

JEBI

ISSN 2791-8122

VOLUME: 4

ISSUE: 1

2024

Journal of

**ECONOMICS AND BUSINESS
ISSUES**



JEBI

JOURNAL OF ECONOMICS AND BUSINESS ISSUES

VOLUME: 4
ISSUE: 1
February 2024





Editors

Dr. İbrahim Halil Ekşi - from Turkey

Dr. Dr. Ahmed Bouteska - from Tunisia

Associate Editor

Dr. Nuri Hacıevliyagil - from Turkey

Dr. Dr. Krzysztof Drachal - from Poland

Editorial Board

Dr. Ahmed Bouteska - from Tunisia

Dr. Mosab Tabash - from UAE

Dr. Almir Alihodzic - from Bosnia

Dr. Mustafa Okur - from Turkey

Dr. Carlo D'Ippoliti – from Italy

Dr. Muhammad Ali - from Pakistan

Dr. Gregorio Sánchez Marín – from Spain

Dr. Nuri Hacıevliyagil - from Turkey

Dr. Güler Aras - from Turkey

Dr. Rıza Demirer - from USA

Dr. İbrahim Halil Ekşi - from Turkey

Dr. Roman Ferrer - from Spain

Dr. Krzysztof Drachal - from Poland

Dr. Rovshan Guliev - from Azerbaijan

Dr. Mehmet Balcılar – from Cyprus

Dr. Zekayi Kaya - from Turkey

Dr. Mehmet Akif Destek – from Turkey

Proof Editors

Dr. Haifa Alhamdani

Gamel Issaku



Journal of Economics and Business Issues

February 2024, Volume: 4 Issue: 1

CONTENTS

- Should Economies Restructure Towards Trade?: A Theory for Partial Specialization with Consumption Consistency** 01-39
Todd J. Barry
- Forecasting House Prices in Albania with the Deep Learning LSTM Network** 40-55
Blerina Vika, Ilir Vika
- The Institutional Characteristics of Government Debt Management and Associated Challenges in Georgia** 56-63
Nazira Kakulia, Lasha Kelikhashvili
- Industrial Conflict Management Strategies in the Teaching Service** 64-76
Nneka Daniella Opene
- The Impact of The Hamas-Israel Conflict on Stock Market Indices in the Middle East and Turkey: An Event Study Analysis** 77-85
Necati Altemur, Binali Selman Eren, Süleyman Serdar Karaca
- IAS 29 Financial Reporting Standard in High Inflation Economies: A Hypothetical Study** 86-112
Elif Umut
- Empowering Green Sukuk Through IoE Towards SDGs Attainment** 113-125
Adlin Masood, Norfhadzilahwati Rahim



Should Economies Restructure towards Trade?: A Theory for Partial Specialization with Consumption Consistency

Todd J. Barry ¹

¹ Adjunct Professor with Bowling Green State University, USA, tbarry@bgsu.edu

Abstract: Why should countries trade the amounts, and kinds, of goods that they do, to maximize utility, and should this lead countries to orient their production completely to their trade sectors? This unorthodox, and primary conceptual article, proposes to answer whether or not completely specializing in goods, under Ricardian trade theory, is absolutely necessary. Many graphs are offered, with linear algebra, and equations, for countries to maximize utility. The main finding is that partial specialization can maximize countries' utility, negating the need to restructure solely for one good, industry, or sector. The implications for trade, using the United States as an example, are discussed. Several other original concepts are introduced, including the "box of surety," and the "ray of satisfaction," with the idea that trade should capture the same ratio of goods that consumers prefer domestically- "consumption consistency." Matrix algebra was used, along with general conceptual observations, with the inclusion of how math errors could be made, but future use of Calculus would add to the equational proofs, and, scholars should look for more empirical evidence of partially specialized trade occurring.

Keywords: *international trade; political-economy; restructuring; Ricardian theory; specialization*

JEL Code: F10

1. Introduction:

In 2023, many countries and firms, despite the global Covid-19 pandemic, which has affected supply chains, continue to restructure their economics towards their trade sectors, while other countries are turning inwards. Orthodox economic theory holds, in accordance with the works of early 19th Century British economist David Ricardo (1817), that countries specialize in the one good or industry that they are best at producing, relative to other goods. They then trade with other countries for the goods that the other country is relatively best in producing, for an overall gain. It is an economic theory of relativity, much like that of Einstein's theory for physics, called "comparative advantage" in economics, not to be confused with "competitive advantage," which is a strength that a company has such as a better human resources department than another firm.

To put these ideas into "layperson's" terms for conceptual use, Einstein's theory in physics was, succinctly, that total energy is the largest mass times the speed of light squared, derived from the radioactive decay of carbon, that gravity bends light, and, relevant here, that time is relative to motion. If there were no motion in the universe, then there would be no time- nothing to compare by. Similarly, in economics, the utility (happiness) of each country depends on the productivity of the other.

Citation: Barry, T. J.; (2024). Should Economies Restructure towards Trade?: A Theory for Partial Specialization with Consumption Consistency. *Journal Of Economic and Business Issues*, 4(1), 01-40.

Received: 11/10/2023

Accepted: 29/12/2023

Published: 29/02/2024

N. Gregory Mankiw's (2015) microeconomics textbook has an unusual but modern way of explaining this, comparing the fictional movie character of Forest Gump, from the movie of the same name, to National Football League (NFL) quarterback Tom Brady. If Forest specializes in making money mowing lawns, and Tom Brady specializes in making money from football and advertisements, then they should each work at what they do best, and then trade what they produce, even if Tom Brady may be better at both, called "absolute advantage." But by dividing tasks, like with the division of labor theorized by Adam Smith (1776), they both end up gaining because the rate of exchange, for both, is greater than the relationship of their individual productivity for both occupations (Mankiw, 2015).

Another way of thinking about Ricardo's theories, added later in the late 19th Century neo-classical revolution, by British economist Alfred Marshall and also by the Austrian School of economists, is that countries completely specialize so as to not lose out in the other goods, which are called opportunity costs, and to gain more goods, thus increasing "utility," or happiness. With trade, states reach more goods, and a higher indifference curve of happiness, anywhere upon as such that the consumer is equally as happy between the two goods, as developed first by Edgeworth (1877).

These theories combined have been used by policy-makers to justify economic restructuring towards the trade sector, in favor of certain industries, whether government promoted, or based on entrepreneurial intuition, observation, research, or business deals/proposals. Is complete restructuring, which can cause the loss of countless jobs, and the closing of countless small firms in less productive industries, necessary, given Ricardo's models? And, how much should countries theoretically trade? The hypothesis of this article is that complete specialization is not necessary, using an addendum to Ricardo's theory and a methodology of several graphical models with matrix algebra, and that states maximize happiness by producing and trading to come close to their domestic consumption preference.

Ricardo's trade theory, and these works that followed, are based on the idea that the two countries can trade goods (barter) at a "terms of trade" agreement, which we know from subsequent works, can depend on: how much countries value goods (called "utility"); how large the country is in market power over a smaller country; the relationship between the values of currencies; tariffs; and the overall good's market, that is, if it were a monopolistic market, giving the monopoly state an advantage.

To continue with this brief intro, this terms of trade must be in-between the two countries' opportunity costs, which are more practically the slopes of their production curves, or trade will become unnecessary. However, Ricardo's theory, which has been questioned by scholars over the years for its vast amount of assumptions needing to make the theory true, but who have never found it to be false, unnecessarily posits that the new slope of the terms of trade must be extended from the point of complete specialization. The theory ignores that the new terms of trade can start along any point along the production graph, otherwise known as the production possibilities frontier, with a parallel line to the terms of trade. While this graph can be drawn as curved, due to increasing

opportunity costs, or diminishing marginal productivity, they are drawn here according to the classical models, with straight slopes, for simplicity, in-line with Ricardo, and for making points without referring to Calculus.

It is important to note that most textbooks assume a starting point of consumption along the production curve without an explanation. Instead, this paper assumes, and explains, "consumption consistency," that, for instance, if one country can produce 3 oranges to 1 apple, that it makes sense that the country's citizens will consume 3 oranges to 1 apple; otherwise, why would a country have developed, over time, such a degree of production? Vice-versa, a country's production might have developed over many years in order to meet a countries' consumption preference. Which one of these occurrences that one believes in depends on how one views "Say's Law," that supply creates its own demand, which has long been held to be true in terms of primitive, less developed societies, while the opposite has been the case in more advanced societies that can cater to consumer demands. Regardless, consumption consistency is assumed for where one country starts consumption, and, that it should continue to where a country ends production through trade. If countries prefer a certain ratio of goods domestically, then why should they not prefer the same ratio throughout trade?

All of these assumptions are applied to both complete and partial specialization, with utility assumed to increase as countries trade for more goods, and combination of goods in-between consumption consistency for their two countries; that is, if consumption consistency for both countries is possible if the countries are of very different sizes. Complete specialization does still yield the greatest of all possible gain, as found, measured by the concepts termed here as the "box of surety," and the "ray of satisfaction," which is shown here as yielding the indifference curve which is the highest and is most consistent with consumption preferences of the home country. Nevertheless, potential gains can be made from the partial trading of the specialized goods, and still keep diverse sectors of the economy, and the associated jobs needed, used for producing the other good. Thus, complete restructuring of an economy towards specialization is not entirely necessary for gains in trade, and small businesses should be able to stay afloat in theory. All of these assumptions will be addressed as we go.

1.1. Literature Review:

There is much research on optimal tariffs and trade "policy," but very little on optimal trade "amounts." Most literature on trade involves those who expanded on comparative advantage, such as Hecksher and Ohlin (1919), who showed that countries specialize according to their resources (labor, capital, etc.). Meanwhile, Stolper and Samuelson (1941) showed that specialization causes "winners and losers" amongst industries that produce the resources. Krugman (1981) emphasized that multinational corporations do not always have to abide by the rules of countries, being situated in many countries.

To go back to the 1700s, Hume (1955 edition), before Ricardo, believed that trade benefitted smaller countries more than larger ones because they receive a greater

proportion of goods to their size. Trade helped smaller nations develop with their standard of living, though for large nations, they gained less, but could not be hurt by trade, all called the “importance of being unimportant” (Pressman, 2014, 99). Edgeworth, in the mid-1800’s, developed his famous utility “box” in which, Pressman writes, “[h]e discovered that there is not likely to be just one trading equilibrium point” (Pressman 2014, 99). The country that gained more had the better government which was more skilled at negotiating, that could “more easily do without the good produced by the other country,” or had the most monopolies to charge what they wanted (Pressman 2014, 99). Much depended on the number of firms in each country; countries with many firms, mainly in large nations, would see greater competition, and its firms would benefit less from trade (Pressman 2014, 99). Many authors have written on the “winners and losers” from trade.

Ricardian trade theory is largely a model in favor of free trade, because tariffs raise prices, distort the terms of trade, and favor certain industries over others. Recent work on international trade includes Maneschi (1992) finds empirically that “foreign trade only affects the rate of profit [not productivity] insofar as it leads to the importation of cheaper wage goods.” Siddiqui (NA) writes that historically, productivity [and likely utility, too] under free trade has not risen, and “free trade policy will deepen further the process of uneven development and unequal exchange” across the world, due to the “weak theoretical and empirical grounds” of free trade. In doing so, the “performance of both sectors [industrial and agricultural] could [both] have a long-term impact on ... well-being.” A number of articles within the past several decades have questioned the extent of globalization that the world has moved to. Many books claim that Covid-19 and limited travel (with bans), backed-up ports, and supply chain precautions, have reduced globalism.

Levchenko and Zhang (2014) write that, in an analysis of 72 countries over almost 50 years, “comparative advantage” has been weaker than expected. Trade productivity from technology, as well as the amount of trade itself, has not grown as much as it should have under Ricardian theory. Seretis and Tsaliki (2015) find that countries maintaining absolute advantages in trade (producing both goods at a more productive rate) tend to hold on to these advantages rather than switch to relatively better gains in comparative advantage, in four Euro-zone states, since 1995. The problem, writes Alan Deardorff (1984) is that “the model (Ricardo’s) implies complete specialization in equilibrium... since imported goods will almost never be produced in the importing country.” Such models “explain only the direction of trade, not the quantity of trade” (Deardorff 1984, 473). This is the conceptual goal of this paper. Finally, “partial specialization” appears in newer texts, but it refers to productivity losses in neo-classical models that cause countries to lose comparative advantage, whereas here, comparative advantage does not change. Finally, Peet and Hartwick (2015) criticize Ricardo for not stressing that some specializations arose by goods being backed by wealthy European monarchs, thus leading to income inequality.

2. Materials and Methods:

The methodology of this article will be to first address the many additional assumptions, to those touched upon already, that Ricardian trade makes, and also the

additional assumptions of this article. The article then presents the theory of comparative advantage graphically, and introduces such new concepts as complete specialization, the box of surety, partial specialization, uneven gains, the ray of satisfaction, and partial specialization with the ray of satisfaction. The article builds to the concept of "consumption consistency," which the country starts out with in term of its level of production, and then should continue with trade. This concept was also mentioned in the introduction.

The paper will then apply these concepts to an example using two countries of A and B. It then introduces basic math to find the quantities that balance trade for partial specialization, in the case that countries wish to produce numerous goods rather than entirely those that it is best at. Partial specialization is shown as helpful in reaching final consumption points near the original "rays of satisfaction," thus obtaining "consumption consistency," especially for countries of unequal size. Several more sections and equations are then offered, for finding what are called "exact," "average," "doubled," "balanced," "singular," and "extreme" rays of satisfaction, with "shifts," and "intersections," for partial or complete specialization, to maximize utility. Assumptions are made for productivity losses, and for trading outside of the "boxes of surety." A series of equational steps is then shown to maximize utility, followed by an overall list of steps in whether a country chooses to use complete or partial specialization. This is followed by an extra example for medium-sized countries. Finally, a discussion rolls forth with brief empirical notes about partial specialization and possible countries' losses from trying to restructure to a sole, complete specialization model. Countries can still maintain smaller industries. This part touches on several applied cases of countries and firms, with a section suggesting how future research can build upon the work presented here, and a conclusion summarizing the findings. All of the math work is matrix/linear algebra with simultaneous equations.

2.1. Ricardian Assumptions:

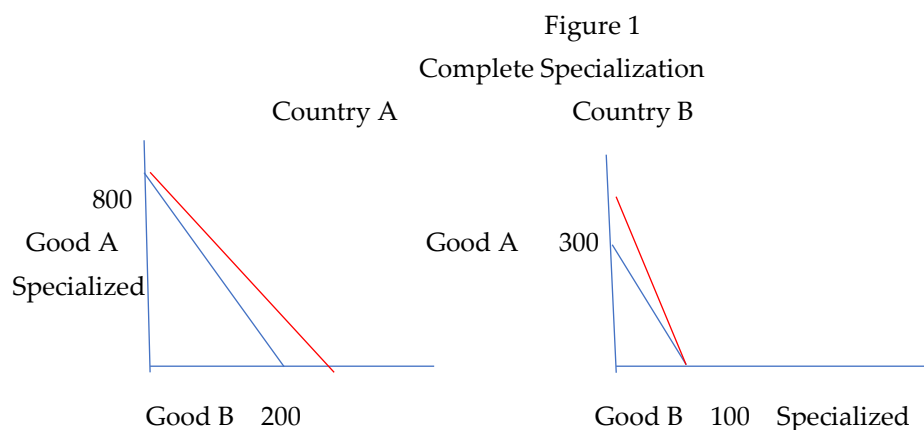
Ricardian theory depends on many assumptions, which will be outlined here, and many will still be used in regards to the theory presented, as well as with the additional, new assumptions of consumption consistency, towards the theory of partial specialization. Ricardian theory, to begin with, assumes a fixed population of labor for all production, and that labor never declines due to frictional, structural, or cyclical unemployment, which would result in a lesser production of one good, or all goods. Furthermore, it assumes that all workers have the skills to switch to complete specialization, such that countries can always produce more goods to trade ("Ricardian Model Assumptions," NA, 1).

Labor is usually the main resource or input in Ricardian models, and not capital, because capital would involve depreciation, as well as diminishing returns, and curvilinear graphs. The theory also assumes that labor by skill is static and that workers do not move to the countries where their skill sets would be more in-line with the goods produced there, which would impact the quantities produced. Another Ricardian

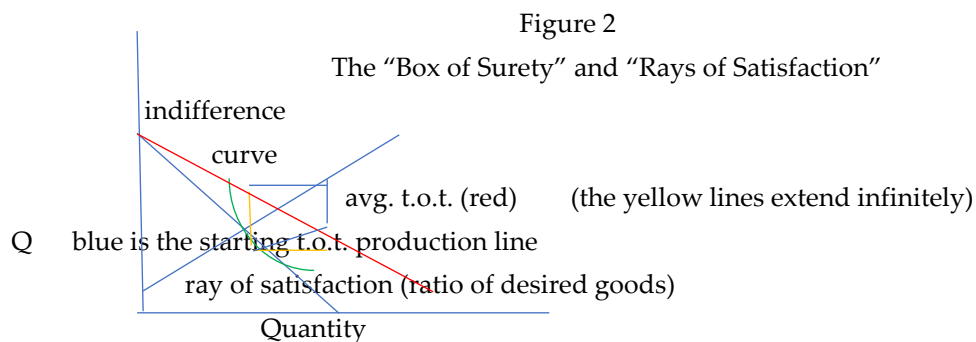
assumption is that perfect competition exists domestically in all factor markets, such that one can always obtain the other resources to produce as many goods as necessary. And, there is no government intervention, an assumption challenged here, and by others, as we know states often help sectors. But specialization, natural or government-led, comes about through, and causes, restructuring.

Ricardian theory also assumes that there are no tariffs, which could affect the terms of trade, as an added price. Further unrealistic is the assumption that trade occurs by barter. In such models, trade could also be expressed with money values, but in exchanging goods, again, trade would depend on the cost of production in the terms of trade- thus, supply. There is nothing else to go by, such as demand. Demand depends on tastes and preferences, which would affect the terms of trade, in how much of the other good one would want, but these tastes are assumed to be the same over time, and typically, there are only two goods assumed to be in the market. It might be possible, though, through very advanced Calculus, to expand to more dimensions of many more goods, with many more gains from trade.

Furthermore, Ricardian models assume that production is efficient with resources, and that production usually falls along the lines of the production curves (PPF's, Production Possibility Frontiers). There are no presumable shifts outward of the curves due to more capital or technological productivity over time (Siddiqui, NA, 1-2). Moreover, the model assumes no transportation costs to ship the products to the other country, which Ricci (1997) found affected the magnitude of trade, though this cost might be included in the terms of trade. While Ricardo did indeed foresee production possibilities with risk, such as if one country had a "shock" or natural disaster, he did not include this possibility into his model of comparative advantage, and it is left out of the models here, though this idea is mentioned. Particularly relevant to this article, the work assumes that domestic preferences will stay the same with trade- that consumer's preferences will not change over time. With preferences, the paper also assumes that domestic production is in-line with domestic consumption, or the reverse- "consumption consistency"- and that this preference continues throughout trade. Finally, the model is pre-neoclassical- it is simplified and does not account for diminishing returns to scale, which would make the lines curved and more complex to calculate, which is left for others.



Here, we build to the final theory with original graphs. The opening up of trade (in red) gives the countries involved a chance to consume at a different rate, or slope, in the trade-off between goods, which is the terms of trade line, and is in-between the two countries opportunity costs ($1/4$ and $1/3$) of the comparatively advantaged goods. Otherwise, the purpose of trade in at least one country would be obviated and production and consumption would continue unchanged. Pre-neo-classical times, opportunity costs stay constant. This 3.5 terms of trade (t.o.t.) is the red line above (Figure 1). Complete specialization would mean making 800 and 100 goods, respectively, for countries A and B.

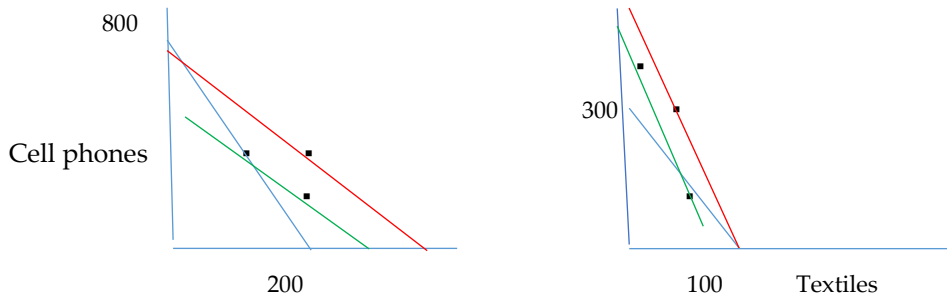


Countries are assumed to continue to consume the same ratio, where the ray of satisfaction (a preference ratio), called by Schotter (2009, 68) the "Income Expansion Path," but hereafter simply called "rays," intersect the red production line, which is consumption after trade. Although it is not absolutely necessary to assume consumption consistency in order to create the theory of partial specialization, this assumption nonetheless helps to develop a closer-to-accurate model, and later is used in the examples to better illustrate the concept of finding maximization for partially specializing. The green "indifference curve" in Figure 2 comes from Edgeworth and indicates that points on the curve, which are tangent to the production lines, represent equal utility to the consumer. To ensure that the indifference curve has increased (equal satisfaction with the two goods), the curve either must increase vertically, to gain more of one of good, horizontally, to gain more of the other good. Or, it must have increased in some combination of the yellow box (the box of "surety") (Figure 2 and Figure 4), beyond the original point of domestic production and consumption. Here, one can be fairly sure happiness is stable: there is either a gain in one good with no loss to the other (for either good), or some mixture inside the box.

Utility gains outside of the "box of surety" are still possible, but not guaranteed. If, in the case of the downward production slope is steeper than 1, then a country will lose utility as the box extends rightward, but gain if the slope is less steep than 1, with steepness being known as "elasticity." Even so, one cannot be sure about maximizing utility, because all one has to go by is the total quantity of goods, and not the mix, and one is assuming that consumption in a country can be aggregated when consumers have different preferences, as questioned by Arrow (1951). With trade, the terms of trade (t.o.t.) causes a movement towards the less specialized good, such as from a bad trade deal. In this case, the ray of satisfaction continues at a rate unchanged, all of the way to the right until an infinitely beneficial terms of trade is reached. At this point, the country has

maintained the same amount of the specialized good, and increased substantially the unspecialized good traded for. Here, "t.o.t." are an average: 3.5.

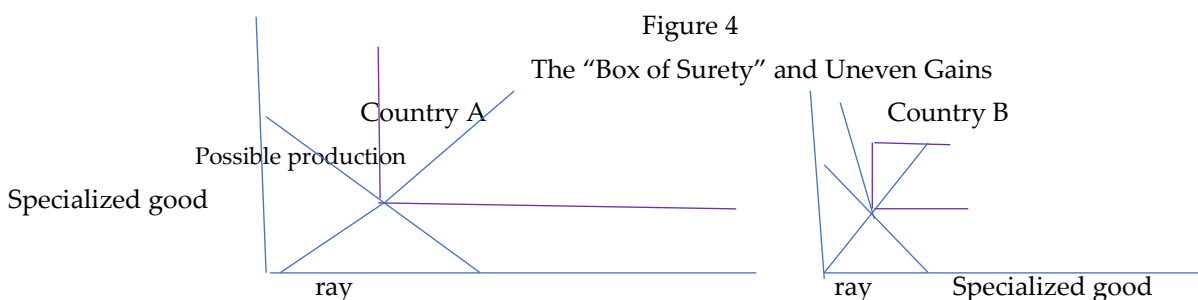
Figure 3
Partial Specialization



The country on the left has the comparative advantage in producing cell phones, since it gives up $\frac{1}{4}$ textiles, while the country on the right has the comparative advantage in producing textiles, since it gives up more, $\frac{1}{3}$, to produce cell phones. One can see, on the left (Figure 3), that partial specialization (given in green) results in a parallel terms of trade line, but from the point of production nearer to the domestic economy, and not from complete specialization at a point of 800 cell phones. There still is an increase in the number of goods that are able to be consumed (textiles), although the number of cell phones has gone down. Whether or not there are more textiles than under complete specialization depends on the specific details of the problem, that is, the terms of trade and the amount of goods traded, which will be addressed later. And, of course, we are assuming that the terms of trade do not change drastically whether a country uses complete or partial specializing, so trade is still acceptable to both countries, and still balances. Regardless, there is a gain in the goods which the country is lacking in (textiles), so if there is a strong demand for these goods, then, despite the loss in cell phones, partial specialization has still fulfilled its purpose. The country gains without having to completely restructure its economy, through business deals or state policy, towards complete specialization.

