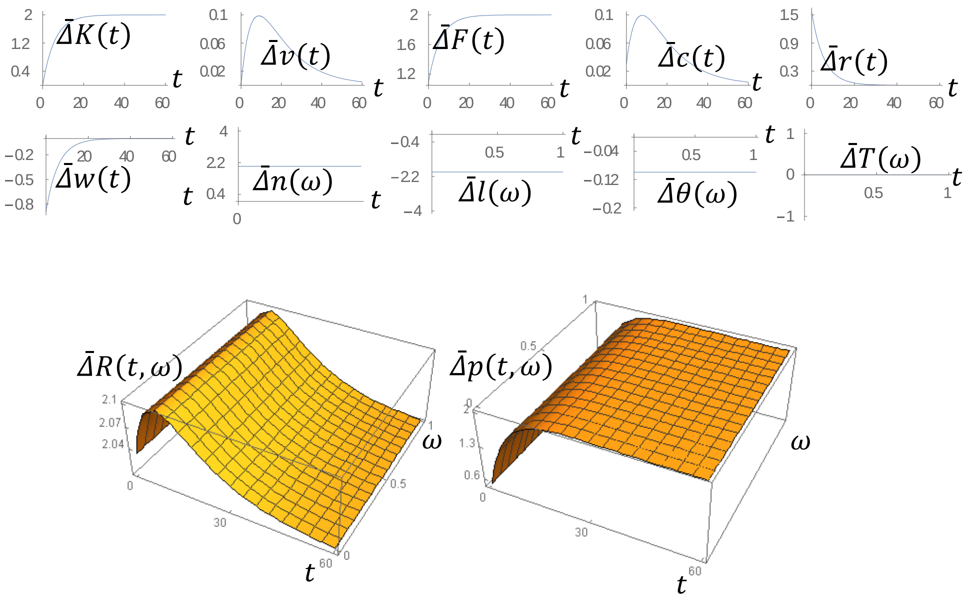
Figure 3. A Rise in the Propensity to Save



A rise in the population

We now examine what happen to the economic system when the population is increased as follows: $N_0 : 50 \Rightarrow 51.$ The simulation results are plotted in Figure 3. The residential density is increased. The lot size and the amenity are reduced at any location. The leisure time is noted affected. The national wealth and output are increased. The total wealth per household is increased. The rate of interest is increased initially and is not affected in the long term. The wage rate is initially reduced and is not affected in the long term. The land value and rent are increased over time and space.

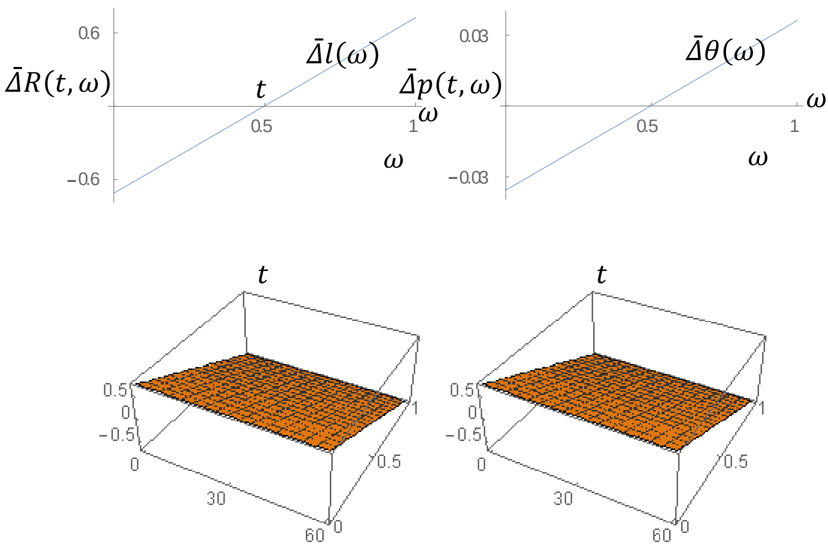
Figure 4. A Rise in the Population



A rise in the propensity to enjoy leisure

We now examine what happen to the economic system when the propensity to enjoy leisure is increased as follows: $\sigma_0: 0.2 \Rightarrow 0.3$. The simulation results are plotted in Figure 5. The lot size and the amenity are reduced near the CBD and are increased far away from the CBD. The residential area becomes denser near the CBD and less dense far away from the CBD as a consequence that people enhance their preference for lot size. The land value and rent are increased near the CBD are increased and the variables are reduced far away from the CBD.