To reduce risk, the country can also diversify its production. Diversification prevents against calamities that could be associated with producing only one type of good. This echoes the findings of Barry (2020) and others, who, interestingly, found that larger nations tend to be the ones able to take on the risks of specializing. Smaller GDP countries are more prevalently tending towards diversification.

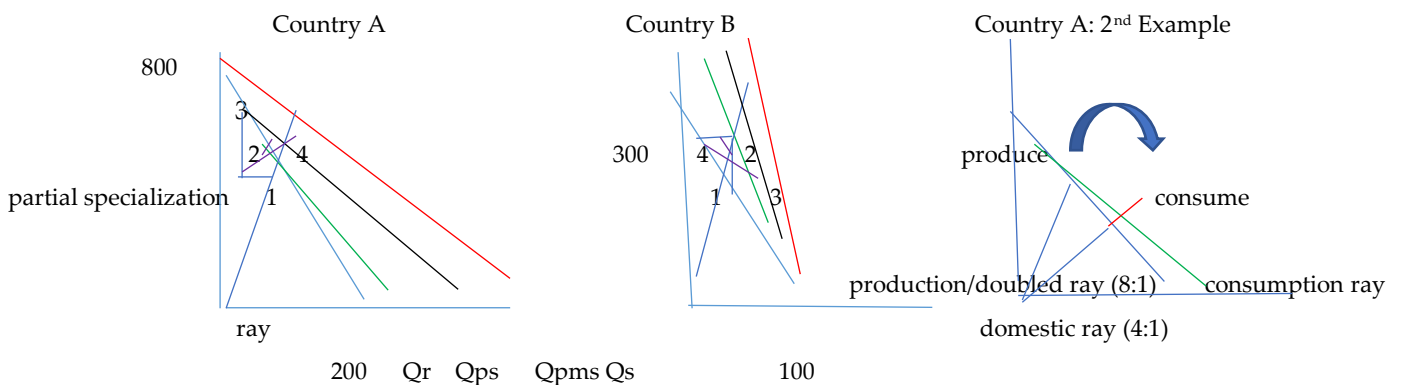
Figure 4
The "Box of Surety" and Uneven Gains



Trade usually causes a gain, and an overall increase in production, more-so to the specialized goods, which are the most traded. It is assumed here, though, that the original ratio of goods consumed continues. Trade results in consumption that is consistent with domestic consumers. This ratio is represented by the ray of satisfaction, if one were to extend it from the origin (Figures 4 and 5).

Figure 5

Partial Specialization (more shifted) with the Ray of Satisfaction



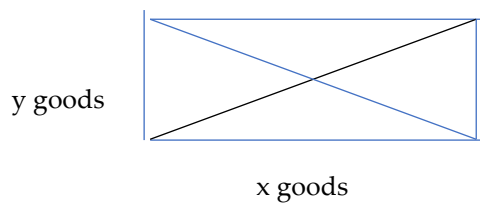
Qr= quantity regular, Qps= partially shifted, Qpms= partially more shifted, Qs= specialized

Most textbooks on international trade simply assume the starting point of domestic production and consumption, as well as the quantity of the amount of goods traded (although they are indeed at a specific ratio: the terms of trade). They also assume the terms of trade, themselves, so long as the terms of trade are between the two opportunity costs. Similarly, this paper will also assume the terms of trade, though it is likely that the larger country can assert more power over it. Also, complete specializing may result in more goods after trade necessary to satisfy domestic customers. Partial specialization is better geared towards meeting consumer’s needs. But, this does not always occur for both countries at the same time. In line with Barry (2018), this section of the paper makes a case that countries will attempt to trade the number of products closest to maintaining the same utility relationship in domestic consumption (and adjust production), that exists prior to trade- “consumption consistency.” This, one should assume, should render a finish point after trade which is close to domestic production, and is not just randomly assumed. One consumes more of the good that you can produce domestically, and less of the one that you cannot, with trade resulting in *more* goods overall.

In Figure 5, if a country truly desires a good, it will sacrifice its terms of trade, and greater quantities of goods, to maintain the right mix. To do so, however, trade (whether complete or partial) will result in more of the non-specialized good. Therefore, domestic production (Qms- “more shifted”) of the country in partially specialized trade must, in the left-hand of Figure 5, shift away from consumption and slightly closer towards the specialized good, to trade. Thus, on the left graph, domestic production moves from point 1, to point 2 (the box is not shown), which is bypassed (its box-of-surety bifurcating

ray does not connect with the original ray) because the terms of trade would yield less of the desirable good. This results in production at point 3, which, with the new, bifurcating ray at 45 degrees (the mid-point, assuming the two goods maximize utility in trade; see Figure 6). Final consumption occurs at point 4, consistent with domestic production. Through the concentric triangles (or “boxes of surety”), the same mix of goods is maintained. However, on the far right, a more simple view is shown: consumption consistency is from the original domestic production ray, and final consumption extends from here (in red). This fewer-step-method is this paper’s approach. One can see on the left-hand graph that the movement from trade is almost always down, towards the non-specialized good, while with the middle graph, the movement is usually upwards, towards the non-specialized good.

Figure 6
Bifurcation Maximizes Utility



In leading up to the examples, the final, basic graph (Figure 6), shows that a ray of satisfaction which bifurcates the production line leads to the greatest area underneath it. This ray yields utility maximization, which will be discussed more later on. If the production line were steeper, then a ray with greater upward slope would be used, and with a steeper production line were flatter, than a flatter ray would be used to maximize utility, which will we see in examples later in this paper. Now, we turn to examples, showing that complete specialization might be unnecessary to maximize utility, if a country chooses to partially specialize. Finding the right (utility-maximizing) ray is essential to determine the finishing points after trade, and therefore the trade amounts themselves, but trade must still balance, as the finish points must be on the curves where the rays intersect the production lines (also called curves).

2.2. Examples Using Matrix Algebra:

The works of Salvatore (1996), Grieco and Ikenberry (2003), Sawyer and Sprinkle (2009), and Kreinin (2010), all assume, with no ostensible reason given, the amount of goods traded and the terms of trade. The following identities (Equations) in 6b can be used to determine the amount of goods traded by both countries in order to maintain Country A’s consumer preference ratio, which, in this example is 4:1. The same ratio must be used initially in Country B’s equations; more will be explained. Thus, while some countries influence the terms of trade by the situations already discussed, they may also influence the amount of goods traded, such that the consumers in only one country’s happiness is “consumption consistent.” However, striving for this ratio could possibly

3.1. Initial Equations- Partial Specialization Starting with Country A:

The following equations show, roughly, how a country can pinpoint an ending point, after trade, and therefore how much to produce before trade, using partial specialization. In Figure 7 (above), the blue line rays of satisfaction are before trade. The red production possibility frontiers are consumption after production have shifted towards trade, then after trade has occurred, and the black production possibility frontiers (partially-specialized), starting before after production has shifted, and end “after trade.” Country A produces at the maximum (“end”) points of the y and x graphs (800y and 300x with complete specialization, and at the intersection of the black and red lines with partial specializing) before trading. The small countries production must change from a constant of 300 to a constant of 350 with specialization. But, because A starts at a certain chosen point, then the percent of goods that Country A decides to “shift” in not producing specialized goods affects the percentage “shift” in Country B. This results in both being able to obtain more non-specialized goods. Since Country A “shifts” 3.125 % ((800-775)/800), then Country B might shift as well, but this is pinpointed later on in the paper. Below, when there are spaces with x, x is a variable, and when there are not, x represents multiplication.

Equilibrium for partial specialization given country A’s chosen starting point (based on how much it decides to restructure towards the “end,” or maximum amounts, before trading):

Slopes, or rays, of 4 and 3:

Country A and B: $\frac{y_2 - y_1}{x_2 - x_1}$ = slope, which are more properly described at the bottom of Fig. 6.

1a]

$\text{Countrya:ystart} - \text{Countryb:ytraded} \times \text{terms of trade} =$	$\text{Countryb:xtraded} \times \text{terms of trade} + \text{Countryb:ystart} =$ <u>4</u>
$\text{Countrya:xstart} + \text{Countryb:xtraded}$	Countrya:xtraded (from left-hand equations)

Countryb:ytraded must be > than Countrya:start

Countrya:xstart + Countryb:xtraded must be > that Countrya:xstart

3.2. Initial Equations- Starting with Country B:

1b]

$\text{CountryBystart} + \text{xtraded} \times \text{terms of trade} =$	$\frac{\text{CountryAystart} - \text{CountryByfinish}}{\text{y traded [or CountryAxstart} + \text{xtraded}]}$ = <u>3</u>
$\text{CountryBxstart} - \text{CountryBxtraded}$	

Countryb:ytraded must be > than Countrya:start

Countrya:xstart + Countryb:xtraded must be > that Countrya:xstart

Given the terms of trade: the lesser the terms of trade, the greater the utility gain for the smaller country, with the steeper production line, which will also be shown throughout this article.

3.3. Partial Specialization Math Example, for Country A:

Proof of Theorem for Equations 1a] and 1b]

Country A: given (50, 600):

From restructuring: the black line, to reach equilibrium.

$\frac{600 - y(\text{given}) \times 3.5}{50 + y} = 412/103.75 = 4$ and from simple restructuring (moving along the blue *crescent*), or "arc," rather than having to completely reorient its economy to the specialized good: $y = 800 - (3.5 \times 103.6) = 110.7 \times$

Country B

When $x = 100$, $y = 0$, so $y = 350 - 3.5x$

$\frac{x_{\text{traded}} \times 3.5 + y_{\text{start}}}{x_{\text{traded}}} = 4$ (the slope of the ray of satisfaction for Country A)
 $x_{\text{traded}} = 53.7$

$\frac{53.75(3.5) + y}{53.7} = 4$ (the slope of the ray of satisfaction for Country A)
 $y = 27$

$27 = 300 - 3x$, $x = 91$

After trading:

$x = 91 - 53.35 = 37.25$

$y = 350 - (37.25)3.5 = 219.6$

□

OR, choosing any starting point:

With an x or abbreviated (partially specialized) y start:

For Country A: $[y \text{ starting point} + 3.5 \text{ times } x \text{ start}] = 775$

With a y start, using a matrix:

Simultaneous equations at black line domestic production:

$y = 775 \text{ (calculated)} - 3.5x$

$y = 4x$

For Country B: with an abbreviated (partially specialized) x start:

$x \text{ starting point (assumed to be 0 here)} + (y \text{ start}/3.5)$

$x \text{ times } 3.5 = (y \text{ maximum/end} - \text{shift})$

Simultaneous equations at black line domestic production:

$Y - (y \text{ maximum/end} - \text{shift}) - 3.5x$

$y = 3x$

3.4. Partial Specialization Math Example, for Country B:

-continued

$$\frac{27 + (37.9 \times 3.5)}{91 - 37.9} = \frac{(600 - 219.6 - 27) \text{ (calculated)} - 132.65}{37.9 \times 3.5} = \underline{\underline{3}}$$

There is statistical discrepancy from rounding, and from the equations needing more refinement and less estimation, which will be shown later. Throughout this paper, we will look for more elegant and convenient ways of using math so that countries' finish points (after trade) come closer to their starting points (before trade) at their initial "rays of satisfaction" for "consumption consistency." Again, the *blue crescent* (or "arc") for Country A in Figure 7 simply compares points with greater specialization to points from partial specialization. It may not be necessary for Country A's economy to completely restructure towards the y good before trading, as it can use partial specialization, and then simply expand production of its x good slightly to obtain the desired ray of satisfaction.

3.5. Further Results- Utility Maximization:

We now attempt to find the utility maximization for rays of satisfaction with trade that benefits both countries, and is close to their initial rays of satisfaction. Again, this is so as to maintain consumption consistency, and it is for either partial or complete specialization: the two types of trade are addressed together in this section, for brevity, as the assumptions are the same for each.

A general observation is that a one-country shift in the starting ray of satisfaction will double the other country's ending ray of satisfaction, because the other country needs to supply both countries with enough goods. Thus, the first step in maximizing utility, if individual "exact" rays are not possible (4 and 3), which they are not, using the math, then one's next step should be to look for such a "doubled" ray, which is the smaller country's ray doubled in order to satisfy itself as well as the other country.

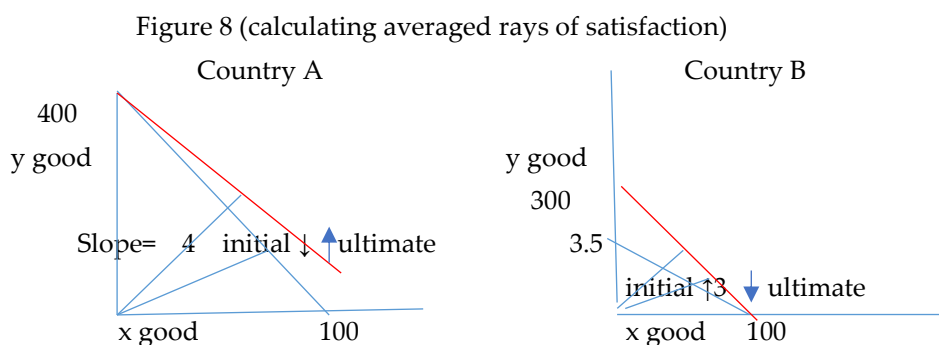
In the previous example, in trying to solve for Country A's "exact" ray, an initial slope of 4 had to be used for both countries, to start. This was to ensure that the ending points fell on the graphs for both countries, simultaneously, with the desired amount of trade. When starting with Country B, we used the number 3 in the example, for the slope of Country B's ray. In this case, trade more greatly benefitted this country. The ray could not have been 3.5, due to the "limits." Country B is too small to satisfy Country A. Also, the "exact" rays cannot work for both countries simultaneously with complete specialization. Thus, one would turn to a "doubled" ray, followed later on by seeking an

“average” ray. Points closest to the rays of satisfaction, as we will see, are usually “pulled” by the larger country (see the directional lines). An “average” ray of $[3$ (initial slope of A + initial slope of B)/2, in this case $(4+3)/2 = 3.5$ of the ray values, could be taken between the two countries. This ray would increase utility (see the math later on), other than with using the exact rays themselves. Still, the rays must yield points which fall on the production curves with the desired, balancing amounts of trade.

Consider a simpler example, using Figure 8, which has the same slopes as before. Country A is smaller, so Country B is indeed able to completely satisfy it through trade. While 3.5 of a slope of both rays of satisfaction would be the maximum utility (shown further ahead with math), the “exact” values for x and y on the red lines are not possible through trade. Again, the countries are different sizes, and need a “doubled” ray. Countries, though, might still trade to be *near* these spots if they are willing to sacrifice some goods. Countries close in size will trade better than those that greatly differ, because the trade will better match consumer preferences. This is conceivably why large nations like the United States, China, Germany, and Japan trade heavily with each other today, rather than more-so with smaller states, and smaller, developing states on the whole tend to trade more amongst themselves.

3.6. The Ray of Satisfaction Used in Production:

In this smaller example, the exact rays: $(46.15, 138.9)$ $(68.5, 224)$, and “doubled” rays: $(32.5, 189.5)$ $(68.5, 274)$ do not allow for the desired, balanced amount of trade for both countries.



In Figure 8, maximization of utility occurs at the “exact” rays where they are 4 and 3 for countries A and B, but this is not possible with complete specialization. A “doubled” ray also does not fit on the curve. These are both determined with simultaneous equations. It is hypothesized from conceptual, mathematical observation that the next possible maximization between the points of 4 and 3 occurs at $(4+3)/2 = 3.5$, an “average” ray. By not meeting the “exact” rays, the larger country and smaller country both may lose domestic consumers by producing more goods that they do not prefer. But, the goal, specified earlier on, is to come as close as possible with the rays to domestic consumption. And, the “average” ray is the same slope as the terms of trade. So, the average ray bifurcates the new, red curve. For this next option of using “average” rays, total utility is

increased. Both countries “initially” try to move to this 3.5 average ray. However, instead, they gravitate towards their initial rays, because these rays are “exact.” Still, as the average ray becomes smaller, the larger nation gains more, but as the ray becomes larger, the small nation gains more, shown in the math work that follows, in 6h.

In the math work below, maximization of utility is assumed to be x times y , as according to Edgeworth, the area beneath a curve. We search for a ray between 3 and 4 that would balance overall utility. Utility is usually assumed to be measured by the area within the indifference curves. But, the slope of these curves is unknown here, and making an assumption would involve more complex Calculus that is beyond the scope of this research. The totaled numbers below are farther away from the small country’s starting utility, meaning that it has benefitted more proportionately. Yet, both countries benefit from trade reaching a higher indifference curve, whereby there are more goods.

The math that follows first shows utility being calculated, and then shows that because 3.5 does not fall on both countries’ red line production curves simultaneously. Therefore, it is necessary to find a “balanced” ray of satisfaction, which results in rays of 3.73 and 3.27. This math generally corresponds with the math that follows using equation [4a and 4b for the larger country example. These points yield the next most utility, barring any losses from moving out of the “box of surety.” Such losses are shown later in Table 1. Potentially, indifference curves may fall outside of the “boxes of surety,” which requires more assumptions, shown later on. Using the outer rays of 4 and 3, or 3 and 4, for either country, does not yield higher utility than 3.5. At some point of applying the rays, only losses would occur, because the points would be outside of the “boxes of surety,” or, outside the maximum of goods’ “limits,” unless these assumptions were set aside. As already stated, if countries produce in expectation of trading, and less, or no, trading occurs, then there will be a loss to the utility of domestic consumers.

3.7. Maximizing Utility, using the same, small countries example:

Proof of Theorem of Average Rays		
Start of production: (with the numbers all roughly rounded)		
<i>Country A</i>		
Rays of Satisfaction	(added vertically)	
4	3.5	3
$Y = 800 - 3.5x$		
$Y = 4x$	$y = 3.5x$	$y = 3x$
$7.5x = 800$	$7x = 800$	$6.5x = 800$
$y = 4x$		
x time y for the area of the box;		
106.4 x 425.6	114.28 x 400	123.07 x 369.2
+	+	+

Using the theory of an average ray:

$$(C + D)/2 = 3.5$$

$$C + 4/3.5 C = 7$$

$$2.14 C = 7$$

$$C = 3.27$$

$$D + 3.5/4 D = 7$$

$$D = 3.73$$

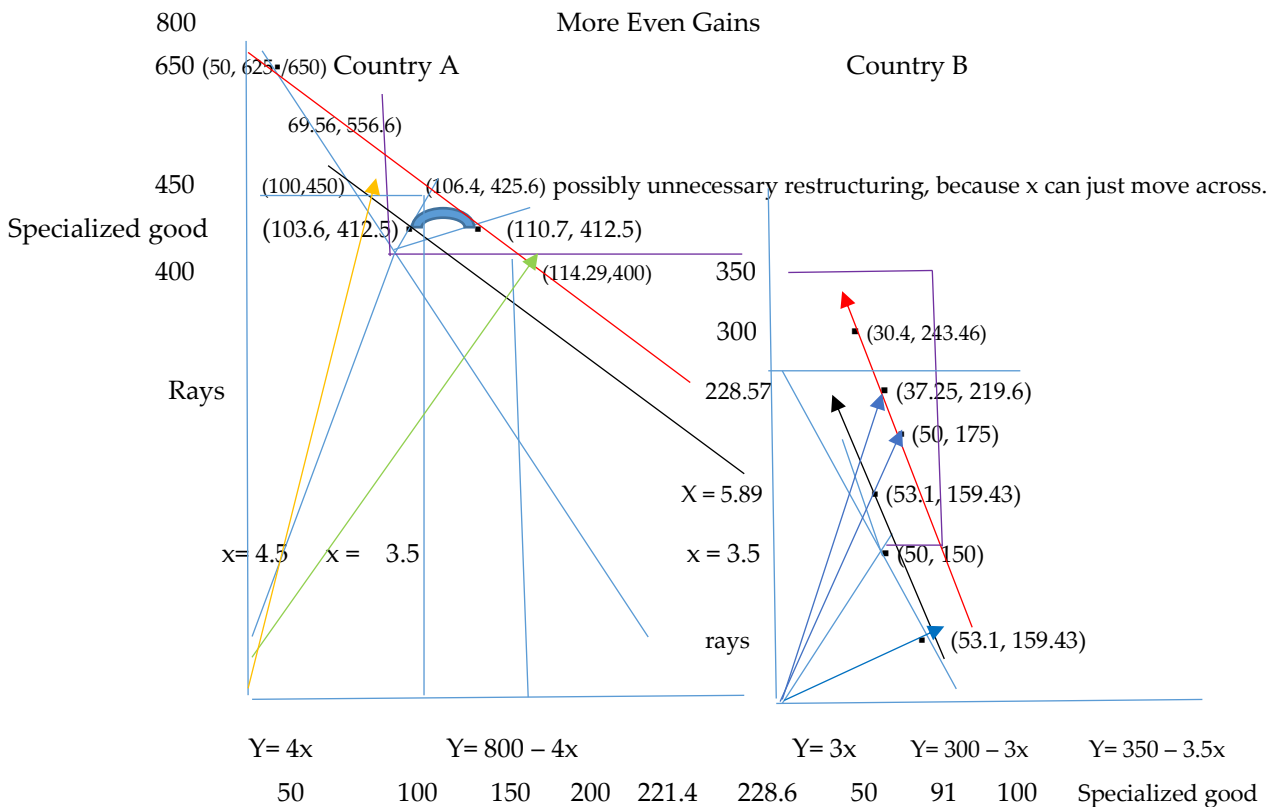
The values above fall on the curve:

(59, 192.93) - The large country: gains 59x, sells 206y

(41, 156.8) - The small country: produces 100x, sells 59 for 206y.

3.9. Finding "Balanced" Rays with Figure 7, and Figure 9 Below:

Figure 9 (not to exact scale)



3.10. Figure 7 and Figure 9- "Average" and "Balanced" Rays Math:

In Figure 7 earlier, and Figure 9 directly above (which shows all of the points we have, and will, discuss) with the 3.5 slope of the terms of trade, "exact" and "doubled" rays are not possible. Then, a bifurcation, with an "average" ray of satisfaction of 3.5, will

give the greatest overall utility. This is in keeping with the original domestic preferences and staying within the “boxes of surety.” And, the points derived must fall on the red lines of trade. If one chooses a different starting point (with partial specialization), using the black line, then these points will be different and a different ray of satisfaction might be needed. This is needed in order to have ending points that are possible with the starting amounts. As stated, “exact” and “doubled” rays are not possible, and an average, 3.5 ray, being the “average” between the original two rays of satisfaction, does not yield points which fall on both curves simultaneously. Then, a “balanced” ray would be the next step in providing each country with maximized utility, along with the example presented with Figure 8. Via these line, if this does not yield points on the curves, then proceed (see Table 4 later on) to find a “singular” ray, discussed next.

Before finding a “singular” ray, the math for a “balanced” ray for Figures 7 and 9 is shown below. Since the balanced ray is not possible, then ultimately take “singular” rays (see ahead). Or, if not possible, then “extreme” rays might be necessary, which are shown by the yellow and green lines within Country A that the small country, Country B, must meet in order to satisfy it, in Figure 9. Exact rays with slopes of 3.5 do not fall on both curves concurrently, so, as stated, first look for a “balanced” ray:

Proof of Theorem of Balanced Rays

$Y = 800 - 4x$ $Y = 3.5x$ ray of satisfaction
$Y = 300 - 3x$ $Y = 3.5x$
Using simultaneous equations: $x = 114.29, y = 400$ $x = 46.15, y = 161.54$

For Figure 7, and Figure 9, using the math below, a “balance” of the rays would result is a ray of 4.87 and 2.13, but the smaller country cannot provide the larger country enough x goods, without “abbreviated starts” - that is, assuming a starting point closer to the center of the graph, explained further in section 3.15.

These balanced rays can be determined by the following equation, which is derived from the math work in this “Finding Balanced Rays” section, where t.o.t. is, again, the terms of trade:

$$4a) \text{ Country A ray} = (A \text{ t.o.t.} + B \text{ t.o.t.}) / [(slope A/slope B) + 1] = 7 / [(800/350) + 1] = 2.13$$

$$4b) \text{ Country B ray} = (B \text{ t.o.t.} + A \text{ t.o.t.}) / [(slope B/slope A) + 1] = 7 / (350/800) + 1] = 4.87$$

These equations consider only the slopes of the original production equations, and not the constants in the production equations. Then, the resulting slopes for the utility-maximizing rays of satisfaction do not fall on the original curves, since the smaller country cannot satisfy the larger. Via the observations made here, the next step should be to find an "equal," or here-called, "singular" ray. This step would be to seek points that fit on the production curves of both countries, to maximize utility.

3.11. Finding "Singular" Rays:

Figure 10 that follows shows utility based on x times y . To maximize overall utility at this point, from observation, it becomes necessary to use "singular" rays, which will be shown with math that follows about maximization. In calculating these rays, they do not always fall directly between the two countries initial rays of satisfaction, because the trading countries are different sizes.

Using Figure 7 (and later Figure 9) to obtain the same ray for both graphs, as an example, then they balance at a ray of 8, and for Figure 8 earlier, at a ray of 4. Both of these numbers can be obtained by dividing the outermost y value for the larger country by the outermost value of x for the smaller country, or: $800/100= 8$, and $400/100= 4$. Therefore, to find a "singular" ray:

5] The equation here is: (total productivity of the larger country y / total production of small country x).

For the value 8, this results in the points of (69.456, 556.54) and (30.44, 243.46) in Fig. 7. The math showing the more elegant derivation for the 4 unit is shown below:

Proof of Theorem for Equations 4] and 5]

$$Bx = 100 - Ax$$

$$400 / (3.5 + ray) = Ax$$

$$350 / (3.5 + ray) = Bx = 1 - Ax$$

$$400 = 3.5 Ax + A x ray$$

$$350 = 350 - 3.5Ax + 100ray - Axray$$

Adding these two equations

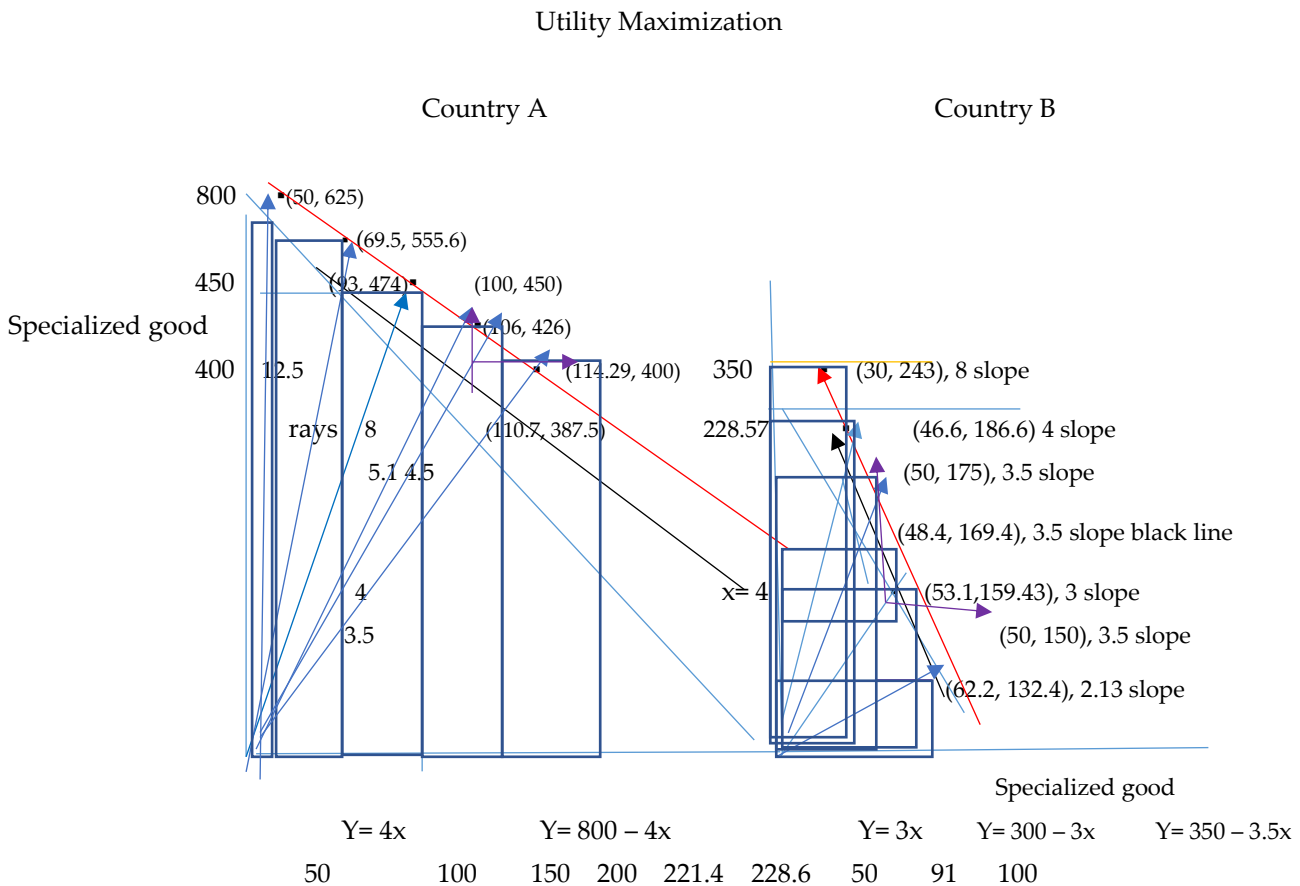
$$3.5Ax - Axray - 400 = -3.5A + 100 ray - Ax ray$$

$$400 = 100ray$$

$$ray = 4 \quad \square$$

3.12. Utility with Various Rays:

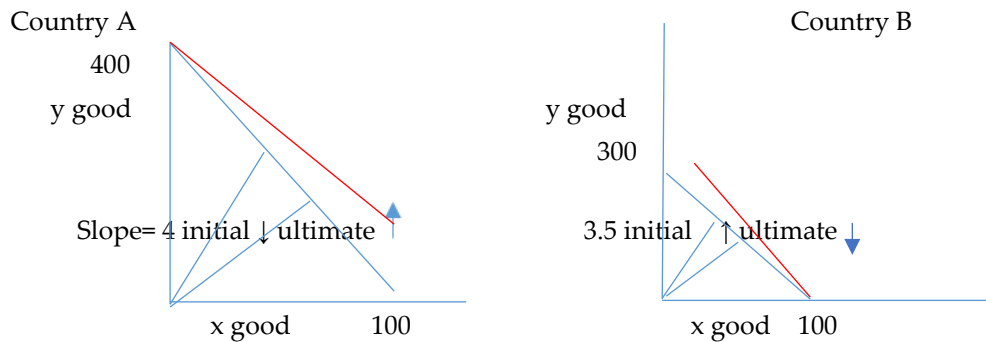
Figure 10 (slightly adjusted) - not to exact scale



Utility maximization (above, and in Table 1 later) is assumed by calculating the areas beneath the points, the rectangles. This is done by 6] utility maximization = multiplying the x and y values for each point. A note should be made again that the smaller country is unable to satisfy the larger country. The red and black lines (the terms of trade with complete or partial specialization) make trading outside of the boxes of surety, signified by the dark purple lines, potentially more utility-maximizing than trading within the boxes. But, this gain is often not possible with a large country trading with a smaller one. If the smaller country cannot satisfy the larger one, then economic restructuring or expansion of the smaller country would have to occur. This assumes that the smaller country sees it as beneficial to come closer to its own initial ray of satisfaction. Or, the larger country could restructure its own economy. Another option would be for the countries to use partial specialization, as shown in figures 7 and 9. Utility for the smaller sized country is analyzed in part 60, after analyzing the smaller countries below.

3.14. Math work for Utility Maximization with Similar-Sized Countries:

Figure 11 (#8 revisited) for Utility Maximization
The Ray of Satisfaction Used in Production



Here, the “exact” and “doubled” rays do not fall on the curves simultaneously. The “balanced” rays were provided earlier. In this example, “singular” rays do not fall on the red line curves for both countries, using 4, from the equation in Figures 7 and 9 “Average Rays”: (53.33, 173.33) Country A, (46.7, 186.66) Country B. Country A gains 53.33 x. So, it sells 186.66y, but B sells 53.3x for 186.5y. Yet, this number should add with the other country to equal the complete specialization of one country’s y value. Thus, sometimes the balanced ray falls on curve, and sometimes it does not. Equally, sometimes the singular ray falls on the curve, and sometimes it does not. It depends on the sizes of the countries. A step-by-step process will be provided in Table 4, based on the author’s observations of such examples.

60. Math work for Total Utility of Differently-Sized Countries:

The following Table (1) lists utilities, starting with the highest sloped rays, for the larger countries in Figures 7, 9, and 10. Utility is the area underneath the graphs (again, with all of the assumptions previously discussed). And, using the red production lines, the Table then subtracts losses from being outside the “boxes of surety.” These boxes are formed around the initial ray of satisfaction and the original blue production line. A more accurate assessment of utility is obtained, based on the consumers’ original satisfaction. This loss to the “boxes of surety” is calculated as $(100 - x)$ or $(x - 100)$ times $(x - 400)$ or $(400 - x)$ for Country A, and $(50 - x)$ or $(x - 50)$ times $(y - 150)$ or $(150 - y)$ for Country B.

For Figures 7, 9, and 10, observe the “total utility” in the table below (Table 1), or, at “total – loss,” for being outside of the “boxes of surety,” and “productivity loss” (explained later). Using 3.5 and 3.5 (“average” rays) is the highest value (54,466 for “total utility”). But, this is not possible given the size of the countries. A * symbol indicates if combinations of ray slopes are indeed possible. Using “exact” combinations of 3 and 4 are also not possible. Just as a note, the 300 extreme y value for Country B cannot be calculated, so a “counter-factual” estimate was used. A “doubled” ray with complete specializing is not possible, but using partial specialization yields a large amount of utility.

Using “balanced” rays (5.9 and 1.9) is the next highest combination, but it is also not possible given the countries’ sizes. The next step (in Table 4), as we have seen, would be to look for a “singular” ray (8), which in this case works, or else, to take an “extreme” ray. For the larger country, the amount of goods traded shift more greatly with different rays. But, proportionately, the number of goods traded changes, and utility increases more, slightly, with small countries. With the last, second to last, and fourth to last row of Table 1, the use of partial specializing creates utility greater than at any possible specialized trading point. And, the points fall on the curves simultaneously. Without trade, a country would simply gain the consumption at the downward sloping blue lines (47,500), in Figures 7, 9, and 10. For this, the utility is shown by the third to last row in Table 1. A country does not need to start domestically where the blue and black production lines intersect: the start can come before, or after, the intersection, but production must be where they meet. In Table 1, as with example in section 3.7, the 3.5 ray creates the greatest utility, but the end points are outside of the “box of surety,” so there is a loss.

Table 1.
Utility at Various Finish Points

Country A: Country B: A + B: A + B:
Ray(finish points)=utility Loss to Box: Ray(finish points)=utility: Loss to Box: Total Utility: Prod. Loss: Total- Losses:

12.5 (50, 625) = 30,000	11,250	3.5 (50, 175) = 8,750	0	38,750	0	27,500*
8 (69.56, 556.6) = 38,717	4,766.9	8 (30.4, 243.46) = 7,401.84	1,831.82	46,118.2	0	39,519.46*
4.87 (95.58, 465.47) = 44,489.8)	288.72	2.13 (62.2, 132.4) = 8,235.28	214.72	52,725.1	0	52,221.64
4.5 (100, 450) = 45,000	0	300 (1, 296.5): counterfactual = 296.5	7,178.5	45,296.5	0	38,118*
3.5 (114.24, 400) = 45,696	0	3.5 (50, 175) = 8,750	0	54,446	0	54,446
More Combinations	n/a	n/a	n/a	n/a	n/a	n/a
3 (123.07, 369) = 45,387	715.17	4 (46.6, 186.66) = 8711	197.64	54,098	0	53,185.19
4 (103.6, 412.5) = 42,735 (with partial specializing, starting at 775)	0	6 (37.25, 219.6) = 8,180.1	2,162.4	50,915.1	267	48,485.7*
4 (100, 400) = 40,000 (initial slope-no trade)	0	3 (50, 150) = 7,500 (no trade)	0	47,500	0	47,500

3.5 (110, 385), = 42,350, with partial specializing	150	3.5 (49, 171.5) =, 8,403, with partial specializing	21.5	50,753	240	50,341.5*
4 (102.88, 411.52) = 42,337.2, with partial specializing.	0	3 (53.85, 161.6), with partial specializing = 8,702.2	0	51,039.4	227	50,812.6*

Again, a * symbol here indicates if combinations of ray slopes are indeed possible, and balance trade.

3.15. Attempting Maximum Utility:

In Table 1, above, dealing with the larger countries in Figures 7, 9, and 10, and for all countries of similar size, then “exact” rays, followed by “doubled” rays, then by “average” rays will yield the most utility. But, all of these rays are unlikely to fall on both production curves. The exception is in using partial specialization. Even in this case, when they do not, then “balanced” rays will yield the most total utility, unless countries are of different sizes, and this ray is not possible given production. In this case, it is best to move to “singular” rays, or, if this is not possible, then to take the “extreme” rays that yield the highest calculated utility. These rays can be discerned and calculated from the green and yellow lines in Figure 9 for that particular example (this step-by-step approach is shown later in Table 4). One can see that a greater utility occurs where there is partial specialization, at slope of 4 and 6. A scholar might ask, though, why a country would not simply start production closer to their initial preferences.

Here, we must make one final assumption, that there is a utility “loss of production” caused by starting at an abbreviated, partial specialization starting point, due to loss of productivity of making less productive goods. This loss can be approximated by x and y of the starting points times the opportunity cost $60 \times (800/200)$ and y start $(0) \times (300/100)$, summed = 240, in the 2nd 3.5 ray example coming. It is the difference between what a country can produce, and what it does produce. We also must relax the assumption that points do not fall below the Production Possibilities Frontier (PPF) (production curve) to simplify the math for maximizing utility. Even considering this, countries can still gain in utility with partial specializing. The equations below show how to calculate points using a 3.5 and 3.5 ray, which have given high utility values in every example, with partial specialization, which is the only type of trade possible with such “exact” rays. With partial specialization, the first step should always be to determine the finish points at which at least country wishes to end at after trade, using linear algebra. This is complex because countries’ constants in their production equations depend on their starting points, and here it is that Country A’s maximum of y goods is 775, or 97% maximization, or, 3% shifted, rounded. The proof of calculating the maximum utility, with partial specialization, will be left to future work.

Using finish points after trade to determine starting points with 3.5 rays to maximize utility:

Equations: $[775 \text{ end} / (3.5 + 3.5)] = 110.7 * 3.5 = 387.5$, and $339 / (3.5 + 3.5) = 48.3 * 3.5 = 169.35$.

Using a 3.5 ray with losses to productivity: we choose the ending points to be on the black curves, in Figures 7, 9, and 10. We use simultaneous equations, with partial specialization starting with the end point 775 for Country A: (110.7, 387.5) and (48.43, 169.53) - again, a 3.5 ray. Here, the * symbol means multiplying, in order to simplify. Again, starting points are based on how much countries decide to restructure towards their "end" points, which are the maximum amounts on the edges of the graphs, after a country decides to trade, but before it has done so. "Finish" points are after trade.

Unknowns: A_{xstart} , A_{ystart} , x_{traded} , B_{xstart} , B_{ystart} ; the underlines are for known quantities.

Proof of Theorem of Starting, End, and Finish Points

$$A_{xfinish} - A_{xstart} = B_{xstart} - B_{xfinish}$$

$$a) \quad 110.7 - A_{xstart} = B_{xstart} - \underline{48.43}$$

$$A_{ystart} - A_{yfinish} = B_{yfinish} - B_{ystart}$$

$$b) \quad A_{ystart} - 387.5 = \underline{169.53} - B_{ystart}$$

$$A_{xstart} + B_{xstart} = \underline{159.13}$$

$$A_{ystart} + B_{ystart} = \underline{557.03}$$

$$775 - A_{ystart} = 3.5A_{xstart}$$

$$339.06 - B_{ystart} = 3.5B_{xstart}$$

$$A_{xstart} + [(339.06 - B_{ystart})/3.5] = \underline{159.13}$$

$$-3.5A_{xstart} = -775 + \underline{549.8} + B_{ystart}$$

$$3.5A_{xstart} + \underline{339.06} = 3.5(\underline{159.13}) + B_{ystart}$$

$$0 + 339.06 = -775 + 549.8 + 556.955 + 2B_{ystart}$$

$$B_{ystart} = 3.653$$

$$A_{ystart} = 557.03 - 3.653 = 553.38$$

$$B_{xstart} = (339.06 - 3.653)/3.5 = 95.83$$

$$A_{xstart} = 159.13 - 95.83 = 63.3$$

Starting Points

Country A Country B

(63.3, 553.38), (95.83, 3.653)

Country A Country B

(110.7, 387.5) and (48.43, 169.53):

and trade is somewhat balanced, and the ending points are reached.

6.15.1. Penultimate Trade Equation:

In the equations below, the term "end" means the maximum point of production after the country specializes. Examples are 800 + 200, or 300 and 100, for Countries A and B with Figures 7, 9, and 10. In these cases, B_{yend} is $350 - 3.125\% * 350$. This is because

the production equations change depending on their starting points (before trade). So long as production is at/ below/or before the intersection of the black and blue production lines, according to the desired amount of “shift” in production, discussed in Section 6b, then production using partial specialization is possible.

Penultimate Trade Equation:

$$7] \text{ Bystart} = [-\text{Ayend} + \text{Ayfinish} + \text{Byfinish} + \text{t.o.t.} (\text{Axfinish} + \text{Bxfinish}) - \text{Byend}]/-2$$

By plugging in to the simultaneous equations above, all of the variables can be solved.

Having used partial specialization, each country comes closer to maximizing its utility.

3.16. Observations on the Penultimate Equation to With Intersections:

In the last example, the start and end numbers are slightly skewed- the x and y finish numbers do not add up to the end points, and Equation 7 does not balance. The math, with the “shifts” and starting points, also needs more elegance, shown later in section 3.17.1. In the last example, an end point of 775 was used for Country A. This equation is correct, but it is apparent that the end points and the “shift” must take into consideration the “intersection” of the partially specialized production line with the original blue production curves. As explained above, this is in order to be sure that that the country’s starting points can intersect the blue production curves, which they do not above. This way, the countries can produce the desired combination of goods necessary for the chosen end points.

Otherwise, as in the examples above, the country would have to produce “extra” of the specialized goods to reach its end points. The starting points would fall on the black production line at an x point for Country A greater than the intersection with blue curve, needing extra production. This production, in the preceding examples, might be possible, but one cannot be sure of the resources needed to create such production. In order for the black production curve of partial specialization to intersect with the blue production curve, in our example for the large country, the initial “shift” can only, at its most, lower the Ay end point to 750, or 6.25% of specialization, discerned from Figures 7 and 9, in Country A. This shift would ensure that the end points are at least equal to, or above, the blue end points within the “box of surety.” Still, the country can gain, if the gains are greater than the assumed losses. The most that Country B can shift is 50, and the simplest endpoint is $x = 100$, which falls on Country B’s blue curve, as well. In these cases, the Ayend, Ayfinish, and Axstart points can be calculated, after choosing the amount of “shift.” The Ax intersection equation is given by:

$$8] \text{ Axintersection} = (800 - \text{shift}) / (\text{original slope}/\text{t.o.t.}), \text{ and:}$$

$$\text{Axfinish} = \text{Axintersection} + 3.5x \quad *$$

$$\text{Ax finish} = \text{shift} / (\text{original slope} + \text{t.o.t.}) \text{ where the shift is equal to or less than the max end point.}$$

*In this case, albeit, it is possible for Country A to “shift” more than 750. This occurs since the black production curve falls below the “box of surety,” and the intersection point as well, in order to reach a desired end point, such as in 3.5 ray example. The country can still gain via trade, and increase its number of goods, and possibly overall utility, but the end points will well exceed the “box of surety.” The further the space between the terms of trade and the original country’s slope, the more specializing that is possible. For the maximum shift of Country A, the points with the “box of surety” can be as little as simply meeting the blue production line, or it can be as much as 6.25 points higher than the blue line equilibrium of 100 in the x value: maximum shift= $[(800-750)/800]$. For Country B, it can also shift more than $100-50 = 50$: the % change is greater, since it is a smaller country. The change is given by:

$$9] \text{ Shift} = \{ \text{MaximumX} - [(\text{midpointX} + \text{midpoint})/\text{t.o.t.}] \} / 100$$

$$100 - [(50 + 150/3.5)/100] = 7.2 \%$$

In order to calculate the Country A’s “intersection,” “end,” and “starting points,” further equations are needed. This is because it is a case where the intersection occurs outside of the “box of surety,” and the starting and end points do as well. The additional equations are:

$$10] (\text{Axfinish} - \text{Axintersection}) = \text{Axintersection} * (\text{t.o.t.} + \text{original slope})$$

$$11] \text{ Desired xfinish} * (\text{t.o.t.} * \text{ray}) = \text{Axend}$$

$110.7 * 7 = 773.5$, and it does indeed intersect the blue curve in the “box of surety,” since $(800 - 773.5)/7.5 = 54$, the Aystart and intersection point.

3.17. The Penultimate Equation with Intersections Examples:

In this five part section, we now refine the prior equations, and use steps, to find starting points with the “intersections,” and the desired “shifts.” We compare the results with: the previous section, with rays of 3.5 and 3.5, and with “exact” rays, whereas “intersections” were not used previously.

With the 3.5 rays’ example, it is helpful to start with the smaller country. So, we use Country B, and a chosen shift to 339.06, the finish point. With simultaneous equations= $339/7 = (48.4, 169.5)$. So, Country A then shifts by a “similar” amount, and the percentages of the two shifts are approximately 1.14% different (4/3.5) in percent. They are also $\Delta 800/\Delta 300$ different in actual numbers. This statistical discrepancy will be left for future scholars. It is hypothesized that the shift allows the t.o.t. to stay in-tact, discussed with Figure 3. Also, as stated, this paper uses rounding of decimals to different places.