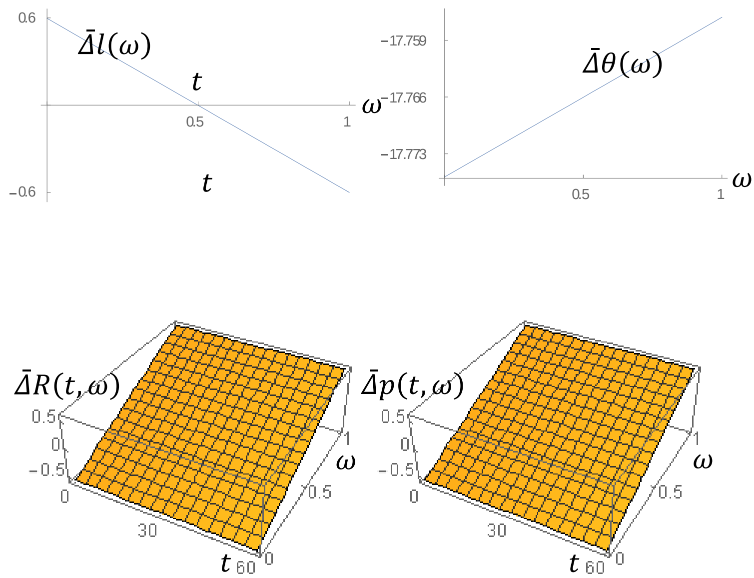
Figure 5. A Rise in the Propensity to Enjoy Leisure



The household disliking more to live in populated areas

We now allow the parameter in the amenity function to be decreased as follows: $\mu: -0.05 \Rightarrow -0.1$. The simulation results are plotted in Figure 6. The lot size is increased near the CBD and reduced far away from the CBD. The amenity is reduced over space. The land value and rent are reduced near the CBD and are increased far away from the CBD. The other variables are not affected.

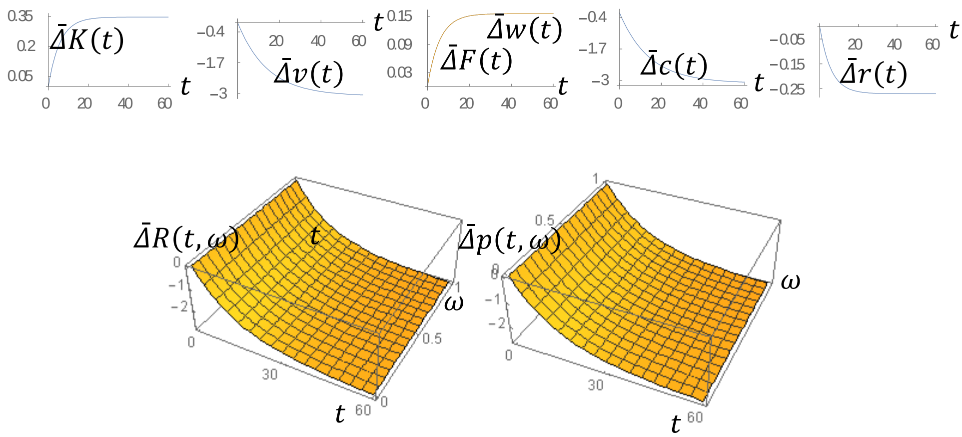
Figure 6. The Households Disliking More to Live in Populated Areas



A rise in the transportation cost

We now examine what happen to the economic system when the transportation cost is increased as follows: $c_T: 0.01 \Rightarrow 0.04.$ The simulation results are plotted in Figure 7. The lot size, the amenity and leisure time are not affected. The national physical capital and output level are enhanced. The wage rate is increased. The total wealth and consumption level per household are reduced. The rate of interest is reduced. The land value and rent are reduced over time and space.