3.17.1. Combining equations, with steps:

$$12] \underline{800 - (\text{shift})} = 1/[(\text{CountryAstartslope} - \text{t.o.t.})] * \text{shift} + \text{CountryBxstart} - \text{CountryBxfinish}$$

$(3.5 + 3.5)$, the ray of satisfaction plus the t.o.t.

where $B_y \text{ shift} = B_x \text{ shift} \times 3.5 = (350 - B_y \text{ shift})/3.5 + 3.5$

and where: $1/(4-3.5) = 2$

$$\frac{(800 - \text{shift})}{(3.5 + 3.5)} = \frac{2 \times \text{shift} + (100 - B_x \text{ shift})}{1}$$

Table 2; A series of steps are given, from start to end, to determine the rays and trade amounts:

Proof of Theorem for Equations 7-12

<p>1: Determine the Country B end and start points, for x and y, and the amount of shift, in either order. Or, Country A could be started with, but that approach is not used here:</p> <p>No shift, y and x are 350 and 0. Country Bx starts at $350/(3.5 + 3.5) = 50$, $x \times 3.5 = 175$</p>						
<p>2. Make sure that these points fall of the blue production lines. Yes, because the blue line intersects the red line along the x axis.</p>						
<p>3. Calculate the x start points for Country A and B, using Equation 12. $800 - 7(\text{shift}) = 15 \text{ shift} + 7(50)$ Shift = 30, $x \times 2 = 60$</p>						
<p>4. Calculate the Country A shift, end points, and starting points. $x \text{ start} = (800 - 30)/(3.5 + 3.5) = 60$ $x \text{ finish} = 50 + 60 = 110$, $x \times 3.5 = 350y$</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; text-align: center;">Starting Points</td> <td style="width: 50%; text-align: center;">Finish Points</td> </tr> <tr> <td style="text-align: center;">Country A Country B</td> <td style="text-align: center;">Country A Country B</td> </tr> <tr> <td style="text-align: center;">(60, 560) (100, 0)</td> <td style="text-align: center;">(110, 385) (50, 175)</td> </tr> </table>	Starting Points	Finish Points	Country A Country B	Country A Country B	(60, 560) (100, 0)	(110, 385) (50, 175)
Starting Points	Finish Points					
Country A Country B	Country A Country B					
(60, 560) (100, 0)	(110, 385) (50, 175)					
<p>5. Check via addition and/or subtraction. $560 - 385 = 175$</p>						
<p>6. Check using equation 7. $B_{y \text{ start}} = [-A_{y \text{ end}} + A_{y \text{ finish}} + B_{y \text{ finish}} + \text{t.o.t} (A_{x \text{ finish}} + B_{x \text{ finish}}) - B_{y \text{ end}}]/-2$</p> <p>$0 = [-770 + 385 + 175 + 3.5(110 + 50) - 350]/-2 = 0$: yes! Trade balances.</p>						

□

3.17.2. With 3.5 rays and Country B Partially Specializing:

By assuming a different start point, and a different amount of shift, it is still possible for both countries, including Country B, to “shift.” They reach a suitable “intersection,” whereby Country B would still fall on the blue line. This can be done without having to start at its maximum x end point, and by using: $\text{Country B}_{\text{start}} = 300 - 3 (\text{Country B}_{\text{xstart}})$. Then, using Equation 12, more fully detailed:

Proof of Theorem for Equation 12

$\frac{(800 - \text{shift})}{(3.5 + 3.5)} = \frac{1}{1} \times \text{shift} + \text{B}_{\text{start}} - \text{B}_{\text{finish}}$								
$\frac{(800 - \text{shift})}{7} = 2 \times \text{shift} + \text{Country B}_{\text{xstart}} - \text{Country B}_{\text{xfinish}}, \text{ with:}$ $\text{Country B}_{\text{start}} = 300 - 3 (\text{Country B}_{\text{xstart}}), \text{ or } 300 - 3 (100 - 2) = 6.$								
<p>In the example from 6p: $800 - 7 (51.6) = 15 \text{ shift}$, But, if B_x shifts to 2 for B_{start}, above, for example: The change is that Country B_{yend} shifts to 343, using $350 - [(100 - 98) \times 3.5]$, and: B_{xfinish} becomes = $343/7 = 49$</p>								
<p>For Country A, $y = 800 - 7 (98 - 49) = 15 \text{ shift}$. Shift = $30.47 \times 2 = 60.93$ Starting Points: <u>Decided first</u></p> <table border="0"> <thead> <tr> <th>Country A</th> <th>Country B</th> <th>Finish Points</th> </tr> </thead> <tbody> <tr> <td>(60.93, 556.27)</td> <td>(98, 6)</td> <td>(110, 385) (49, 171.5):</td> </tr> </tbody> </table>			Country A	Country B	Finish Points	(60.93, 556.27)	(98, 6)	(110, 385) (49, 171.5):
Country A	Country B	Finish Points						
(60.93, 556.27)	(98, 6)	(110, 385) (49, 171.5):						

3.17.3. Observations:

All of the finish points fall on both black and blue lines, and balance using Equation 7. In both examples from section 3.17, the Country A starting points are, correctly, slightly less than in part 3.15; the “intersection” results in *less* loss of productivity. The finish points for Country A are slightly different than Figures 7 and 9 because the start points are different. These numbers might also have statistical discrepancies because the “shifts” do not occur in equal percentages between the two countries. The maximum “shifts” are, in Country A, 6.25%, and the maximum “shift” in Country B is 7.2%, as already explained. The relationship (by division), again, is 1.14, which is the slopes of $4/3.5 = 1.14$. The derivation for how these shift differences affect the statistical discrepancy is, again, left to others. Furthermore, in order for countries of different sizes to trade, and reach “exact” rays, it is likely that an “intersection” can be found. Still, this intersection may not always be possible. Therefore, the starting points may have to differ in terms of the “shifts,” or percentages of shifts. Or, there need to be some adjustment of the countries’ resources in order to produce more of the specialized good for a starting point not on the blue lines, in combination with the goods traded for.

3.17.4. Finding “Exact” Rays with Intersections and Steps:

With the “exact” rays example: - the end points are calculated using Figures 7 and 9, with a 0 shift that has already been chosen for Country B, so a 350 maximum y end point. The less the partial specialization, the higher the points will be when the black line passes through the “box of surety.” The previous, 3.5 ray example works well with equation 12, because with the same ray for each country, each country gains the same proportionately. This may not always be so, as below, with “exact” rays, Country A’s finish points are slightly less than in Figures 7 and 9. So, finding points with “exact” rays:

Table 3: Finding Exact Ray Start and End Point Steps:

Proof of Theorem of Steps

<p>1: Determine the Country B end and start points, for x and y, and the amount of shift, in either order. No shift, y and x are 350 and 0. Country Bx starts at $350/(3.5 + 3) = 53.85$, $x \cdot 3 = 161.54$</p>						
<p>2. Make sure that these points fall of the blue production lines. Yes, because the blue line intersects the red line along the x axis.</p>						
<p>3. Calculate the x start points for Country A and B, using Equation 12. $(800 - \text{shift})/(3.5+4) - 2 \text{ shift} - 46.15 = 0$ $(800- \text{shift})/7.5 = (2 \text{ shift} + 46.15)$ $\text{shift} = [800 - 7.5 (46.15)]/16$ $\text{shift} = 28.37$, $x \cdot 2$ $x \text{ start} = 56.73$</p>						
<p>4. Calculate the Country A shift, end points, and starting points. $56.73 + 46.15 = 102.88$ or, $(800 - 28.37)/7.5 = 102.88$, slightly less than 103.6 in Fig. 7, because of a greater shift. $y = 800 - (4 \times 56.73) = 573.08$</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">Starting Points</td> <td style="width: 50%; border: none;">Finish Points</td> </tr> <tr> <td style="border: none;">Country A Country B</td> <td style="border: none;">Country A Country B</td> </tr> <tr> <td style="border: none;">$(56.73, 573.06) (100, 0)$</td> <td style="border: none;">$(102.88, 411.52) (53.85, 161.54)$</td> </tr> </table>	Starting Points	Finish Points	Country A Country B	Country A Country B	$(56.73, 573.06) (100, 0)$	$(102.88, 411.52) (53.85, 161.54)$
Starting Points	Finish Points					
Country A Country B	Country A Country B					
$(56.73, 573.06) (100, 0)$	$(102.88, 411.52) (53.85, 161.54)$					
<p>5. Check via addition and/or subtraction. $573.06 - 411.52 = 161.54 = 0 = \text{yes!}$</p>						
<p>6. Check using equation 7. $\text{Bystart} = [-\text{Ayend} + \text{Ayfinish} + \text{Byfinish} + \text{t.o.t.} (\text{Axfinish} + \text{Bxfinish}) - \text{Byend}]/-2$ $0 = [-771.63 + 411.52 + 161.54 + 3.5 (102.88 + 53.85) - 350] -2 = 0 = \text{yes!}$ These are the answers to our paper-wide search!</p>						

3.18. Overall, Entire Paper Step-by-Step Approach:

The following Table 4 shows the *overall* steps that should be taken, based on the examples in this paper, for obtaining rays of satisfaction which maximize overall utility based on consumption consistency. A complete mathematical proof of utility is left to others.

Table 4.
Steps to Maximize Utility

Step 1	Decide on partial or complete specialization.	Once completed, then...
Step 2	Take "exact" rays.	If not possible, then...
Step 3	Take a "doubled" ray	If not possible, then...
Step 4	Take an "average" ray.	If not possible, then...
Step 5	Take a "balanced" ray.	If not possible, then...
Step 6	Take a "singular" ray.	If not possible, then...
Step 7	Take an "extreme" ray	If not possible, then...
Step 8	If using Complete Specialization, then now use Partial Specialization in some form (using the 6 steps from 6r, especially for "exact" rays for utility maximization), and repeat the process, or adjust the terms of trade. Otherwise, there is no beneficial trade possible between the two countries, except for relaxing the "box of surety" or consumption-consistency assumptions.	This is the last option.

3.19. (final results). Additional Example Using All Sections:

This section provides an additional example using "medium" sized countries, and how to maximize utility, based on the previous examples, and the step-by-step approach in Table 4.

Figure 12
Medium-Sized Countries

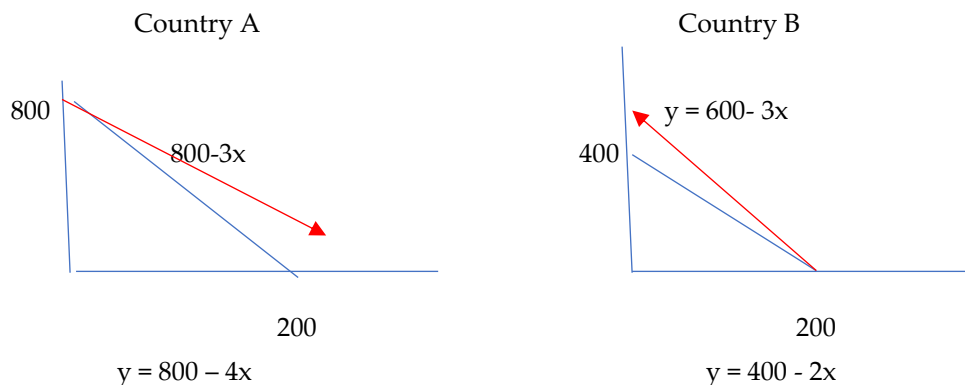


Table 5: Final Example- Using Steps from Table 4 to Maximize Utility:

1. It is randomly decided to start with specialized trade, using a terms of trade of 3.
2. (114.3, 457), (120, 240). Trade does not balance.
3. (114.3, 457), (85.7, 342.8). Yes, a “doubled” ray balances trade on the red lines.
4. Even if continuing, (133.33, 400), (100, 300) does not balance.
5. Even if continuing, $[6/(800/600) + 1] = 2.57$, $[(6/(600/800+1)] = 3.42$, does not balance.
6. If continuing, $800/200 = 4$, so, (114.3, 457), (85.7, 342.8) works as a “singular” ray.
7. Not needed.
8. Not needed.

4. Discussion:

Empirically, in 2021, the U.S. traded \$4.5 trillion dollars’ worth of goods, with \$1.7 trillion dollars of exports, and \$2.8 trillion dollars of imports, yielding a trade deficit of \$1.1 trillion dollars, the most it has ever been. This deficit is truly most dangerous long-term, due to pressures on the currency, and an imbalance of saving, but not immediately as it simply represents the present preference of consumption versus and saving and investing, and rather reflects the U.S. budget deficit. During the fear of the Covid-19 pandemic in 2020, and supply-chain issues, trade was lower at \$3.75 trillion dollars, with \$1.4 trillion dollars of exports, \$2.3 trillion dollars of imports, and a trade deficit of \$902 billion dollars. Before the pandemic, trade had been fairly constant at approximately \$4 trillion per year, with an approximate deficit of \$700-750 billion dollars (“Trade in Goods” 2022, 1-4). Most of this American trade is with Mexico and Canada due to their geographic proximity, as well as with China, Japan, Germany, and the rest of Europe, due to their sizes and different types of goods produced, often at greater productivity for these goods with lower labor costs, resulting in less expense to the U.S. consumer.

Figures 7 and 9 are perfect examples of how partial specialization allows both countries to come closer to their individual rays of satisfaction of their countries’ consumers. Because the small country cannot fully satisfy the large country, it would need to restructure by producing more of its specialization good. Instead, an alternative is to use partial specialization. For Country A, partial specialization may result in a new starting point on the production possibilities curve such as at (50, 625) ($y = 800 - 3.5x$), in Figure 7, in which case the production curve, and ending consumption, still shift markedly

outwards. Albeit, the new ratio of goods consumed, compared to complete specializing, is less, and may fall outside of the “box of surety.” However, the country need not produce all of the extra specialized goods to trade, and reduce the non-specialized goods. Utility, in sum, is shown in Table 1. In some cases it may be better for countries to not even to trade, unless it is done with partial specializing.

Historically, some economists, historians, or politicians might argue that the United States may have exported capital into China and other South East Asian countries, starting in the 1970’s with United States President Richard Nixon’s trip to China, in order for these nations to supply the United States with less expensive goods. The United States, meanwhile, focused on manufacturing and technology. Many scholars and leaders in different countries have also made the case for numerous years since that era for economic restructuring in favor of certain industries, such as technology, within their countries, in order to create “better” jobs. For another example of this, in the 1960’s, Japan started reorienting its economy towards its trade sector, heavily based on electronics, autos, and technological goods, which inevitably must have come with empirical economic costs. But, if an imagined island is made mostly of coconuts, and trade is for a few pineapples, yes, the pineapples will be highly demanded, but most likely, the food culture will still rely on coconuts, the staple, or “Giffen” good, such as rice with Japan.

In the United States, there is also the constant push for “good paying jobs,” which are usually more high-tech in nature, and thus presumably higher paying. According to Amadeo (2021), the United States currently specializes in chemical, banking, aerospace, computer parts, and defense parts, and the U.S. has transitioned away from consumer products to these more high-tech specialized goods over the past several decades (Amadeo 2021, 3). One might add that the United States also has a very successful pharmaceutical industry. Amadeo also writes that, for another example, Middle East countries are not just good at producing oil, but also chemicals derived from oil, which help fuel manufacturing in Southern Europe (Amadeo 2021, 1). Services can be traded, as well, by sending accounting and financial paperwork overseas, for example. Education, though, must be readily available for such restructuring.

But, does this trend towards specialized products necessarily mean that lesser-paying jobs, for less skilled individuals, cannot exist, too, alongside such jobs which require higher education, which not everyone may be able to obtain and afford? Cannot there still be a middle class? Why do some small industries, such as furniture stores, the arts, or basic manufacturing, have to die, and not co-exist? As shown here, many small businesses and many small sectors can remain in countries, and flourish, even though the country moves towards specialization. Futuristically, many say that Artificial Intelligence (AI) (super computers) will eliminate jobs, which is largely true, but will not such technology need upkeep for new jobs, and entrepreneurship for new uses, thereby yielding new fields for partial specialization?

In the 2000-2001, United States’ short recession, the cause was various factors, among them the after-effects of the Dot.com bubble bursting, lack of confidence in political and economic leaders, uncertainty over future expectations, and corporate debt scandals

involving Enron and World.com. In addition, scholars have found that economic restructuring was also a possible cause. Figura and Wascher (2008) estimate the loss from the restructuring at this time to have been 0.5% to 1 % per year of Gross National Income (GNI), and doubtlessly also to Gross Domestic Product (GDP). With both, not only the nation loses, but also individual income earners. Lower productivity often comes from restructuring, they find, because firms and countries change from the goods that they are producing.

With the Covid-19 pandemic, economic restructuring, which caused more goods to be bought online, was not a choice. The pandemic resulted in structural employment, and largely changed the ways employees are working. But, restructuring often is a choice. With restructuring, the loss is more to small firms, as large international companies, instead, can diversify and produce many types of goods in many divisions of their companies. Understanding foreign regulations, developing new supply chains, switching types of physical capital, maintaining company image, and keeping worker morale high are all needed to restructure an economy towards its trade sector, which might involve laying off workers, closing plants, moving operations, and taking other actions that cost an economy. Covid-19 and the Green movement's response to climate change, have and will continue to create new issues in restructuring, possibly leading to short-term structural unemployment. But, in the long-run possibly increasing utility if the new firms and jobs are part of industries that are partially specialized

In order to restructure, the cost of restructuring (C) must be less than the opportunity cost of more goods obtained in trade (OC), which is also the benefit of restructuring.

Equation [10]: Restructuring Cost < Opportunity Cost (OC) (or Benefit from Specialized Trade).

Table 6.

Costs to Restructure (not all-inclusive):

Cost of new labor/retraining
Cost to obtain and use new natural resources/parts
Cost to obtain new capital (property, plant, equipment)
Cost of relocating businesses
Cost (interest) to obtain new financing
Cost of developing new technology
Cost to develop new supply chains ("finding" new trade partners)
Cost for new marketing, and finding new consumers
Costs to small countries in scaling production
Cost from competition causing lesser firm profits
Cost to consumption consistency (excess inventory, changing production)
Cost to utility from exceeding the "box of surety" (forcing consumer's habits)
Cost in risk (cyclicality, over-concentration, or economic "shocks")

- Created by the Author. Many of these costs are assumed away by Ricardo's model.

This model becomes even more useful if we change Ricardo's assumption from a two good model, to a model in which the non-specialized good represents an index of all non-specialized goods. In this sense, we can make more realistic judgments about countries' entire economies in terms of restructuring. While neo-classical economics assumed diminishing returns, the graphs here assume that there are losses to countries in production of specialized goods, but even without these losses in Table 1, the math shows that countries still can maximize their utility through partial specialization, rather than restructure. According to Freedman (2018), a global analyst, the 2006-2007 time frame, before the United States 2008 financial crisis, was a time where a lot of restructuring was taking place, but Freedman does not indicate if this had a direct effect on the crisis, or if it was a symptom of the oncoming recession. Many firms were trying to improve their balance sheets by storing more in cash (Freedman 2018, 1-2).

Freedman (2018) says that this restructuring was also occurring at the time of his writing, 2018, in the United States and in countries around the world. Much of the restructuring was, and is, a result of years of corporate mismanagement, he writes. Restructuring is usually cyclical, he notes, occurring around the times of economic problems, citing Irwin Gold, a former top finance executive. Specific firms that are now restructuring include Malaysian Airline, Toys R Us, and many telecom, appliance, and car making firms. Global trade was strong before the pandemic, but corporate debt was at the highest levels since the 2008 financial crisis, so many companies are now restructuring their financing mixes, having implications for their countries, particularly in the United States, Australia, and China, he writes. Some of the countries around the world that have firms that are restructuring may need massive loans from the International Monetary Fund (IMF) or the World Bank to do so (Freedman 2018, 1-2).

An excellent overall example of partial specialization to conclude this paper is to take the example from Ricardo himself. Consider the United Kingdom (U.K.) vs. Portugal- while the first country only made cloth, and the latter wine, the two now currently each make both. The U.K. makes just over 5 billion euros worth of cloth, while Portugal makes about 2.5 billion, as of 2019 (Liu 2022, 1). For wine, Portugal makes nearly 20 million bottles per year, and the U.K. makes some 15.6 million bottles ("Wine From" 2022, 1). Thus, it is possible to have different sectors within a country, while still playing to a country's strengths. Just to add to the discussion, similarly, a model was presented by the famous economist Arthur Lewis in the 1950's (1954) for equal production of agriculture and manufacturing in developing countries, akin to the concepts presented here, although Lewis' work focused on the interchangeable skills of labor, and how this impacted production of different goods, whereas the work here did not focus on resources used in production but on consumer preferences, to maximize utility.

5. Conclusion:

In summation, assuming "consumption consistency" should allow researchers and policy-makers to better find amounts of trade that maximize a country's utility, both from its starting ray of production, through its ending ray of production after international trade.

Meanwhile, using “partial specialization” has proven to be a useful theory that can allow countries to come closer to their desired ending points (maximum production amounts) and finish points (amounts after trade) without having to entirely restructure their economies. As explained beforehand, each country has a trade “preference” which orients towards their ray of satisfaction. The consumption consistency assumption is that the closer to the points on the production possibilities curve (the downward blue, black, and red lines in the figures) is to the initial consumption preferences, given by the rays of satisfaction, and extended through trade, is where utility is theoretically maximized.

The primary example in this study used a large and small country trading. With this size imbalance, and using one country’s ray of satisfaction rather than the others’, one country ends up supplying massive amounts of one good to another. The solution for this dilemma, as already suggested by Barry (2018), and as we have seen here in depth, is to partially specialize, and/or to take various ray of that yields certain production, and then consumption, points. This occurs only if the points are possible mathematically in the amount of goods traded, given the countries sizes, such that a ray produces points that fall on both countries’ production/consumption lines. Some of the rays suggested were an “exact” ray, a “doubled” ray, an “average” ray, a “balanced” ray, and a singular sloped, “singular” ray. If this still does not occur, then trade between the two countries will not happen, or countries can try to steer trade to favor its ray and “preferences,” through an “extreme” ray. Or, the terms of trade may need to be changed, or partial specialization turned to. A final equation for proving total utility is left to others.

Countries, though, do in fact try to obtain terms of trade closer to giving up fewer of their preferred goods, noted here with brief empirical evidence, and, according to many texts, such as in Salvatore (1996), Sawyer and Sprinkle (2009), and Kreinin (2010). In such texts, as already alluded to, larger nations often use their market power and supply and demand to steer the terms of trade in their direction. Whether or not the average rays of satisfaction must be exactly equal to the terms of trade to maximize utility, as was in this case, will be left to future research. But, a greater terms of trade should lead to steeper rays of satisfaction, and benefit the smaller country more. Table 1 shows the most utility, that can be realized, at partial specialization points for the example in Figures 7, 9, and 10, but with a the formula for finding points for total maximization with partial specialization, which would occur at each country’s individual production ray, an “exact” ray, though the exact mathematical proof applying Calculus and/or spatial geometry to the graphs will be left to others. Consumption consistency also reflects how countries prefer to spend their income. In fact, Schotter (2009) wrote about the ray of satisfaction, what he termed the “Income Expansion Path,” as increasing, proportionately between two goods, via increases in income. Whether or not this ratio continues, empirically, with increased national income, is also an interesting question for future researchers.

With these theories in mind overall, though, it need not be that each country has to focus on producing one sole good, or trading for the other’s countries’ specialized good, or that it is necessary to focus solely on one occupation in order to gain. While such sole a focus might result in the “most” apparent gain, there may be costs for an economy of

switching to very few production sectors, which was addressed in the discussion section. Instead, consumption consistency and partial specialization of countries can have positive benefits. Even without trading as many goods, partial specialization can still yield a high indifference curve, and maintain a close ratio of goods (“consumption-consistency”) to that which consumers prefer domestically. Countries can then make small adjustments, such as with the blue crescent, shown in Figure 7. Partial specialization is especially helpful with countries of different sizes; and, future research should also look into this issue when multiple trading countries are involved.

Further research should also look for more empirical examples of partial specialization occurring, such as whether or not it occurs within different industries, and whether states overall try to maintain a balanced ratio of goods. This would be in accordance with the theory presented here. The amount of goods that countries “should” trade, using “consumption consistency” to meet consumer tastes- and use partial specialization to obviate unnecessary restructuring- should be equal to the amount of goods that countries “do” trade. Other factors, though, why nations trade with other ones are based on: political orientations, geography, culture/ language, risk, and many other variables that could be tested in the future using statistical regression. This could include a variable representing comparative advantage representing the preferences, in ratios, of domestic consumers.

Perhaps the most under researched of these variables is risk, for which a viable equation could be created that links partial specialization to diversification and to the equations of Barry (2020), as already noted. Useful for this possible equation is the fact that countries “shift” to specialize to a certain percentage. Future research should also analyze the losses if and/or when initial production (the “shift”) falls below the Production Possibilities Frontier, or if countries’ starting points of trade with partial specialization are beyond their points of intersection with initial production curves, and how this affects the future gains from trade. Also, the models here assume that final points after trade using partial specialization could not be obtaining by consuming different mixes of goods on the indifference curves with complete specialization, albeit with very far-stretching indifference curves. This might thereby lessen the need to partially specialize. Still, the fact that the penultimate equation works by percentages (and a proof of this is needed) should make decisions for policymakers easier. Countries should look to trade with other countries that have, or will form, trade industries in proportion to the percentages of trade, or “shifts,” that are equal to, or near, their own.