Figure 7. A Rise in the Transportation Cost



5. CONCLUDING REMARKS

This study dealt with economic growth and residential distribution by integrating the Solow growth and Alonso residential distribution model. A unique feature of the study is to endogenously determine land value and rent with interactions between wealth accumulation, amenity, land, and transportation conditions. We built a spatial growth model in which the economic production and growth mechanism are based on the Solow growth model, the residential distribution is based on the Alonso model, the land price is based on Zhang's recent work on economic growth with endogenous land value, and the transportation conditions are exogenous. The economy is isolated and developed along a straight line with unit width. We simulated the motion of the spatial economy over time and space. We also carried out comparative dynamic analysis with regards to the total productivity of the industrial sector, transportation conditions, amenity, and preference on the spatial dynamics. As capital accumulation, residential location and land value are endogenous our study makes it possible to introduce dynamics among transportation systems, land value and rent, economic growth. Although the model is developed with microeconomic foundation and deals with complicated interactions among many variables over time and space, it is based on many strict assumptions. For instance, the travelling cost is not dependent on the distance and we neglect possible congestions. We also neglect inner complexity of the CBD. We have a single type of residents. Economic structure is also oversimplified. It is well-observed that households of different incomes locate their dwellings in different locations. It is possible for us to incorporate multiple income groups within our framework, even though this might cause new analytical difficulties. Many other limitations of the model become apparent in the light of the sophistication of the literature of economic growth theory, regional science and urban economics. Nevertheless, the model makes a unique contribution in the sense that it synthesizes the main ideas in neoclassical growth theory and neoclassical urban economics.

Appendix

From (2) and (3), we have:

$$r(K) = \frac{\alpha\ A\ N^{\beta}}{K^{\beta}} - \delta_k, w(K) = \frac{\beta\ A\ K^{\alpha}}{N^{\alpha}}. \text{(A1)}$$

We omit time variable in expressions, except when it is necessary. Insert (8) and the definition of $\bar{r}(\omega)$ in the definition of $\bar{y}$:

$\bar{y}(\omega) = (1 + r)\bar{k}(\omega) + w + \int_0^L R(\widetilde{\omega})\bar{l}(\omega, \widetilde{\omega})d\widetilde{\omega} + \int_0^L p(\widetilde{\omega})\bar{l}(\omega, \widetilde{\omega})d\widetilde{\omega} - c_T$. (A2)

Insert (5) in (A2)

$$\bar{y}(\omega) = (1 + r)\bar{k}(\omega) + w + (1 + r)\int_0^L p(\widetilde{\omega})\bar{l}(\omega, \widetilde{\omega})d\widetilde{\omega} - c_T. \text{(A3)}$$

Insert (8) and (9) in (A3)

$$\bar{y}(\omega) = (1 + r)v(\omega) + w - c_T. \text{(A4)}$$

From (18) and (A5), we have:

$$R(\omega)l(\omega) = (1 + r)\eta v(\omega) + \eta w - \eta c_T. \text{(A5)}$$

Insert (4) in (A5)

$$R(\omega) = (1 + r)\ \eta\ n(\omega)\ v(\omega) + \eta\ n(\omega)\ w - \eta\ n(\omega)\ c_T. \text{(A6)}$$

Integrate (A4) from 0 to L:

$$\tilde{r} = (1 + r)\eta\tilde{v} + \eta w N - \eta c_T N, \text{(A7)}$$

where we use (11) and

$$\tilde{r} \equiv \int_0^L R(\omega) d\omega \,, \tilde{v} \equiv \int_0^L n(\omega) v(\omega) d\omega.$$

From the definitions of v we have:

$$\tilde{v} = \int_0^L \left(n(\omega)\bar{k}(\omega) + n(\omega)a(\omega) \right) d\omega = K + V^*. \text{(A8)}$$

From (5) we have

$$\tilde{r} = r\, V^*. \text{(A9)}$$

From (8) and (9) we have:

$$\tilde{v} = K + \frac{\tilde{r}}{r}. \text{(A10)}$$

From (A7) and (A10) we solve:

$$\tilde{v}(K) = \hat{r}(r\, K + \eta\, w\, N - \eta\, c_T\, N), \text{(A11)}$$

where

$$\hat{r}(K) = \frac{1}{r - (1 + r)\eta}.$$

From (18) and (A4), we have:

$$c = (1 + r)\xi v + \xi w - \xi c_T, \text{(A12)}$$

Multiplying the two sides of (A10) by n and then integrate the resulted equation from 0 to L:

$$C = (1+r)\xi\,\tilde{v} + \xi\,w\,N - \xi\,c_T\,N. \text{(A13)}$$

Insert (A11) in (23):

$$\dot{K} = \Omega_1(K) \equiv F - (1+r)\xi\,\tilde{v} - \xi\,w\,N + \xi\,c_T\,N - \delta_k\,K. \text{(A14)}$$

As the right-hand side of (A14) contains a single variable, we can solve the equation. In the rest of the appendix we treat $K(t)$ as known.

Insert (18) and (A4) in (20):

$$\dot{v} = \Omega_2(K,v) \equiv -\bar{r}\,v + \lambda\,w - \lambda\,c_T, \text{(A15)}$$

where

$$\bar{r}(K) \equiv 1 - \lambda - \lambda\,r.$$

This is a first-order linear differential equation with non-constant coefficients. Its general solution is given by:

$$v(\omega,t) = \frac{\lambda\int\big(u(t)(w-c_T)\big)dt + C_0}{u(t)}, \text{(A16)}$$

where C_0 is a constant to be determined and

$$u(t) = exp\left(\int \tilde{r}(t)dt\right).$$

Hence, in the rest of the appendix we treat $K(t)$ and $v(\omega,t)$ as known functions of time. Insert (17), (18) and (4) in (16)

$$U(\omega) = \theta_0\, n^{\mu-\eta_0}(\omega)\, T^{\sigma_0}(\omega)\, \bar{y}^{\xi_0+\lambda_0}(\omega). \text{(A17)}$$

where $\theta_0 \equiv \theta_1 \lambda^{\lambda_0} \xi^{\xi_0}$. Insert (A17) in (19)

$$n^{\mu-\eta_0}(\omega)\, T^{\sigma_0}(\omega)\, \bar{y}^{\xi_0+\lambda_0}(\omega) = \hat{n}, 0 \le \omega_1, \omega_2 \le L, \text{(A18)}$$

where

$$\hat{n}(t) = n^{\mu-\eta_0}(0)\, T^{\sigma_0}(0)\, \bar{y}^{\xi_0+\lambda_0}(0).$$

From (A18) we solve

$$n(\omega,t) = n(0,t)\, g(\omega,t), 0 \le \omega_1, \omega_2 \le L, \text{(A19)}$$

where

$$g(\omega,t) \equiv \left(\frac{T^{\sigma_0}(0)\, \bar{y}^{\xi_0+\lambda_0}(0)}{T^{\sigma_0}(\omega)\, \bar{y}^{\xi_0+\lambda_0}(\omega)}\right)^{1/(\mu-\eta_0)}.$$

Insert (A19) in (1)

$$n(0,t) = N\left(\int_0^L g(\omega,t)d\omega\right)^{-1}. \text{(A20)}$$

We can now determine all the variables over time and space by the procedure in the lemma.

REFERENCES

Agell, J. and Edin, P.A. (1990) Marginal Taxes and the Asset Portfolios of Swedish Households. The Scandinavian Journal of Economics 92 (1), 47-64.

Ahlfeldt, G., Redding, S.J., Sturm, D., and Wolf, N. (2015) The Economics of Density: Evidence from the Berlin Wall. Econometrica 83(6), 2127-89.

Albouy, D. and Lue, B. (2015) Driving to Opportunity: Local Rents, Wages, Commuting, and Sub-Metropolitan Quality of Life. Journal of Urban Economics 89, 74-92.

Alonso, W. (1964) Location and Land Use. MA., Cambridge: Harvard University Press.

Anas, A. (1978) Dynamics of Urban Residential Growth. Journal of Urban Economics 5, 66-87.

Anas, A. (1990) Taste Heterogeneity and Urban Spatial Structure: The Logit Model and Monocentric Theory Reconciled. Journal of Urban Economics 28, 318-35.

Anas, A. and Kim, I. (1996) General Equilibrium Models of Polycentric Urban Land Use with Endogenous and Job Agglomeration. Journal of Urban Economics 40(2), 232-56.

Arnott, R.J. (1980) A Simple Urban Growth Model with Durable Housing. Regional Science and Urban Economics 10, 53-76.

Arnott, R., Braid, R., Davidson, R. and Pines, D. (1999) A General Equilibrium Spatial Model of Housing Quality and Quantity. Regional Science and Urban Economics 29, 283-316.