Finally, future work should also simplify the math here to a more refined and elegant condition, and it should use more examples. It should look for small-or-large country anomalies whereby the rules here do not hold. Future work should also use more complex, neo-classical models, so that determining the exact quantity of goods a country should trade with diminishing returns, due to depreciation or the reallocation of resources, can be identified in order to yield even more accurate indifference curves. Using Calculus as such with neo-classical curves, and not just matrix and linear algebra, would also be helpful to doing this, for applied realism. As with all models, many assumptions are

needed, and this paper has in-fact attempted to use these assumptions, and to reassess other ones that might be specious, in finding how many goods conceptually are produce and traded to maximize utility, which increases happiness for the world. By continuing to refine these Ricardian assumptions, in total, would continue to aid in government trade policies and business decisions for all countries concerned.

In short, the ideas presented here are believed to be entirely original, with no similar outstanding work discernable. If there is research on this topic, however, the graphs and equations here have certainly been a unique way of portraying the information in ways that are easier to conceptualize. In this way, it contributes noticeably to the existing theoretical literature on international trade, by showing that trade need not be specialized completely, and that countries maximize utility by producing and trading close to their domestic preferences, if possible, whatever those preferences may be, which were assumed here with new ideas. To sum, future work could add in mathematical eloquence and provide more real world examples and evidence, which are left to others. However, the works of Hume (1700s, 1955 ed.), Ricardo (1817), Edgeworth (1877), and others have been used and added to by applying a different methodology of graphs, and equations, using matrix/linear algebra, building on the lines of Ricardo's theory of comparative advantage.

Acknowledgement: The author would like to acknowledge Dr. Mohammad Ashraf for his help in improving this article.

References:

1. Anonymous. (NA). "Ricardian Model Assumptions." Retrieved June 6, 2022 from https://saylordotorg.github.io/text_international-trade-theory-and-policy/s05-03-ricardian-model-assumptions.html
2. Anonymous. (2022). "Trade in Goods with World, Seasonally Adjusted." U.S. Census Bureau. Retrieved September 21, 2022 from <https://www.census.gov/foreign-trade/balance/c0004.html>.
3. Anonymous. (2022). "Wine from the United Kingdom." Retrieved June 6, 2022 from https://en.wikipedia.org/wiki/Wine_from_the_United_Kingdom.
4. Amadeo, K. (2021). "Comparative Advantage Theory and Examples." U.S. and World Economies: *The Balance*. Retrieved January 9, 2021 from www.thebalance.com/comparative-advantage-3305915.
5. Arrow, K. J. (1951). *Social Choice and Individual Values*. New York, NY: Wiley.
6. Barry, T. J. (2018). "Trade matrices for trade negotiators, applied to 'Brexit' and 'NAFTA': an approach." *Holistica: Journal of Business and Public Administration*, 9(3). December, 2018.
7. _____ (2020). "David vs. Diversification: Ricardian trade theory compared to financial principles, in varied designs." *Journal of Economic Library*, 7(4), December.
8. Costinot, A. & Donaldson, D. (2012). "Ricardo's Theory of Comparative Advantage: Old Idea, New Evidence." *American Economic Review*, 102(3), May.
9. Dearnorff, A. (1984). "Testing Trade Theories and Predicting Trade Flows." In R.W. Kenen and P.B. Jones (Eds.), *Handbook International Economics*, Volume 1, North Holland, Amsterdam.
10. Edgeworth (1877). *New and Old Methods of Ethics: Or "Physical Ethics" and "Methods of Ethics,"* Oxford: Parker.
11. Figura, A. & Wascher, W. (2008). "The Causes and Consequences of Economic Restructuring: Evidence from the Early 21st Century." Board of Governors of the Federal Reserve System.
12. Freedman, W. (2018). "The Return of Restructuring?" *Global Finance*, July, August, 6-17. Retrieved June 6, 2022 from <https://www.gfmag.com/magazine/julyaugust-2018/return-restructuring>.

13. Grieco, J. M. & Ikenberry, G.M. (2003). *State Power and World Markets*. New York, NY: W.W. Norton.
14. Heckscher, E. F. (1919). "The Effect of Foreign Trade on the Distribution of Income." In E.F. Heckscher and B. Ohlin (Eds.), *Heckscher-Ohlin Trade Theory*. Cambridge, MA: The MIT Press, 1991 (translated, edited and introduced by Harry Flam and M. June Flanders).
15. Hume, D. (1955). "On the Balance of Trade." In E. Rotwein (Ed.), *Writings on Economics* (pp. 60-77). Wisconsin, U.S.A.: University of Wisconsin Press.
16. Kreinin, M. E. (2010). *International Economics: A Policy Approach*. New York, NY: Pearson Learning Solutions.
17. Krugman, P. R. (1981). "Intraindustry Specialization and the Gains from Trade." *Journal of Political Economy* 89 (5): 959-73. DOI: 0002-3808/81/8905-0005/0\$1.50.
18. Levchenko, A. A. & Zhang, Z. (2014). "The Evolution of Comparative Advantage: Measurement and Implications." National Bureau of Economic Research, Working Paper 16806. Retrieved June 6, 2022 from <https://www.chicagofed.org/-/media/publications/working-papers/2014/wp2014-12-pdf.pdf>
19. Lewis, A. (1954). "Economic Development with Unlimited Supplies of Labour." *Manchester School* 22 (May): 139-191. <https://doi.org/10.1111/j.1467-9957.1954.tb00021.x>
20. Liu, S. (2022). "EU Textile and Apparel Industry and Trade Patterns (Updated April 2021)," retrieved June 6, 2022, from <https://shenglufashion.com/2022/01/28/eu-textile-and-apparel-industry-and-trade-patterns-updated-january-2022/>.
21. Maneschi, A. (1992). "Ricardo's international trade theory: beyond the comparative cost example." *Cambridge Journal of Economics*, 16(4), December.
22. Mankiw, G. N. (2015). *Principles of Economics*. Ed. 7. Stamford, CT: Cengage.
23. Peet, R. & Hartwick, E. (2015). *Theories of Development Ed. 3*. New York, NY; Guilford Free Press.
24. Pressman, S. (2014). *Fifty Major Economists 3rd edition*. New York, NY: Routledge.
25. Ricardo, D. (1817). *The Works and Correspondence of David Ricardo*. In P. Sraffa and M.H. Dobb (Eds.), Vol I. *On the Principles of Political Economy and Taxation*. Cambridge, UK: Cambridge University Press, (1951 edition.).
26. Ricci, L. A. (1997). "A Ricardian Model of New Trade and Location Theory." *Journal of Economic Integration*, 12(1): 47-61. <https://doi.org/10.11130/jei.1997.12.1.47>
27. Salvatore, D. (1996). *Schaum's International Outlines: International Economics: Fourth Edition*. New York, NY: McGraw-Hill.
28. Sawyer, W. C., & Sprinkle, R.L. (2009). *International Economics- 3rd Edition*. Upper Saddle River, NJ: Princeton.
29. Schotter, A. (2009). *Microeconomics: A Modern Approach: First Edition*.
30. Seretis, S. A. & Tsaliki, P.V. (2015). "Absolute Advantage and International Trade: Evidence from Four Euro-zone Economies." *Review of Radical Economics*, 34 (3). <https://journals.sagepub.com/doi/10.1177/0486613415603160>
31. Siddiqui, K. (NA). "David Ricardo's Comparative Advantage and Developing Countries: Myth and Reality." *International Critical Thought*, 8(3). <https://www.tandfonline.com/doi/abs/10.1080/21598282.2018.1506264>
32. Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*. New York, NY: New York Library, 1937 edition.
33. Stolper, W. F. & Paul, S. (1941). "Protection and Real Wages." *Review of Economic Studies*, 9: 58-73. <https://doi.org/10.2307/2967638>.



Forecasting House Prices in Albania with the Deep Learning LSTM Network[#]

Blerina Vika ¹, and Ilir Vika ^{2,*}

¹ Department of Statistics and Applied Informatics, Faculty of Economy, University of Tirana; blerina.vika@unitir.edu.al

² Research Department, Bank of Albania; ivika@bankofalbania.org

* Correspondence: blerina.vika@unitir.edu.al

[#] *Disclaimer: This research article is considered as a preliminary work that aims at stimulating debate and critical comments. It expresses the views of the authors and does not necessarily represent those of the institutions where they work. The authors are grateful to comments and suggestions received from participants at the "Istanbul Annual International Multidisciplinary Conference on Economics, Business, Technology and Social Sciences - 2023", organized by the European Institute for Research and Development (EIRD), Istanbul, Türkiye, in May 13-14, 2023.*

Abstract: This article investigates the role of economic, financial and demographic indicators in forecasting house prices in Albania. The pool of variables is drawn from empirical studies for advanced and developing countries. To test their importance, we employ the long short-term memory network from the machine learning techniques. As the time span of observations is rather limited, the specification of models is maintained to be parsimonious and sufficient to capture the most important dynamics. As such, we compare the performance of a univariate network with models containing the most related variables such as GDP and actual rental, and then augment them with bank loans and interest rates, demand from non-residents, unemployment rate, urban population, cost of construction, and area of building permits. The forecast ability is evaluated during the 2018-2022 period for horizons at 1, 4, 8 and 12 quarters ahead. Preliminary results suggest that multivariate, theory-driven models can help improve upon forecasts generated from the univariate network. Apart from GDP and rentals, costs of construction and financial indicators are some additional variables in which forecasters may have confidence on when predicting residential house prices in Albania.

Keywords: House prices; Machine Learning; LSTM model; Albania

Citation: Vika, B.; & Vika, I. (2023) Forecasting House Prices in Albania with the Deep Learning LSTM Network. *Journal Of Economic and Business Issues*, 4(1), 40-55.

Received: 30/05/2023
Accepted: 18/11/2023
Published: 29/02/2024

1. Introduction

Albania's house prices have been growing much faster than in Euro area as well as most Eastern European countries (EECs) (Figure 1). The rapid increase in prices, especially since 2018, has naturally raised the question of a speculative bubble in the housing market. The concern is mostly related to a fall in prices that could have potential adverse consequences on the broader economy. The flourishing in asset prices that preceded the Asian and US financial crises in 1997 and 2008, respectively, was largely attributed to speculative real estate price bubbles. These days, the fearsome housing market realignment looms at a time when many central banks have been raising their policy rates in order to fight inflation, thus reversing the easy financial conditions that were enjoyed for almost a decade. The higher costs of financing may impede economic growth and the recent boom in property sector and perhaps put downward pressure on house prices.

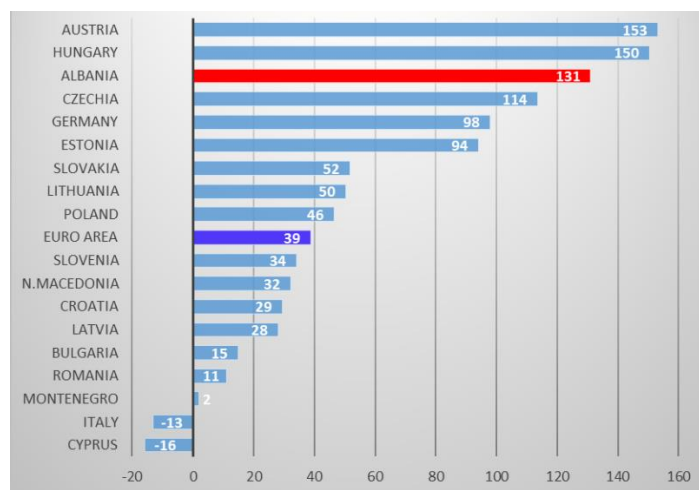


Figure 1. Cumulative growth (%) of house prices (2008-2022).

Real estate is regarded as a potential investment opportunity to government securities, especially in small countries like Albania where stock markets or alternative investment forms don't exist or are still underdeveloped. A reversal of the housing boom could have significant implications for households and policymakers, as housing is a crucial household asset and mortgages contribute substantially to household liabilities. Also, soaring housing prices might make homeownership unaffordable for many low-income households. Further increases in mortgage rates in domestic or foreign currencies might exacerbate affordability concerns. For these reasons, the link of housing market with other macroeconomic indicators and its direct and indirect effects on financial stability has propelled the need to monitor the developments of, and predict the future course of house prices.

This article aims to shed light on which theory-driven indicators are important in forecasting residential property prices in Albania. Traditionally, the relationship between house price growth and its economic fundamentals has been studied by using standard econometric techniques such as cointegration methods. However, our analysis explores the potential of the innovative long short-term memory (LSTM) neural network, which belong to the deep learning methods within the innovative Artificial Intelligence techniques. Neural networks allow for flexible mapping of variables, enabling accurate approximation of highly non-linear functions. Unlike standard econometric methods, neural networks do not require the specification of regression parameters.

Neural networks are becoming especially popular in economic analyses where traditional statistical techniques are insufficient. The process of establishing a neural network's architecture is similar to curve fitting, with the number of hidden layers and neurons determining the model's complexity. Using too few layers or neurons leads to poor fit and prediction, while using too many can result in overfitting. Neural networks possess inductive capabilities, allowing them to model complex systems even without precise knowledge of underlying rules. This article utilizes neural networks to address barriers faced in accurately forecasting house prices in Albania, such as the absence of a consensus model, disputes over included variables, and data measurement challenges.

The study begins by taking a glance at the literature on housing price dynamics. It further investigates through graphical inspection the drivers and implications of fluctuating housing prices, in order to assess factors behind price surges, particularly in the last five years. The next two sections highlight concerns about data measurement to proxy for house price fundamentals and briefly explain the model and forecasting procedure. Empirical results are discussed in Section 6, followed by concluding remarks in Section 7.

2. A Brief Literature Review

The relationship between house prices and macroeconomic fundamentals has been relatively overlooked in academic research, although housing is a significant component of household wealth, especially in developing countries, and it played a crucial role in driving the global financial crisis through the financial accelerator mechanism. Nevertheless, the literature has expanded after the global financial crisis.

A survey paper by Duca et al. [1] on the wide international literature on housing market dynamics draws five important lessons. Firstly, conventional theories based on efficient market rational expectations appear insufficient to explain housing market dynamics. Heterogeneity, trading costs, asymmetric information, and credit constraints contribute to slower price adjustments. Expectations-driven dynamics play a substantial role in housing booms and busts. Secondly, simplistic house price-to-rent arbitrage models are inadequate, as they fail to capture the variation in house prices due to factors like imperfect substitution, sticky rents, transaction costs, risk aversion, and price volatility. Credit constraints and the shadow price of credit also affect the relationship between house prices and rents. Thirdly, credit conditions are found to be a key driver of house prices, with shifts in credit availability significantly impacting price movements. Fourthly, differences in land supply responses explain much of the observed spatial variation in house prices. Areas with less elastic land supply experience more frequent and larger price bubbles. Housing supply and credit availability also influence national-level house prices. Finally, during the Covid-19 pandemic, house prices behaved differently than in previous downturns due to factors such as different shocks, a better-capitalized financial system, and government interventions.

These findings caution against putting too much weight on the role of real interest rates, as other factors like changing demand for detached housing or reduced supply contribute to the house price booms and busts. The connection between macro-financial factors and residential real estate prices has been examined in the literature for advanced as well as emerging market economies. Demand-side factors like income, wealth, and financial conditions, along with supply-side factors such as housing availability, play a role in determining long-term housing prices. However, the impact of these factors varies depending on the countries, time periods, and methodologies used in the studies (see for e.g., Tsatsaronis and Zhu [2]; Égert and Mihaljek [3]; Agnello and Schuknecht [4]; Cerutti, Dagher, and Dell’Ariccia [5]).

In the context of Albania, there are a number of studies that have investigated the property market developments and the house price predictive power by using various linear traditional models. Using certain macroeconomic indicators, Yzeiraj [6] tries to construct a “fundamental” house price index for Albania. Although the fundamental-based index varied from the actual HPI due to the indicator used as a proxy for rent, all measurements pointed to a certain degree of HPI overheating after 2006 and a period of “correction” starting from 2012. Suljoti [7] employs a vector error correction method (VECM) to investigate the role of mortgage loans on house price growth in Albania. Her findings reveal that house prices are strongly linked to financial leverage and the exchange rate but not so much with the interest rate on new euro loans. Still, the author hints that social demographic factors together with institutional obstacles (e.g. property rights and registration) might be important influencers of housing market developments. Three studies focusing on house prices in the capital city, Tirana, find that most explanatory variables are consistent with hedonic pricing theory (Kraja et al. [8]) and there is a statistically significant (long-run) relationship with mortgage loans, long-term lending rates and costs of construction (Marku et al. [9]) or remittances (Lleshaj and Korbi [10]). Yet, other attempts on country-wide prices conclude that it is difficult to establish a theoretically-relevant relationship with all of the explanatory variables (Koprencka et al. [11]) or the impact of macroeconomic variables seems to be time-varying, particularly with respect to the mortgage rate (Halili [12]).

As such, forecasting house prices remains a challenging task due to the complex interactions among the economic, financial, and demographic indicators. In recent years, machine learning (ML) techniques, such as the long short-term memory network (LSTM), have shown promise in improving the accuracy of house price forecasts. Several studies have applied ML models to predict house prices in various countries, including advanced and developing economies (see for e.g., Mora-Garcia et al. [13]; Wang and Li [14]; Park and Bae [15]; Banerjee et al. [16]; Kok et al. [17]; Ceh et al. [18]; Fan et al. [19]; Ho et al. [20]; Chatzidis [21]; Alfaro-Navarro et al. [22]; Hong [23]; Hacıevliyagil et al. [24]). Their results outperformed traditional time series models by achieving better forecast accuracy. To the best of our knowledge, there is no research article for Albania yet to have tried to take advantage of neural network tools. Hence, it added to our motivation to enrich the modest empirical literature for housing market in Albania with innovative and encouraging techniques that can deal with theoretical and statistical drawbacks, as well as data measurement challenges.

3. House Price Developments and Long-Run Stylized Facts

The housing price index (HPI) in Albania has increased significantly from 2000 to 2022, both in nominal and real terms (adjusted for consumer prices, CPI). In fact, the cumulative increase in the HPI is calculated to be about five times higher than that of the CPI. However, the performance of the HPI index has not been the same over time. A look at the HPI index developments in Figure 2 suggests that the 2000-22 period can be divided into i) a decade 2000-09 of rapid house price growth (with a cumulative increase of 146%); followed by ii) a period of price “stabilization”, albeit fluctuating until 2017; and then iii) a strong upward HPI trend reappears during 2018-22, with prices increasing nearly 76% at a firm pace as reflected in its lower volatility.

It seems that in the long run the cumulative increase of HPI index (402%) reflects the performance of nominal gross domestic production (455%), and is not much related to the consumer price basket (78%) and even less to that of construction cost index, CCI (12%) (please see Table 1). This means that the galloping growth of the HPI index in the last five years may be the result of the need to adjust after a relatively long stagnation of prices during the period of high uncertainties related to, among other things, the shocks of the global crisis, the debt crisis in the Eurozone, and the gridlock situation in the domestic financial sector up the middle of the last decade.

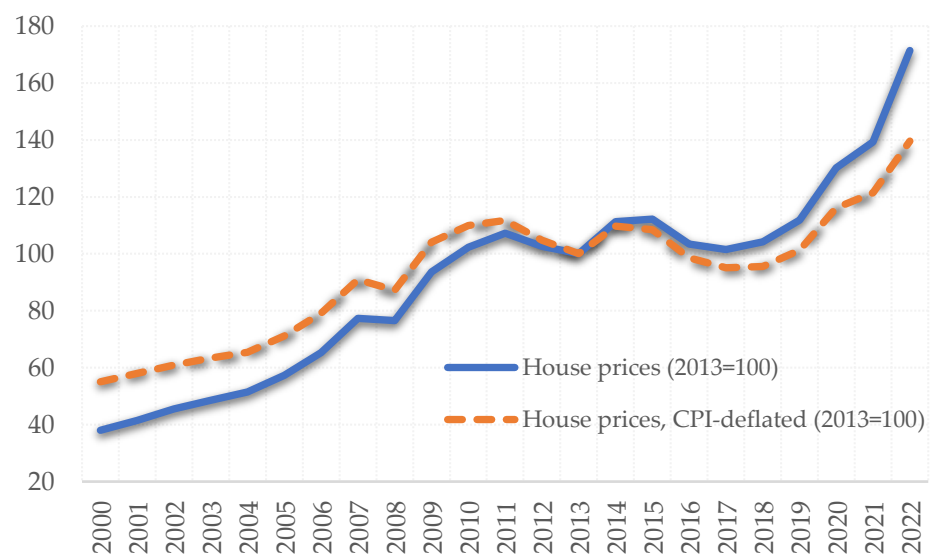


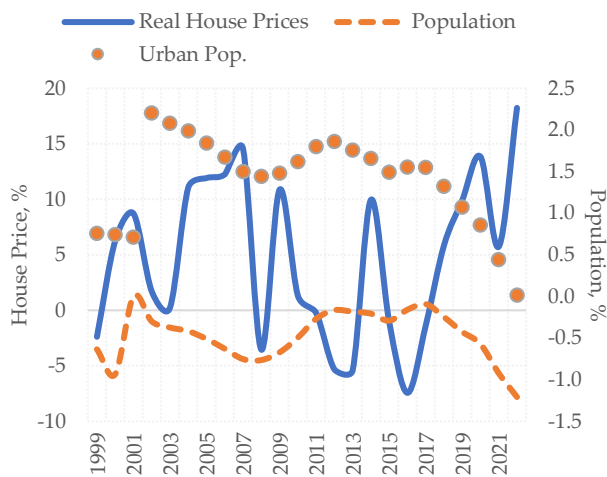
Figure 2. House price performance in Albania.

Table 1. Cumulative growth of house prices in the past two decades.

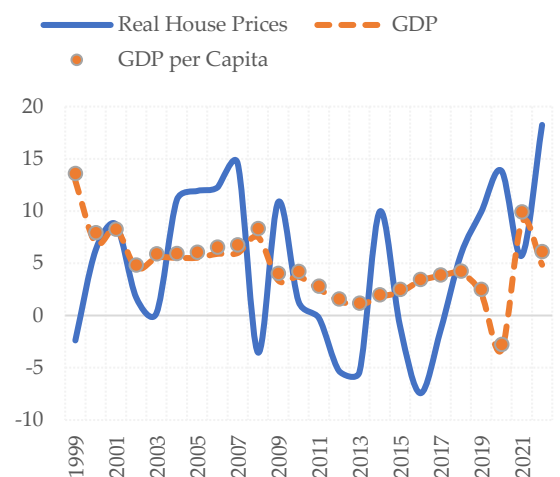
	Whole period 2000-2022	Rapid HPI growth 2000-2009	Relatively calm period 2010-2017	Return of strong HPI growth 2018-2022
HPI, cumulative growth (%).	401.7	146.5	1.9	76.3
HPI, st. dev. of yoy % changes.	8.4	7.9	6.7	8.3
CPI, cumulative growth (%).	77.8	30.1	14.8	12.7
CCI, cumulative growth (%).	6.0	-6.5	3.3	8.7
GDP, cumul. nom. growth (%)	454.9	181.1	39.1	41.9

A graphic analysis gives us an impression that the rapid growth of housing prices in recent years is related to the fundamental indicators (Figure 3). Despite the negative growth of the total population in recent decades, internal migration to urban areas in Albania has been constantly increasing. The favorable situation in the labor market, as implied by the decrease in the unemployment rate, as well as the wealth effect that is proxied here by the increase in GDP per capita, may have exerted pressure to raise housing prices. Non-resident interest in investing directly in real estate in Albania has grown significantly over the past five years, jumping from an average of 0.36% of GDP over 2013-17 to 1.59% in 2022. Similarly, the banking system appears to have further stimulated demand in the residential sector, as can be understood from the increase in the ratio of real estate loans to gross domestic product. In addition to lending, the continued decline in the real interest rate on new mortgage loans should have increased the affordability of housing purchases.