Arnott, F. (2007) Congestion Tolling with Agglomeration Externalities. Journal of Urban Economics 62(2), 187-203.

Beckmann, M.J. (1969) On the Distribution of Urban Rent and Residential Density. Journal of Economic Theory 1, 60-7.

Beckmann, M.J. and Papageorgiou, Y.Y. (1989) Heterogeneous Tastes and Residential Location. Journal of Regional Science 29, 317-23.

Beeson, P. and Eberts, R.W. (1989) Identifying Productivity and Amenity Effects in Interurban Wage Differentials. The Review of Economics and Statistics 71, 443-52.

Brinkman, J.C. (2016) Congestion, Agglomeration, and the Structure of Cities. Journal of Urban Economics 94, 13-31.

Brito, P.M.B. and Pereira, A.M. (2002) Housing and Endogenous Long-Term Growth. Journal of Urban Economics 51, 246-71.

Brueckner, J.K. (1987) The Structure of Urban Equilibria: A Unified Treatment of the Muth-Mills Model. Mills, E.S. (Ed.) Handbook of Regional and Urban Economics, vol. 2. Amsterdam: Elsevier.

Burmeister, E. and Dobell, A.R. (1970) Mathematical Theories of Economic Growth. London: Collier Macmillan Publishers.

Capello, R. and Nijkamp, P. (2004, edited) Urban Dynamics and Growth: Advances in Urban Economics. Amsterdam: Elsevier.

Chen, Y. and Rosenthal, S. (2008) Local Amenities and Life-Cycle Migration: Do People Move for Jobs or Fun? Journal of Urban Economics 64, 519-37.

Cobb-Clark, D. and Hilderbrand, V.A. (2009) The Asset Portfolios of Native-born and Foreign-born Australian Households. Economic Record 85 (268), 46-59.

Davis, M. A., and Heathcote, J. (2007) The Price and Quantity of Residential Land in the United States, Journal of Monetary Economics 54, 2595–620.

De Palma, A., Kilani, M. and Lindsey, R. (2005) Congestion Pricing on a Road Network: A Study Using the Dynamic Equilibrium Simulator METROPOLIS. Transportation Research A 39, 588-611.

Fischer, M.M., Button, K.J. and Nijkamp, P. (1996, edited) Regional Housing and Labour Markets. Cheltenham: Edward Elgar.

Fujita, M. (1989) Urban Economic Theory – Land Use and City Size. Cambridge: Cambridge University Press.

Gabriel, S.A., Mattey, J.P., and Wascher, W.L. (2003) Compensating Differentials and Evolution in the Qaulity-of-Life Among US states. Regional Science and Urban Economics 33, 619-49.

Gaudecker, H. von. (2015) How Does Household Portfolio Diversification Vary with Financial Literacy and Financial Advice? The Journal of Finance 70 (2), 489-507.

Glaeser, E.L. and Gyourko, J. (2005) Urban Decline and Durable Housing. Journal of Political Economy 113, 345-75.

Glaeser, E.L., Kolko, J., and Saiz, A. (2001) Consumer City. Journal of Economic Geography 1, 27-50.

Guiso, L., Haliassos, M., and Jappelli, T. (2002) Household Portfolios. Mass., Boston: MIT Press.

Henderson, J.V. (1985) Economic Theories and Cities. New York: Academic Press.

Henderson, J.V. and Thisse, J.F. (2004, ed.) Handbook of Regional and Urban Economics. Amsterdam: Elsevier.

Hoehn, J.P., Berger, M.C., and Blomquist, G.C. (1987) A Hedonic Model of Interregional Wages, Rents and Amenity Values. Journal of Regional Science 27, 605-20.

Leung, C.K.Y. and Teo, W.L. (2011) Should the Optimal Portfolio Be Region-Specific? A Multi-region Model with Monetary Policy and Asset Price Co-Movements. Regional Science and Urban Economics 41(3), 293-304.

Lin, C.C., Mai, C.C. and Wang, P. (2004) Urban Land Policy and Hosing in an Endogenously Growing Monocentric City. Regional Science and Urban Economics 34, 241-61.

Liu, Z; Wang, P.F., and Zha, T. (2011) Land-Price Dynamics and Macroeconomic Fluctuations. Working Paper, Federal Reserve Bank of Atlanta, No. 2011-11.