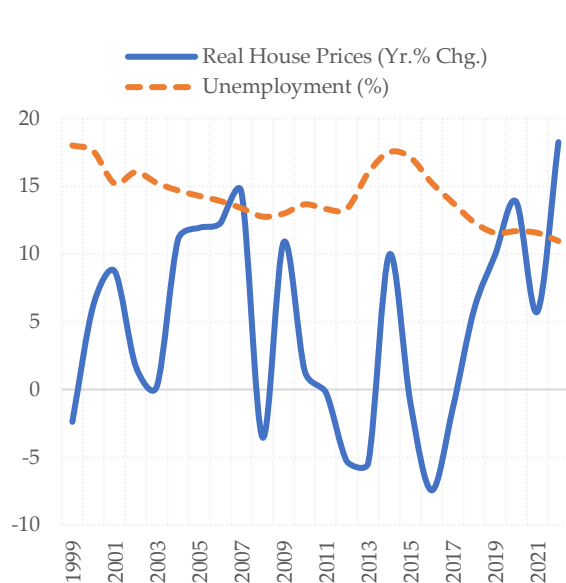
On the other hand, the influencing factors that affect the supply side such as costs and building permits for housing present a different picture. The construction cost index is constantly reported with a negative annual growth in real terms, and therefore incapable to influence the real price upsurge in the residential market. While the influence of construction permits is not very clear. The reduction of the area allowed for housing construction to only 3 square km during the years 2012-17 at a time when the urban population increased by over 159 thousand people may have created a synergy which has been somewhat reflected in the increase in housing prices in the subsequent period (see Table 2). However, the granting of building permits for dwellings measured in square km during 2018-22 should have eased the demand pressures resulting from the increase in the urban population, as is evident from the reduction of the ratio of these indicators to its lowest level since 2002.



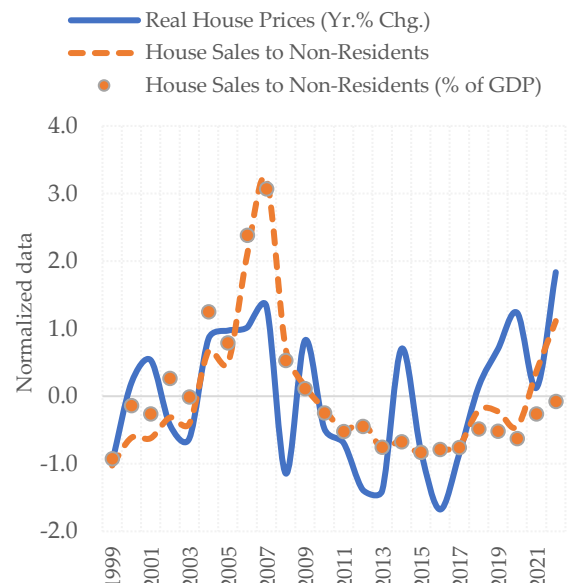
(a) House Prices and Population (YoY % change)



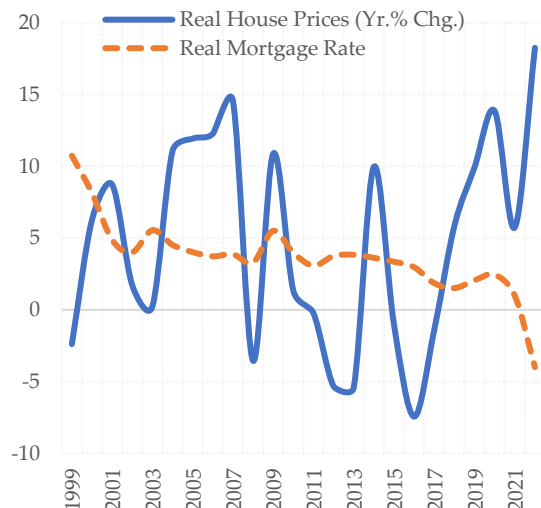
(b) House Prices and Income (YoY % change)



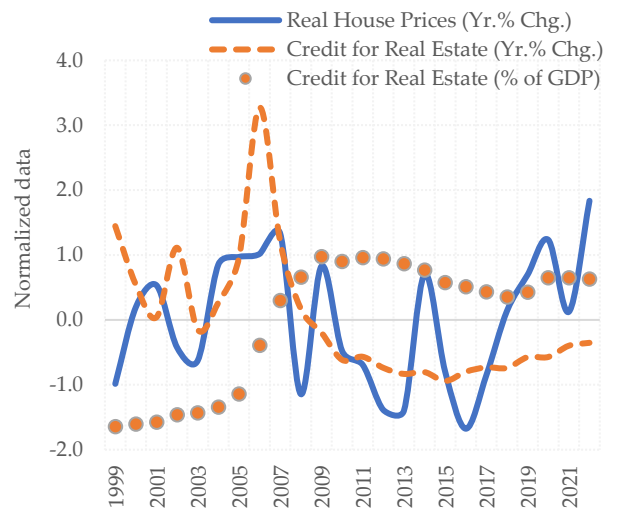
(c) House Prices and Unemployment Rate



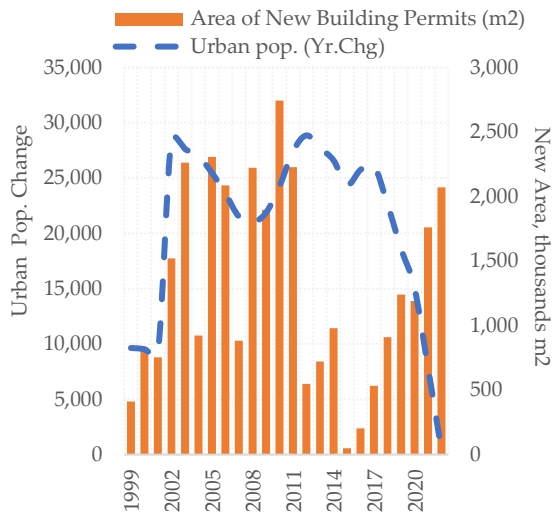
(d) House Prices and House Sales to Non-Residents



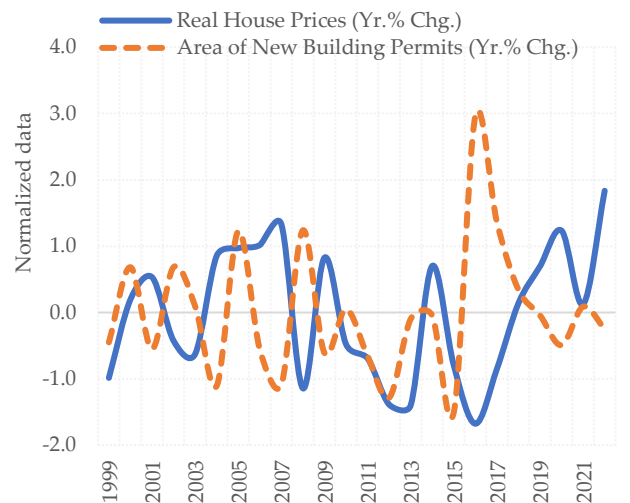
(e) House Prices and Mortgage Rate



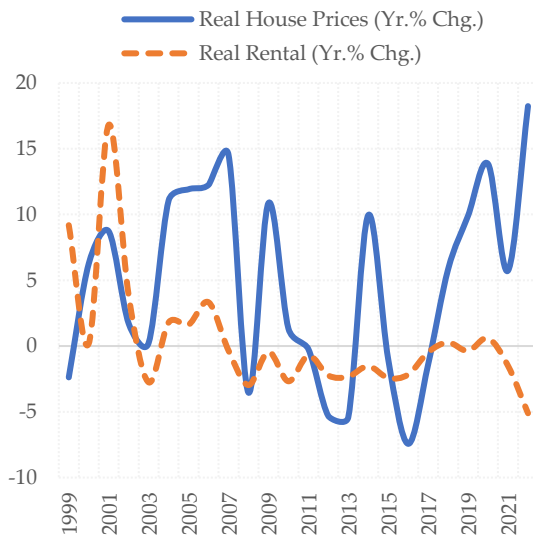
(f) House Prices and Credit for Real Estate



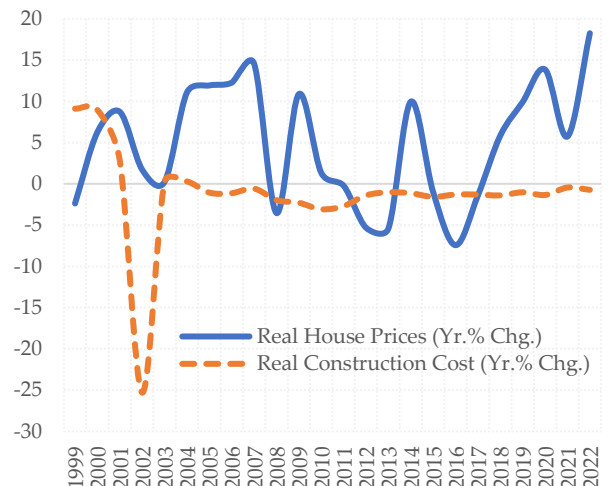
(g) House Demand and Supply



(h) House Prices and New Area for Build. Permits



(i) House Prices and Rentals



(j) House Prices and Construction Costs

Figure 3. Graphic analysis of house price determinants.

Table 2. Urban population growth per sq. km of house building area permits.

Years	Urban population, cumulative growth (1)	Sum of new house building area permits, in km ² (2)	Ratio of column (1) over (2) (3)
2002-22	472,243	29.28	16,131
2002-12	277,204	19.62	14,130
2012-22	223,898	10.21	21,936
2012-17	159,416	3.04	52,526
2018-22	64,482	7.17	8,991

4. Data Issues

As there is no consensus on a properly defined multivariate model that could fully explain and predict fluctuations of house prices, macroeconomic performance should provide at least in the long run, appropriate information for the tendency of prices in the house market. The economic data that is relevant for analyzing movements in house prices in Albania is not always available at quarterly frequency for the full period under investigation. Thus, many of them had to undergo certain manipulation in terms of interpolation from annual frequency and/or earlier period extrapolation by using supportive indicators. Below is the list of variables that could be finally constructed at quarterly frequency for the 1998Q1:2022Q4 period:

- House price index. It is constructed as a combination of the indices provided by the Financial Stability Department (2013Q1-2022Q4) and the Monetary Policy Department (1998Q1-2013Q4) at the Bank of Albania.
- Gross domestic product. Data is available from the Institute of Statistics (Instat) at quarterly frequency from 2009. Quarterly data that goes back to 1998Q1 is provided by the Research Department, Bank of Albania.
- Unemployment rate. Data source is Instat for population age of 15 years old and above.
- Rent. Rental is an item in the consumer price index, downloaded from the Institute of Statistics.
- Construction cost index. Data is available from Instat since 2002Q1. Data for the earlier period is calculated from authors with vintage data provided from the Statistics Department, Bank of Albania.
- Commercial banks' real estate loans. This indicator is obtained from assets of the banking system, which are available in the Bank of Albania's website.
- Interest rate on new housing loans. The composite indicator is constructed by authors using the simple average of interest rates on lek-, and euro-denominated loans for house purchases by households. The data is only available at monthly frequency from Bank of Albania since December 2015. Before that, data is extrapolated by means of regressions on the 12M Treasury bill rate, interest rates on euro loans and the 3M Euribor rate.
- House sales to non-residents. Data on non-residents' direct investments in houses is only available since 2014Q1 from the balance of payments statistics at the Bank of Albania. To extrapolate direct investment in real estate data series, various OLS regressions were run by authors with sample periods 2014-2022 or 2008-2013, using (different lags of) variables such as remittances, deposits of non-residents, and total inflows of FDIs. Each forecasts back to 1994 were compared with, and selected on the basis of extrapolations that are found closer to the survey results by Gedeshi and Uruci [25], which reveals that about 18 percent of remittances are used for reconstruction of purchasing new houses.
- Urban population. It is available from World Development Indicators. Annual data is interpolated into quarterly frequency using constant match average method.
- Area of construction permits issued for new residential buildings. Data is available from Instat at quarterly frequency. Earlier annual data is interpolated using constant match sum method.

5. The LSTM Technique and Modeling Strategy

Neural networks are being increasingly used as powerful tools for predicting time series data. Over time there have been developed a number of techniques that address internal challenges within these networks. Some popular examples include the multilayer perceptron (MLP), recurrent neural networks (RNN), generalized regression neural networks (GRNN), and long short-term memory (LSTM). These evolving neural network techniques belong to the family of deep learning methods, and have recently found extensive application in forecasting time series.

The hidden layers of conventional artificial neural networks consist of basic neuron configurations that overlook context. In addition to them, RNNs incorporate a directed cycle that enables past events to capture important information for future outcomes. RNNs are predominantly utilized for temporally correlated data, resulting in a neural network model that makes use of past data and the correlation between lagged and current data to forecast future data. Nonetheless, RNNs suffer from vanishing gradients when there is a substantial temporal gap between the relevant information and its utilization point. To address this issue, the so-called LSTM technique introduces cell states, acting as a conveyer belt, to the hidden states of an RNN. Through recursive operations, LSTM preserves both cell states and hidden states, mitigating the problem of vanishing gradients.

As such, the LSTM method intends to enhance the long-term memory of RNNs by incorporating memory cells and gating mechanisms that control information flow. LSTM networks overcome the limitations of RNNs by storing information and reducing errors over extended periods. The fundamental structure of LSTM revolves around the network's ability to learn what to retain, discard what is considered unnecessary, and keep track of information over long time intervals. In this study, an LSTM model is employed to identify which of the fundamental indicators prove relevant for predicting house prices in Albania.

Table 3 displays the univariate and multivariate LSTM model specifications that are chosen in our analysis. The modeling forecasting procedure draws its variables from a pool of indicators that are found theoretically relevant in other empirical studies. A number of networks for the real house price function were used, where both real rental and real GDP appear as informative variables in almost all models. This basic network design is then augmented with a couple of the remaining variables, so the selection procedure may contain up to a handful of regressors that are considered sufficient to describe the most important dynamics given the limited number of observations. Following other studies, all variables enter the model in year-on-year growth rates, except for the real interest rate and the unemployment rate which are kept in levels.

The structure of neural networks is generally described by three "layers" and the number of "neurons", or nodes that transfer information among them. It starts with the input layer, whose nodes can be viewed as the model's explanatory variables. Information from input nodes is processed to the output layer (equivalently, the dependent variable) via a number of nodes in the hidden layer(s). Given the limitations of our data series, all LSTM model specifications take the dependent variable of real house prices in the current quarter to be a function of two input lags of all explanatory indicators including its own lags, thereby introducing two autoregressive terms.¹ The flexibility of the networks and model fit could be increased by adding more neurons and hidden layers (Ghysels and Marcellino [26]), therefore we consider two hidden layers with 200 and 100 nodes, respectively. There are a number of nonlinear functions needed to "activate" the hidden layers. We employ the Rectified Linear Unit (ReLU) function, which is found to be computationally efficient (Nair and Hinton [27]).

¹ A reduced-form model type with four autoregressive terms was tried, too, but they were found to provide inferior predictions when compared to models with two autoregressive terms. For sake of space the results are not shown here, but can be available from the authors on demand.

Table 3. LSTM network specifications.

Dependent variable	Explanatory variables				
	(1)	(2)	(3)	(4)	(5)
HPI	LDV				
HPI	LDV	GDP			
HPI	LDV	YPC			
HPI	LDV	RENT			
HPI	LDV	RENT	GDP		
HPI	LDV	RENT	YPC		
HPI	LDV	RENT	YPC	CCI	
HPI	LDV	RENT	GDP	CCI	
HPI	LDV	RENT	GDP	BCRE	
HPI	LDV	RENT	GDP	RIR	
HPI	LDV	RENT	GDP	RIR	BCRE
HPI	LDV	RENT	GDP	HSNR	
HPI	LDV	RENT	GDP	UNR	
HPI	LDV	RENT	GDP	URB	
HPI	LDV	RENT	GDP	URB	CM2

Note: HPI = real house price index, CPI-deflated; LDV = lagged dependent variable; GDP = real GDP; YPC = real GDP per capita; RENT = real rental, CPI-deflated; CCI = construction cost index; BCRE = bank credit for real estate; RIR = real interest rate on new loans; HSNR = house sales to non-residents; UNR = unemployment rate; URB = urban population; CM2 = area of construction permits in thousand square meters.

The LSTM networks are trained by using the Adaptive Moment Estimation (Adam), which is an extension to the classical stochastic gradient-descent procedure used to update the network weights. Adam combines the advantages of certain popular extensions, and may in practice be preferred to other adaptive learning-method algorithms. One of the benefits of these optimization algorithms is that one does not need to tune the learning rate (Ruder [28]), therefore we count upon its default value of around 0.001. Many researchers monitor errors on a validation set during training and stop the parameter updating earlier if the forecast error does not improve enough. However, the parameters (biases and weights) in our analysis are updated by the Adam optimizer until the error in the training sample is reduced and becomes equal to the learning rate value, or a maximum of 400 epochs is reached.

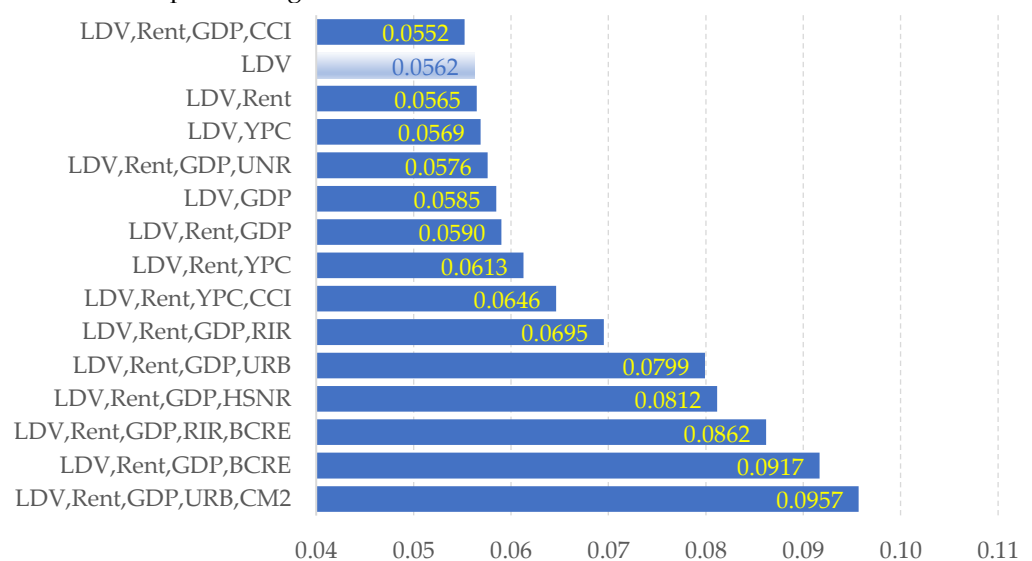
Finally, the link between house prices and the selected informative variables is tested in a pseudo out-of-sample period consisting of the last five years, which are excluded from the network learning process. More precisely, the (adjusted) period under investigation, which ranges from 1999Q1 to 2022Q4 has been divided into the so-called training and the validation period up to 2017Q4,² and the forecast evaluation period that runs from 2018Q1 through 2022Q4. The forecast evaluation is based on the smallest estimated forecast errors, as measured by the root mean square error (RMSE). For each of the LSTM specifications we note down its forecast performance for the 1, 4, 8 and 12 quarters ahead. Consequently, the evaluation process for every model is repeated 20 (17, 13 and 9) times for the 1 (4, 8 and 12) quarter(s) ahead forecast horizon, until the last horizon ending in 2022Q4 is reached.

² The validation dataset consists of 16 quarters.

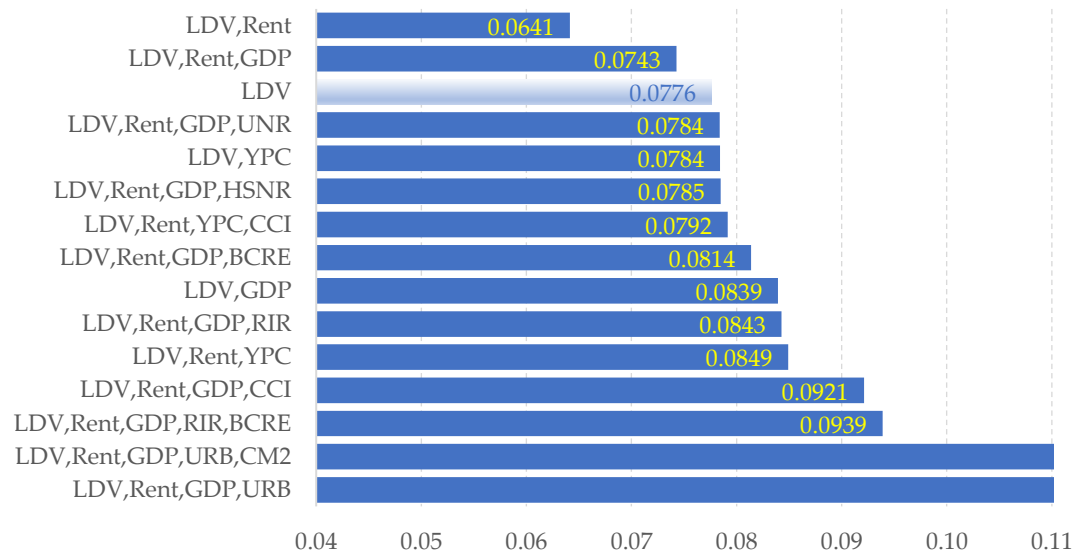
6. Empirical Findings

The power of deep neural networks stems from their freedom to choose a large number of parameters for training that can fit well different types of datasets. However, this power can turn into a weakness, if the model is “saturated” with a lot of parameters that can help it learn too many details in the training dataset but performs very poorly on the unseen or validation period. One way to check for the problem of overfitting is to monitor the evolution of predicted errors as we increase the number of epochs. If error values in the training period decrease significantly but errors in the validation period show substantial increase, overfitting needs to be taken into account. Measuring the model loss for all of our LSTM networks (not shown here) indicates that the size of forecast errors is always (considerably) descending on training data. On the other hand, forecast improvement in the validation dataset is clearly not as much of, and errors often incline upward at higher numbers of epochs. Nevertheless, it was resolved the uprise in errors’ size is not large enough to make a case for reconsidering network configuration due to overfitting.

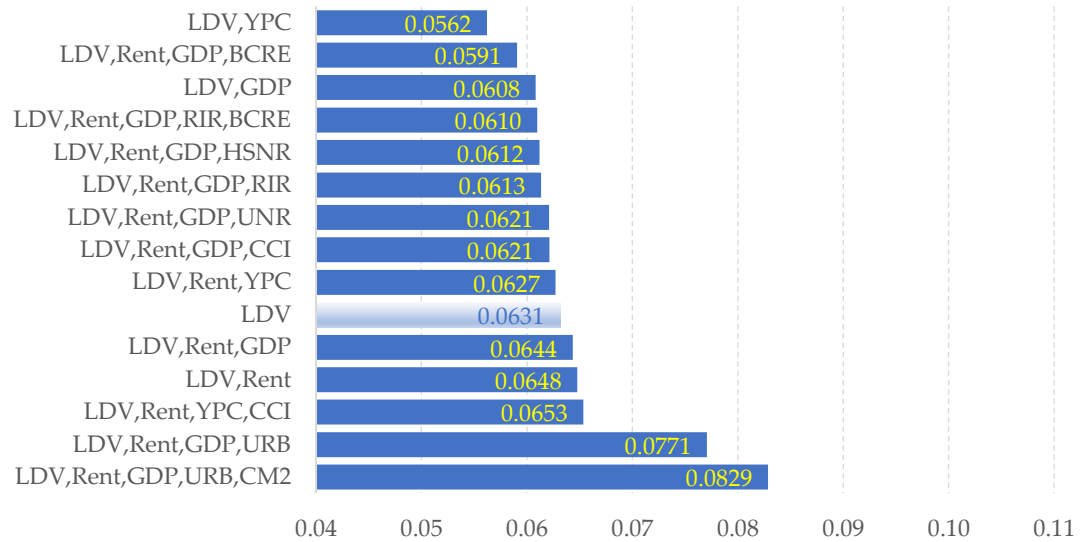
Turning to the focal point of the analysis, we now try to differentiate the economic indicators that can best serve as informative variables for predicting housing prices, particularly when compared with the univariate model performance. Figures 4a-4d compare the ability of all network designs to forecast in the short and the medium run during the whole out-of-sample period spanning from 2018Q1-2022Q4. Stimulatingly, the univariate model, which only relies on its own past values of house price growth, does not show as the best forecasting model in any of the forecast horizons. Its underperformance holds the attention that residential prices are indeed linked to, and have not moved in detached mode from the theory-driven economic indicators neither in the short, nor in the longer-term period. Another salient feature of the results is the rising number of explanatory variables that get involved in the top-ranking models as we aim for the medium-term forecasts. Real rental and GDP developments seem to provide relatively important information for predicting short-term movements in housing prices, as it is shown in the results for the 1 and 4 quarters ahead forecast horizons. Going for the two and three years ahead forecasts the group of relevant indicators gets augmented, particularly with the construction cost index and bank credit for real estate. Interestingly, urban population growth that captures the impact of evolving demographic factors falls in the group of worst forecast performers. In the same vein, area of residential building permits which may be used as a supply-side determinant seems highly ineffectual in the endeavor of beating the univariate network forecasts. The forecast errors (RMSEs) of models that contain these indicators are at least 50 percent higher than those of the univariate model.



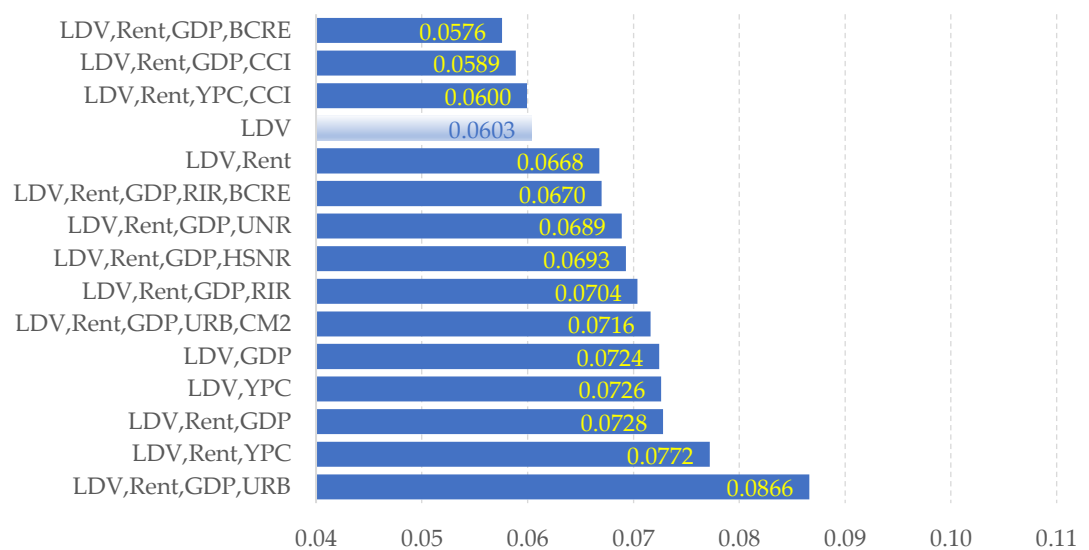
(a) RMSE ranking for the forecast horizon, h = 1.



(b) RMSE ranking for the forecast horizon, h = 4.



(c) RMSE ranking for the forecast horizon, h = 8.



(d) RMSE ranking for the forecast horizon, h = 12.

Figure 4. RMSE Ranking from Lowest to Largest (out-of-sample period, 2018Q1-2022Q4).

The annual growth of real house prices during our forecast evaluation period was not so even. It accelerated from 5.9 percent in 2018 to 13.9 percent during pandemic in 2020. Despite cooling down to 5.8 percent in 2021, it accelerated even faster to 18.2 percent in 2022, therefore resisting to the adverse shocks stemming from struggling global economic and geopolitical issues. For that reason, it is worthwhile to check whether the networks training and validation up to the end of 2017 hold and provide consistent results during the post-Covid lockdown period (2020Q3-2022Q4). Again, the forecast ability of multivariate models is clearly stronger than the univariate model.³ Their superiority is more noticeable in the short run predictions (for horizons equal to 1 and 4 quarters), where the majority of fundamental indicators appear to have carried useful information for real house prices in the coming year. All the same, urban population and area of building permits fall in the worst ranking models, giving the impression of being unhelpful in our exercise.

The employed regularization method used on normalized data should help to impede overfitting by modifying the cost function in our LSTM neural networks. Yet, underperformance in the validation dataset could come from overly simplistic assumptions (resulting in biased forecast errors) and/or from model's sensitivity to fluctuations in the training set (resulting in high variance of errors). For that reason, we compute the bias and variance proportions of the mean squared forecast errors in our models. The former (latter) proportion indicates how far the mean (variance) of predictions is from that of actual data. Both proportions take values between 0 and 1. The smaller they are, the better the model performs in tracking the mean and variance of real house prices.

Table 4 displays the results for the univariate and multivariate networks in the testing dataset, spanning from 2018Q1 to 2022Q4. Generally speaking, all models seem to predict fairly well the mean of real house prices, particularly at longer horizons of 2-3 years. The bias proportion of the univariate model is 0.31 at $h=1$ and decreases to merely 0.02 at $h=12$. By and large, augmenting the network with economic fundamentals improves the mean forecasts at all horizons. Furthermore, all LSTM networks show satisfactory results in foretelling the variability of future house prices. The computed variance proportions appear very low in most cases, for both types of models. In sum, the average of mean (0.16) and variance (0.07) proportions for all models at all horizons only amount to 0.23 (out of 1), suggesting that more than three-fourth of the forecast error may be considered as irreducible error. This implies that the selected LSTM structures may suffer neither from underfitting (high bias), nor from overfitting (high variance). The statistical robustness of our models provides, thus, support to above findings that (certain) fundamental indicators are important in forecasting house prices in Albania.

³ The results are not shown here, but can be put at the readers' disposal upon request.

Table 4. Measuring Bias and Variance Proportions of Mean Squared Forecast Errors.

Forecast horizons:	Bias proportion				Variance proportion			
	h=1	h=4	h=8	h=12	h=1	h=4	h=8	h=12
LDV (Univariate)	0.312	0.338	0.198	0.021	0.245	0.055	0.064	0.137
LDV,GDP	0.308	0.389	0.102	0.016	0.144	0.001	0.094	0.033
LDV,YPC	0.305	0.374	0.164	0.000	0.188	0.012	0.220	0.031
LDV,Rent	0.075	0.086	0.180	0.063	0.179	0.001	0.103	0.047
LDV,Rent,YPC	0.128	0.226	0.011	0.008	0.075	0.000	0.061	0.005
LDV,Rent,GDP	0.118	0.130	0.016	0.030	0.141	0.003	0.009	0.017
LDV,Rent,GDP,CCI	0.008	0.393	0.134	0.009	0.184	0.004	0.107	0.147
LDV,Rent,YPC,CCI	0.129	0.314	0.052	0.010	0.232	0.030	0.048	0.142
LDV,Rent,GDP,BCRE	0.232	0.155	0.076	0.000	0.001	0.024	0.227	0.201
LDV,Rent,GDP,RIR	0.340	0.182	0.173	0.008	0.163	0.001	0.187	0.014
LDV,Rent,GDP,RIR,BCRE	0.244	0.250	0.003	0.000	0.010	0.009	0.070	0.095
LDV,Rent,GDP,HSNR	0.049	0.200	0.130	0.026	0.015	0.020	0.186	0.026
LDV,Rent,GDP,UNR	0.047	0.304	0.091	0.053	0.133	0.018	0.104	0.034
LDV,Rent,GDP,URB	0.396	0.492	0.329	0.065	0.090	0.008	0.012	0.000
LDV,Rent,GDP,URB,CM2	0.446	0.380	0.290	0.021	0.015	0.011	0.000	0.035

Note: LDV = lagged values of the dependent variable (real HPI); GDP = real GDP; YPC = real GDP per capita; RENT = real rental, CPI-deflated; CCI = construction cost index; BCRE = bank credit for real estate; RIR = real interest rate on new loans; HSNR = house sales to non-residents; UNR = unemployment rate; URB = urban population; CM2 = area of construction permits in thousand square meters. Shadowed cells indicate that multivariate models perform not as well as the univariate network in tracking the mean and variance of actual house prices.

7. Concluding Remarks

After a period of relative calm in the mid-2010s, the housing prices in Albania have exhibited a return to a steep rise for at least four consecutive years, including during the pandemic. The current phase has raised concerns about a possible change in direction as post-pandemic housing price surges face increasing risks of reversal amidst slower economic growth and higher interest rates. Although housing prices appear to be generally in line with its “sustainable” levels as indicated by the deviation of the ratio of house price to per capita GDP from its estimated long-term levels (Vika [29]), fear about a potential price correction necessitates a rigorous monitoring and understanding of the key factors influencing the risks of housing price decline. The prediction-based analysis in this article demonstrates an important role for fundamental indicators in predicting house prices in Albania. Their information content improves upon univariate model forecasts in the short-, as well as the longer-term horizons, albeit the combination of variables in addition to real rental and GDP growth could change over time. Although the Albanian financial sector at present appears relatively strong and resilient, government institutions should be attentive to the housing market trends and its related economic fundamentals in order to ensure the stability of both housing and finance.

Author Contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used “Conceptualization, B.V. and I.V.; methodology, B.V.; software, B.V.; validation, B.B. and I.V.; formal analysis, B.V. and I.V.; investigation, B.V. and I.V.; resources, I.V.; data curation, I.V.; writing—original draft preparation, B.V. and I.V.; writing—review and editing, B.V. and I.V.; visualization, I.V.. All authors have read and agreed to the published version of the manuscript.”

Funding: “This research received no external funding”.

Acknowledgments: The authors are grateful to comments and suggestions received from participants during the presentation at the “Istanbul Annual International Multidisciplinary Conference on Economics, Business, Technology and Social Sciences - 2023”, organized by the European Institute for Research and Development (EIRD), Istanbul, Türkiye, in May 13-14, 2023. Special thanks are for Mr Altin Tanku, Head of Research Department at Bank of Albania, for helpful discussions on house price determinants in Albania.

Conflicts of Interest: “The authors declare no conflict of interest. The institutions where the authors worked at the time of conducting this research article had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results. Therefore, any views or errors that remain are the sole responsibility of authors.”

References

- Duca, J. V.; Muellbauer, J.; Murphy, A. (2021). What drives house prices cycles? International experience and policy issues. *Journal of Economic Literature* 59 (3): 773-864.
- Tsatsaronis, K.; Zhu, H. (2004). What drives housing price dynamics: cross-country evidence. *BIS Quarterly Review*, March.
- Egert, B.; Mihaljek, D. (2007). Determinants of house prices in Central and Eastern Europe. *Comparative Economic Studies*, Vol. 49, pp. 367-388.
- Agnello, L.; Schuknecht, L. (2011). Booms and busts in housing markets: determinants and implications. *Journal of Housing Economics*, Vol. 20, pp. 171-190.
- Cerruti, E.; Dagher, J.; Dell’Ariccia, G. (2015). Housing finance and real-estate booms: a cross-country perspective. *IMF Discussion Note* No. 15/12.
- Yzeiraj, Endrit (2016). House prices in Albania: deviations from the equilibrium? *Bank of Albania working paper* 20 (59) 2016.
- Suljoti, Erjona (2017). The implications of financial conditions in the housing market – a cointegrated analysis. *Bank of Albania Working Paper* 27 (66) 2017.
- Kraja, I.; Sejдини, M.; Sejдини, A. (2018). Tregu i banesave në Shqipëri: regresioni hedonik. *INSTAT Revista e Statistikave dhe Analizave Social Ekonomike* Nr. 1/2018. Available online: <https://www.instat.gov.al/media/4268/4-the-housing-market-in-albania.pdf> (accessed on 30 April 2023).
- Marku, E.; Lleshaj, Ll.; Lleshaj, A. (2020). VECM analysis of house price index. Case of Tirana. *European Journal of Marketing and Economics*, Vol. 3, Issue 1, January-June 2020.
- Lleshaj, Ll.; Korbi, A. (2019). VAR model for short-run endogenous factors in real estate market: case of Albania. *American Research Journal Of Humanities Social Science*, Vol. 02, Issue 10, pp. 29-36, October 2019.
- Koprencka, L. K.; Bundo, Sh.; Qarri, A. (2014). Factorial analysis of Albanian housing market. *Acta Universitatis Danubius, Economica*, Vol 10, No 4 (2014).
- Halili, F. (2022). The Impact of Macroeconomic Factors on the Change of Residential Prices – The Case Study of Albania. *International Journal of Applied Research in Management and Economics*, 5(4): 29-44.
- Mora-Garcia, R.-T.; Cespedes-Lopez, M.-F.; Perez-Sanchez, V.R. (2022). Housing Price Prediction Using Machine Learning Algorithms in COVID-19 Times. *Land* 2022, 11, 2100.
- Wang, D.; Li, V.J. (2019). Mass appraisal models of real estate in the 21st century: a systematic literature review. *Sustainability* 2019, 11 7006.
- Park, B.; Bae, J.K. (2015). Using machine learning algorithms for housing price prediction: the case of Fairfax County, Virginia housing data. *Expert Syst. Appl.* 2015, 42, 2928-2934.
- Banerjee, D.; Dutta, S. (2017). Predicting the housing price direction using machine learning techniques. Proceedings of the 2017 IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI), Chennai, India, 21–22 September 2017; pp. 2998–3000.
- Kok, N.; Koponen, E.-L.; Martínez-Barbosa, C.A. (2017). Big Data in Real Estate? From Manual Appraisal to Automated Valuation. *J. Portf. Manag.* 2017, 43, 202–211.
- Ceh, M.; Kilibarda, M.; Liseć, A.; Bajat, B. (2018). Estimating the Performance of Random Forest versus Multiple Regression for Predicting Prices of the Apartments. *ISPRS Int. J. Geo-Inf.* 2018, 7, 168.

19. Fan, C.; Cui, Z.; Zhong, X. (2018). House Prices Prediction with Machine Learning Algorithms. Proceedings of the 2018 10th International Conference on Machine Learning and Computing, Macau, China, 26–28 February 2018; pp. 6–10.
20. Ho, W.K.O.; Tang, B.-S.; Wong, S.W. (2021). Predicting property prices with machine learning algorithms. *J. Prop. Res.* 2021, 38, 48–70.
21. Chatzidis, I.V. (2019). Prediction of Housing Prices based on Spatial & Social Parameters using Regression & Deep Learning Methods. Master's Thesis, University of Thessaloniki, Thessaloniki, Greece, 2019.
22. Alfaro-Navarro, J.-L.; Cano, E.L.; Alfaro-Cortés, E.; García, N.; Gámez, M.; Larraz, B. (2020). A Fully Automated Adjustment of Ensemble Methods in Machine Learning for Modeling Complex Real Estate Systems. *Complexity* 2020, 2020, 5287263.
23. Hong, J. (2020). An Application of XGBoost, LightGBM, CatBoost Algorithms on House Price Appraisal System. *Hous. Financ. Res.* 2020, 4, 33–64.
24. Hacıevliyagil, N.; Drachal, K.; Eksi, I.H. (2022). Predicting House Prices Using DMA Method: Evidence from Turkey. *Economies* 10: 64. Available online: <https://doi.org/10.3390/economies10030064> .
25. Gedeshi, I. (2002). The role of remittances from Albanian emigrants and their influence in the country's economy. In Kotios and Petrakos (eds.) *Restructuring and Development in Southeastern Europe*, University of Thessaly Press, SEED, 2002.
26. Ghysels, E.; Marcellino, M. (2018). *Applied Economic Forecasting Using Time Series Methods*. Book published by Oxford University Press, 2018.
27. Nair, V.; Hinton, G. E. (2010). Rectified linear units improve restricted Boltzmann machines. Proceedings of the 27th international conference on machine learning (ICML-10), pp. 807-814.
28. Ruder, S. (2017). An overview of gradient descent optimization algorithms. arXiv:1609.04747v2 [cs.LG] 15 Jun 2017.
29. Vika, I. (2023). Whither house prices in Albania. *Bank of Albania*, Unpublished research document, May, 2023.



The Institutional Characteristics of Government Debt Management and Associated Challenges in Georgia

Nazira Kakulia¹ and Lasha Kelikhashvili^{2,*}

¹ Associate professor at Ivane Javakishvili Tbilisi State University; Nazira.kakulia@tsu.ge

² PhD Candidate at Ivane Javakishvili Tbilisi State University; Lasha.Kelikhashvili952@eab.tsu.edu.ge

* Correspondence: Lasha.Kelikhashvili952@eab.tsu.edu.ge

Abstract: The paper summarizes certain institutional characteristics of the government debt management process in Georgia. The research aims to identify potential areas for improvement that should support the effective management of public finances and enhance government effectiveness overall. By nature, the paper is primarily based on qualitative research methods, predominantly centered around the analysis of international assessments and the legislative framework. The research reveals that there are some more or less significant challenges in the country that need to be addressed by policymakers.

Keywords: government debt; institutional environment; legislation

1. Introduction

By one of the most formal definitions, government debt refers to the financial obligations incurred by a government to residents and/or non-residents of the country [6]. According to the International Monetary Fund's databases, there has been virtually no sovereign state in recent decades whose government has been without debt [35]. In a broad sense, government debt includes the financial obligations of the government sector, and debt accumulation mainly depends on macroeconomic trends and political decisions. On the other hand, under democratic conditions, governments have a strong tendency toward deficit spending, which ultimately results in debt accumulation. Within the realm of public finance, there is a significant emphasis on establishing an effective debt management mechanism, which delineates the parameters of fiscal policy [4]. The importance of an effective government debt management mechanism is underscored by the fact that its absence is often associated with a heightened rate of debt growth. Numerous studies show that a high and increasing level of government debt is associated with adverse effects on economic growth in the medium and long term. According to Reinhart and Rogoff [18], in developing countries, a debt-to-GDP ratio exceeding 60% significantly impedes the nation's investment activity and economic growth. This threshold is relatively high for developed countries. Pattillo, Poirson, and Ricci [19], drawing on data from 93 countries, showed that the impact of government debt on investment activity and economic growth becomes sharply negative when the debt-to-GDP ratio reaches 35–40 percent. In contrast, Schclarek [20], analyzing data from 59 countries, revealed that government debt, irrespective of its magnitude, exerts a detrimental influence on investment and economic growth.

It is noteworthy that the degree of influence of government debt on economic growth exhibits significant heterogeneity among countries [13, 14]. Some studies attribute this heterogeneity to differences in the macroeconomic, financial, and institutional characteristics among countries. For instance, Chudik et al. [2] suggest that the impact varies between countries due to disparities in their financial systems, historical patterns of debt service, and political systems. Kourtellos argues that the effect of government debt on economic growth is contingent upon a country's democratic institutions. Specifically, in the presence of a weak institutional environment, a negative relationship exists between the mentioned indicators, whereas in the conditions of a robust institutional environment, this relationship dissipates [9].

The study by Teles and Mussolini, which focuses on the productivity of government spending, is closely tied to the institutional environment. The authors conducted an empirical analysis using panel data from 74 countries and found that an increase in government debt can stimulate economic growth. However, a prerequisite for this is the existence of a healthy fiscal situation where the increase in debt is associated with a simultaneous increase in productive government spending [23].

Citation: Kakulia, N.; & Kelikhashvili, L. (2024). The Institutional Characteristics of Government Debt Management and Associated Challenges in Georgia. *Journal Of Economic and Business Issues*, 4(1), 56-63.

Received: 23/11/2023

Accepted: 27/12/2023

Published: 29/02/2024

From this perspective, the study underscores the necessity for the effective utilization of credit resources. Many other researchers emphasize the critical importance of a well-developed institutional environment [10, 15].

These views align with those of researcher-economists, who argue that a generally healthy institutional environment is one of the key factors influencing a country's economic situation [1, 8, 16].

Considering the aforementioned reasons, the presence of a proper debt management mechanism is especially crucial for developing countries, primarily due to their unsustainable macro-fiscal environment [24] and/or relatively high risks of corruption [21].

For these reasons, almost all countries have the appropriate legal environment that, on the one hand, ensures the maintenance of fiscal discipline by limiting debt growth and, on the other hand, creates the institutional basis for managing the accumulated debt. Given the relevance of the issue, the purpose of this research is to study the formal institutional characteristics in Georgia from the perspective of government debt management. Achieving this goal serves the timely identification of existing shortcomings in the country in terms of debt management, the elimination of which should potentially contribute to the effectiveness of the country's fiscal policy.

2. Materials and Methods

The research, due to its specificity, is mostly based on the methods of qualitative and comparative analysis. It also uses some statistical analysis methods when analyzing the effectiveness of fiscal rules in Georgia. The article discusses some internationally recognized evaluations related to debt management. Specifically, the results from the last reports of the Public Expenditure and Financial Accountability (PEFA) assessment [26, 27] and the Debt Management Performance Assessment (DeMPA) [25]. These two reports jointly evaluate the design and effectiveness of many aspects of the government debt management framework. Additionally, the research goes deeply into the legislation in force in Georgia related to public debt. In particular, the "Law of Georgia on State Debt" [30], "Organic Law on Economic Freedom" [29], "Budget Code of Georgia" [31], and the decree of the Minister of Finance of Georgia N99, "On Approving Budget Classification" [32]. The quantitative data used in the paper comes from the Ministry of Finance of Georgia and the National Statistics Office of Georgia. The conclusion from the study is unique by nature and valuable for further research.

3. Results

Georgia, with a market-based economic system, has a relatively short history of 30 years. The institutional environment of fiscal policy and public finance arrangements is no exception from this history. Furthermore, the institutional design of debt management is one of the micro-components of the general institutional landscape of the country. Therefore, for the analysis of government debt and the comprehensive assessment of its potential impact on macroeconomic parameters, it is important to review the existing institutional environment to detect potential shortcomings.

Before delving into the details of debt management, it is pertinent to analyze the overall framework of fiscal policy and public finance management in the country. In this regard, our focus will be primarily on reviewing the information presented in the 2022 report of the assessment of 'Government Expenditure and Financial Accountability' [27]. This assessment holds particular significance as a diagnostic tool for public finance management, jointly developed by the European Commission, IMF, World Bank, and the governments of France, the UK, Sweden, and Switzerland, aimed at studying reforms implemented in individual countries. The criteria from this assessment collectively form a kind of benchmark for well-designed PFM.

PEFA evaluates the institutional design of public finance management based on 94 indicators categorized into seven groups. Within these groups, government debt management issues are encompassed under the 'Management of Assets and Liabilities' indicator. The evaluation employs a four-point system (A, B, C, and D), where an 'A' indicates the best result while a 'D' indicates the worst. These scores can be equated with numerical scores: A = 4, B = 3, C = 2, and D = 1, to produce comparable statistics.

In Georgia, PEFA assessments were conducted at the central government level in 2013, 2018, and 2022 [33]. The results for 2022, along with the outcomes of the most recent evaluations in other participating countries, are summarized in Figure 1. Notably, the results indicate that Georgia holds an advanced position among the assessed countries in terms of the institutional design of public finance management. A particularly intriguing comparison lies with the ECA countries, predominantly comprising post-communist nations of the Soviet Union and Eastern Europe, which significantly share the same experiences with Georgia in forming a market economy.