Lucas, R.E. (1988) On the Mechanics of Economic Development. Journal of Monetary Economics 22, 3-42.

Lucas, R.E. and Rossi-Hansberg, E. (2002) On the Internal Structure of Cities. Econometrica 70(4), 1445-76.

Mills, E.S. (1967) An Aggregative Model of Resource Allocation in Metropolitan Areas. American Economic Review 57, 197-210.

Muth, R.F. (1969) Cities and Housing. Chicago: University of Chicago Press.

Oates, W.E. (1969) The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Syudy of Tax Capitalization and the Tiebout Hypothesis. Journal of Political Economy 77, 957-71.

Oron, Y., Pines, D. and Sheshinski, E. (1973) Optimum vs Equilibrium Land Use Pattern and Congestion Toll. Bell Journal of Economics and Management Science 4, 619-36.

Rabenau, B.V. (1979) Urban Growth with Agglomeration Economics and Diseconomics. Geographia Polonica 42, 77-90.

Richardson, B.V. (1973) Regional Growth Theory. New York: John Wiley.

Rietveld, P., Button, K. and Nijkamp, P. (2003, edited) Urban Transport. Cheltenham: Edward Elgar.

Roback, J. (1982) Wages, Rents, and the Quality of Life. Journal of Political Economy 90, 1257-78.

Rosen, S. (1979) Wages Based Indexes of Urban Quality of Life. Straszheim, M. and Mieszhowski, M. (Eds.) Current Issues in Urban Economics, Baltimore: John Hopkins University Press.

Sato, Y.H. and Xiao, W. (2015) Land Development, Search Frictions and City Structure. Regional Science and Urban Economics 50, 63-76.

Solow, R. (1956) A Contribution to the Theory of Growth. Quarterly Journal of Economics 70, 65-94.

Solow, R.M. (1973) On Equilibrium Models of Urban Location, in Essays in Modern Economics, edited by Parkin, M. London: Longman.

Solow, R.M. and Vickrey, W.S. (1971) Land Use in a Long Narrow City. Journal of Economic Theory 3, 430-47.

Swan, T.W. (1956) Economic Growth and Capital Accumulation. Economic Record 32, 334-61.

Tabuchi, T. and Thisse, J.F. (2002) Taste Heterogeneity, Labor Mobility and Economic Geography. Journal of Development Economics 69, 155-77.

Tiebout, C.M. (1956) A Pure Theory of Local Expenditures. Journal of Political Economy 64, 416-24.

Train, K. and McFadden, D. (1978) The Goods/Leisure Tradeoff and Disaggregate Work Trip Mode Choice Models. Transportation Research 12, 349-53.

Uhler, R.S. and Gragg, J.G. (1971) The Structure of the Asset Portfolios of Households. The Review of Economic Studies 38 (3), 341-57.

White, M. (1976) Firm Suburbanization and Urban Subcenters. Journal of Urban Economics 3, 323-43.

Yang, H. and Huang, H.J. (2005) Mathematical and Economic Theory of Road Pricing. Amsterdam: Elsevier Science.

Zhang, W.B. (1993) Woman's Labor Participation and Economic Growth - Creativity, Knowledge Utilization and Family Preference. Economics Letters 42, 105-110.

Zhang, W.B. (1993a) Wages, Service Prices and Rent - Urban Division of Labor and Amenities. Seoul Journal of Economics 6, 97-113.

Zhang, W.B. (2002) An Economic Theory of Cities - Spatial Models with Capital, Knowledge, and Structures. Berlin: Springer.

Zhang, W.B. (2008) Growth and Residential Distribution with Economic Structure and Amenity: A Synthesis of Solow-Uzawa's Growth, Alonso's Urban, and Muth's Housing Models. Papers in Regional Science 87, 277-303.

Zhang, W.B. (2016) Gold and Land Prices with Capital Accumulation in an Economy with Industrial and Agricultural Sectors. Annals - Economy Series; Constantin Brancusi University 2016(2), 16-29.

Zhang, W.B. (2018) Growth, Residential Distribution and Endogenous Land Value in an Integrated Solow's Growth and Alonso's Residential Model. Asian Themes in Social Sciences Research 2(1), 23-31.

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Volumen 6
Número 2, abril-junio 2021

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