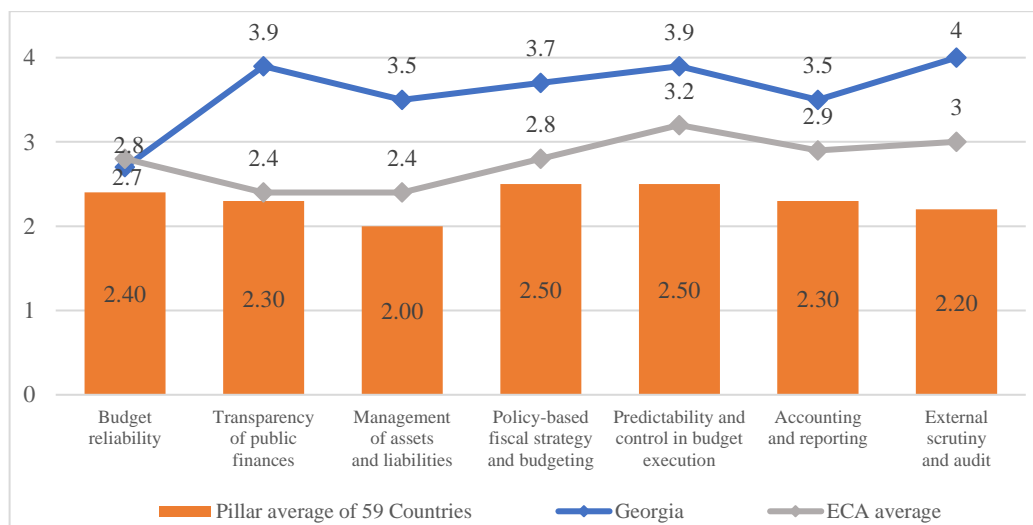


Figure 1. PEFA assessment scores for Georgia, ECA and total 59 countries participating in the program. Source: Ministry of Finance of Georgia

In the ECA region, institutional design of "asset and liability management" (which also includes debt management issues), Georgia is considered one of the advanced countries with 3.5 points (the ECA countries' average is 2.4 points). A similar situation is true for almost all the other indicators.

It should be noted that, along with significant informative nature, the main shortcoming of PEFA is the fact that it is mainly focused on the assessment of the institutional environment design and pays less attention to its actual performance. Therefore, the positive score obtained in the mentioned assessment does not guarantee high efficiency in the institutional design of the public sector.

In addition to the PEFA assessment, which evaluates various aspects of public finance management, the "Debt Management Performance Assessment" (DeMPA) developed by the World Bank (WB) provides more in-depth and crucial information directly related to the effectiveness of the government debt management mechanism. It not only focuses on institutional design but also observes its performance. This assessment establishes a standard for the design of government debt management institutional framework and its performance.

The assessment was first conducted in Georgia in 2013 and then again in 2020 [25]. Despite significant progress in debt management during this period, certain challenges persisted. Notably, out of the 33 indicators determined by the methodology, 22 indicators received the lowest score, either 'D' or 'C,' in 2013, while the same scores were deserved by 15 indicators in 2020 (Figure 2).

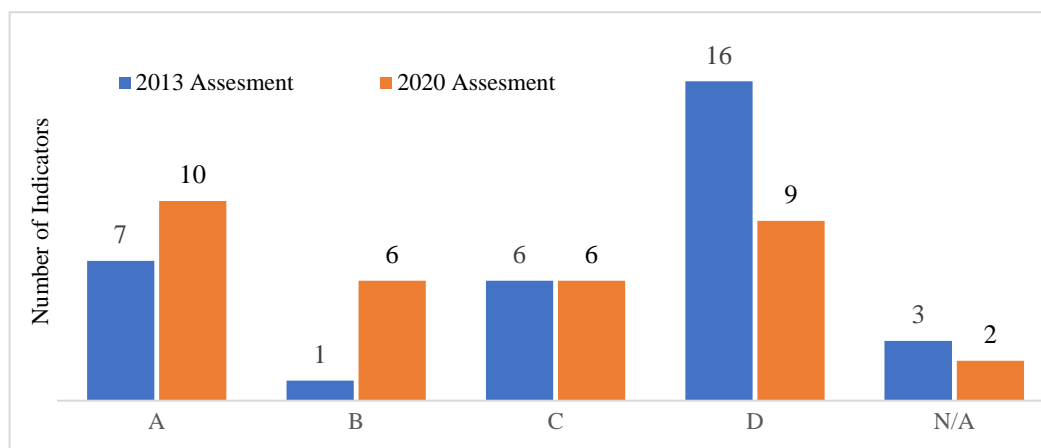


Figure 2. Distribution of the DeMPA scores for 2013 and 2020. Source: World Bank

Despite progress in certain areas, according to DeMPA's 2020, several issues are still challenging:

- The process and procedures of on-lending;

- Low effectiveness of the debt management strategy document in the process of determining annual credit borrowing needs;
- Challenges in reporting against targets outlined in the debt management strategy.

It should be mentioned that significant changes were made in terms of the debt management process in 2021–2022, following the assessment. In particular, in 2021, for the first time since 2019, the government's debt management strategy was updated, outlining the main directions and targets of debt management. Additionally, based on the new regulation, the strategy must be updated annually. Considering the changes, it is likely that as of the end of 2022, the DeMPA assessment indicators have improved compared to the previous assessment, although challenges persist.

Alongside the assessments based on the aforementioned methodologies, it is crucial to delve into the legal framework in Georgia relating to government debt management and the associated challenges. The legal framework is a vital component that determines the formal institutional design.

The formal institutional design of public sector debt management in Georgia, along with other indirectly connected regulatory acts, mainly relies on the "Law of Georgia on State Debt" [30], "Organic Law on Economic Freedom" [29], "Budget Code of Georgia" [31], and the decree of the Minister of Finance of Georgia N99 "On Approving Budget Classification" [32].

"The Law of Georgia on State Debt" [30] defines the concept of state debt, categorizing it into two major components: state domestic and state foreign debt (the foreign debt component also includes the debt of the National Bank's debt to the IMF). According to the law, credit resources mobilized in national currency by the Ministry of Finance on behalf of the state, or with the approval of the Ministry of Finance (including resources mobilized by issuing securities denominated in national currency), belong to the state domestic debt. State external debt includes credit resources mobilized in foreign convertible currency by the Ministry of Finance on behalf of the state or with the approval of the Ministry of Finance (including resources mobilized by issuing securities denominated in foreign convertible currency). The mentioned law assigns exclusive responsibility for the management of public debt to the Ministry of Finance of Georgia, a practice considered the best internationally by the IMF [6].

Issues related to government debt are also defined by the "Organic Law of Georgia on Economic Freedom." [29] The law determines the definition of government debt and the fiscal rules applicable in Georgia. In particular, the law defines government debt as follows:

Government debt	=	State debt defined by the "The Law of Georgia on Public Debt"	-	Debt of National Bank of Georgia to IMF	+	Debt of budgetary organizations
------------------------	---	--	---	--	---	--

Figure 3. Definition of Government debt in Georgian legislature.

Source: *Organic Law of Georgia on Economic Freedom*

It should be noted that from 2023, the debt of budgetary organizations includes the financial obligations of those state-owned enterprises, which were classified as a government sector based on the IMF's recommendation [34].

As for fiscal rules, two quantitative fiscal rules are defined by the law. In particular:

1. **Debt Rule** - The ratio of (Government debt + PPP)/GDP shall not be more than 60%;
2. **Budget Balance Rule** - The ratio of the consolidated budget deficit/GDP shall not be more than 3%.

The existence of mechanisms for deviating from fiscal rules is one of the crucial parts of anti-crisis policy in many countries. However, for the credibility of fiscal rules, it is important that deviations occur only in necessary situations and are fully explained by these situations [11].

Quantitative fiscal rules determined by organic law align with the practices observed in many other countries. These rules include the so-called "debt ceiling" used as a medium-term fiscal sustainability indicator and the budget balance limit as an operational indicator for planning fiscal policy at the operational level [3]. Furthermore, the limits established by the fiscal rules are in accordance with those defined by the Maastricht Treaty in the European Union.

Adherence to fiscal rules plays a crucial role in promoting a stable economic situation in any country. Consequently, it is essential to assess the current situation in Georgia in this context. The comparative analysis of the limits set by law and corresponding factual figures reveals that Georgia falls within the group of countries exhibiting high fiscal discipline. Specifically, over the ten-year period of the fiscal rules' existence, the debt rule ratio exceeded the limit only once, in 2020. However, the deviation occurred in compliance with the exit clause defined by Article 7 of the organic law (Figure 4 (a)) and the indicator returned within the limits at a fairly fast pace and created a significant "fiscal space" for the state's anti-crisis response.

Additionally, kernel density estimation methodology is applied to estimate the distribution of the frequency of deviations from the limits (Figure 4 (b)). Deviations are calculated in the following manner:

$$\text{Deviation from the limit in year } t = \text{Factual figure of the indicator for year } t - \text{Limit set by the law}$$

For the calculation of deviations, the first-generation fiscal rules and corresponding indicators were applied to the 2013–2018 period, while the current fiscal rules and corresponding indicators were used for the 2019–2022 period. The analysis indicates that debt rule ratio over the considered period was more than 20 percentage points below the limit.

It is noteworthy that a similar analysis, using the same methodology, was conducted previously [22]. However, the mentioned analysis has covered the 2011–2021 period, while this study covers the 2013–2022 period. The decision to take 2013 as a starting point is more relevant, considering the fact that the first-generation fiscal rules were enacted this year.

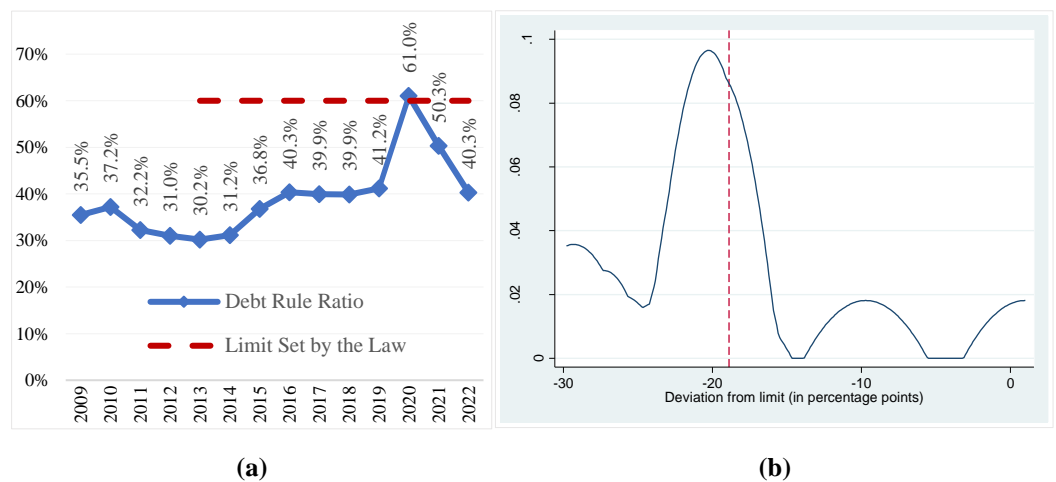


Figure 4. (a) Compliance of debt rule ratio to the limit set by the Organic Law of Georgia on Economic Freedom; (b) kernel density estimation for deviations.

Source: Ministry of Finance of Georgia and authors calculation

A similar conclusion can be drawn regarding the behavior of the budget balance rule over the last decade. However, it should be mentioned that unlike the debt rule ratio, this indicator is characterized by a longer and larger deviation from the limit. Nevertheless, the aforementioned dynamics of deviations, like the debt rule, comply with the exit clause defined by the organic law (Figure 5 (a)).

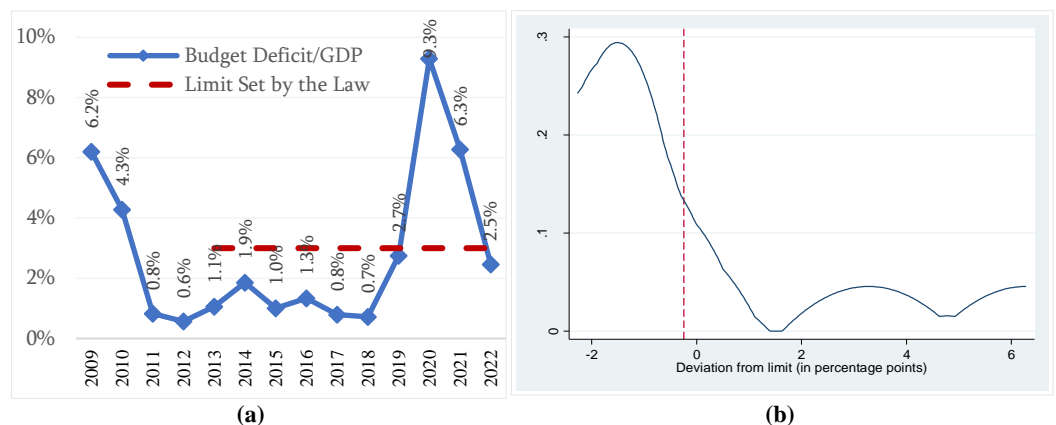


Figure 5. (a) Compliance of budget balance rule ratio to the limit set by the Organic Law of Georgia on Economic Freedom; (b) kernel density estimation for deviations.

Source: Ministry of Finance of Georgia and authors calculation

In contradistinction to the debt rule ratio, the mean density of deviations in the budget balance demonstrates a negative tendency, albeit approaching zero (Figure 5 (b)).

To summarize, it can be asserted that according to current practice, performance of the fiscal rules in Georgia is significantly better than the global average tendency discussed by Davudi et al. [3].

In addition to the Organic Law of Georgia "On Economic Freedom," the "Budget Code of Georgia" [31], and the decree of the Minister of Finance of Georgia N99 "On Approving Budget Classification" [32], it determines the institutional segmentation of the state and regulates the public finances management process, including state/government debt accounting and reporting issues in accordance with the principles of GFSM 2014 [5, 6].

Despite the fact that the existing institutional design in the country in terms of debt management is mostly in line with international best practices, analysis of the existing legal framework reveals certain challenges. In particular:

- 1) Georgia belongs to the group of countries that produce public finance statistics based on the GFSM 2014. Nevertheless, the criteria for classifying domestic and foreign debt in the "Law of Georgia on State Debt" are not in compliance with the "Public Sector Debt Statistics Guideline" developed by the IMF based on the GFSM 2014. In particular, the classification of debt into domestic and foreign components in Georgia is based on the currency of the debt denomination as mentioned above, while according to the mentioned guideline, it should be classified into domestic and foreign debt according to the residency of the creditor [5, 6].
- 2) Article 48 of the "Law of Georgia on State Debt" defines the various components of the debt, which until 2020 were recorded under the general name "historical debt" in the state domestic debt statistics, and its amount was estimated at 672 million GEL [34]. Despite the entry in the law, from 2020 on, the mentioned component is no longer recorded in the state and government debt statistics and, therefore, is not used for the calculation of the "debt rule" indicator either.
- 3) The legislative framework in Georgia, unlike other types of budgetary organizations, does not regulate the borrowing authority of those state-owned enterprises that were classified as general government sector in 2022. This fact, at least, creates a risk for debt sustainability.

4. Discussion

Historically, Georgia has been characterized by a low level of government debt, which to some extent indicates the high efficiency of the fiscal rules in force in the country. Nevertheless, there are certain shortcomings in the existing legislative environment in terms of government debt management that somewhat limit the full accounting and reporting of the debt. In order to overcome the mentioned shortcomings, it is important that the agencies responsible for debt management in Georgia ensure the full accounting of the debt in accordance with the current legislation, which will allow the stakeholders to use comprehensive and accurate information.

Additionally, taking into account the existing shortcomings, appropriate changes should be made to the existing legislation in Georgia, which will guarantee the accounting and reporting of government debt in accordance with internationally recognized best practices. In particular, the classification of government debt in the context of domestic and foreign debt should be done according to the residency of the creditor. In addition, the issue of borrowing authority for state-owned enterprises belonging to the general government sector should be regulated by the legislation.

Finally, agencies responsible for debt management should ensure full implementation of the recommendations outlined in the World Bank's Debt Management Performance Assessment.

Consideration of the mentioned issues will significantly support the preparation of comprehensive information regarding government debt and its usefulness for stakeholders.

It should be noted that in the paper, government debt management and its institutional issues were isolated from other macro-fiscal parameters. The logical continuation of the research is a discussion of the mentioned findings in relation to general fiscal policy efficiency.

Author Contributions: Conceptualization, N.K. and L.K.; methodology, N.K. and L.K.; software, L.K.; investigation, L.K.; resources, N.K. and L.K.; writing—original draft preparation, L.K.; writing—review and editing, N.K.; visualization, L.K.; supervision, N.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding

Data Availability Statement: the data used in the research can be accessed using the following links: 1) https://mof.ge/saxelmwifo_valis_martva; 2) <https://mof.ge/4564>; 3) <https://mof.ge/5109>; the legislation is fully presented in references section of the paper.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ananiashvili I., Models of Estimation and Analysis of Non-observable Macroeconomic Indicators. Economics and Business (In Georgian Language). 2014, # 5, pp. 13-54. https://eb.tsu.ge/doc/jurnali5_sekt_okt_2014.pdf.
2. Chudik A., Mohaddes K., Pesaran H., Raiss M., Is there a debt-threshold effect on output growth?. 2017, Review of Economics and Statistics 99: 135–50. https://www.researchgate.net/publication/315337119_Is_There_a_Debt-Threshold_Effect_on_Output_Growth.
3. Davoodi H. R., Elger P., Fotiou A., Garcia-Macia D., Han X., Lagerborg A., Lam W.R., Medas P., Fiscal Rules and Fiscal Councils: Recent Trends and Performance during the Pandemic. 2022 IMF Working Paper N 22/11, International Monetary Fund, Washington, D.C. <https://www.imf.org/external/datamapper/fiscalrules/map/map.htm#>.
4. IMF publication, Public Financial Management and Its Emerging Architecture. 2019, (Editors Cangiano, M., Curristine, T., & Lazare, M.), <https://www.imf.org/external/np/exr/bforums/2013/pfm/pdf/excerpt.pdf>.
5. IMF, „Public Sector Debt Statistics - Guide for Compilers and Users“. Washington, D.C.: International Monetary Fund. 2013, <http://tffs.org/pdf/method/2013/psds2013.pdf>.
6. IMF, “Government Finance Statistic Manual 2014“. Washington, D.C.: International Monetary Fund, 2014, <https://www.imf.org/external/Pubs/FT/GFS/Manual/2014/gfsfinal.pdf>.
7. IMF, “Georgia: Request for a Stand-By Arrangement-Press Release; Staff Report; and Statement by the Executive Director for Georgia“. Washington, D.C.: International Monetary Fund, 2022, <https://www.imf.org/en/Publications/CR/Issues/2022/06/21/Georgia-Request-for-a-Stand-By-Arrangement-Press-Release-Staff-Report-and-Statement-by-the-519907>.
8. Kakulia, N., Lazarashvili T., Institutional transformation and its challenges in Georgia (In Georgian Language). Conference Proceedings: Faculty of Economics and Business of Ivane Javakhishvili Tbilisi State University. IV International Scientific Conference - "Challenges of Globalization in Economy and Business", November 1-2, 2019, pp. 174-178. https://www.researchgate.net/publication/348884366_institutsiuri_transpormatsia_da_misi_gamotsvevebi_sakartveloshi.
9. Kourtellos A., Stengos S., and Tan C. M., The effect of public debt on growth in multiple regimes. 2013, Economics & Finance Faculty Publications. 5. <https://commons.und.edu/ef-fac/5>.
10. Law H. S., Hung Ng C., Kutan M. A., Law K. Z., Public debt and economic growth in developing countries: Nonlinearity and threshold analysis. 2021. Economic Modelling 98: 26–40. https://econpapers.repec.org/article/eeeecmode/v_3a98_3ay_3a2021_3ai_3ac_3ap_3a26-40.htm.
11. Gbohoui, W., Medas P., Fiscal Rules, Escape Clauses, and Large Shocks. Special Series on Fiscal Policies to Respond to COVID-19. 2020, International Monetary Fund, Washington, DC. <https://www.imf.org/-/media/Files/Publications/covid19-special-notes/enspecial-series-on-covid19fiscal-rules-escape-clauses-and-large-shocks.ashx>.
12. Gaspar V., Medas P., & Perrelli R., IMF Blog - “Global debt reaches a record 22 – trillion“. 2022, <https://www.imf.org/en/Blogs/Articles/2021/12/15/blog-global-debt-reaches-a-record-226-trillion>.
13. Heimbberger, P., Do Higher Public Debt Levels Reduce Economic Growth?. 2021, The Vienna Institute for International Economic Studies (wiiw). Working Paper 211. <https://wiiw.ac.at/do-higher-public-debt-levels-reduce-economic-growth-dlp-5976.pdf>.
14. Mencinger J., and Verbic M., Aristovnik A., Revisiting the role of public debt in economic growth: The case of OECD countries. 2015. University of Ljubljana. MPRA Paper No. 67704. <https://mpra.ub.uni-muenchen.de/67704/>.
15. Klaus M., Moshammer E., Pierluigi B., Institutions, public debt and growth in Europe. 2016. ECB Working Paper Series No 1963, <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1963.en.pdf>.
16. Papava V., Khaduri. N., Institutional Analysis of Post-Communist Transformation (In Georgian Language). Science and Technology, 1998, N 1-3.
17. Papava V., Charaia V., The problem of the growth of Georgia’s public debt during the economic crisis under the covid-19 pandemic. Georgian Foundation for Strategic and International Studies, 2021, N152. <https://gfsis.org.ge/files/library/opinion-papers/152-expert-opinion-geo.pdf>.
18. Reinhart C. M., Rogoff K. S., „Growth in a Time of Debt“. American Economic Review: Papers & Proceedings, 2010, 573–578. https://scholar.harvard.edu/files/rogooff/files/growth_in_time_debt_aer.pdf.
19. Pattillo, C., Poirson, H., & Ricci, L. A., “External Debt and Growth“. IMF working paper, 2002, N WP/02/69, <https://www.imf.org/external/pubs/ft/wp/2002/wp0269.pdf>.
20. Schclarek Curutchet, A., Debt and Economic Growth in Developing and Industrial Countries. Lund University Working Papers, 2005, N 34. http://swopec.hhs.se/lunewp/abs/lunewp2005_034.htm.
21. Schneider, F.x Cooray, A., “How does corruption affect public debt? An empirical Analysis“. ECONSTOR, 2013, Working Paper No. 1322. <https://www.econstor.eu/bitstream/10419/97435/1/773137955.pdf>.
22. Tabaghua S., Fiscal Rules Nexus Covid19 shock in Case of Georgia (Macro Approach). ekonomisti. 2023, # 1, pp. 111-122. <https://ekonomisti.tsu.ge/uploads/images/2023ekon1.pdf>.
23. Teles V., Mussolini, C., Public debt and the limits of fiscal policy to increase economic growth. 2014. European Economic Review. Vol. 66, 2014, pp. 1-15. https://econpapers.repec.org/article/eeeecrev/v_3a66_3ay_3a2014_3ai_3ac_3ap_3a1-15.htm.
24. Wheeler, G. Sound Practice in Government Debt Management. Washington, D.C.: World Bank. 2004, https://openknowledge.worldbank.org/bitstream/handle/10986/15017/289880PAP_ER0So1government0debt0mgmt.pdf?sequence=1&isAllowed=y.
25. World Bank. “Debt Management Performance Assessment (DeMPA) 2020 Georgia“. Washington, D.C., 2020, https://openknowledge.worldbank.org/bitstream/handle/10986/37238/P17401505b_422f0670b69a07cdccdef774.pdf?sequence=1&isAllowed=y.
26. PEFA. 2018. Public Expenditure and Financial Accountability (PEFA) Assessment 2017. <https://www.pefa.org/node/276>.
27. PEFA. 2022. Public Expenditure and Financial Accountability (PEFA) Assessment 2022. <https://www.pefa.org/node/5197>.
28. PEFA. 2022. GEORGIA: 2022 National PEFA & GRPFM Dissemination Workshop. https://mof.ge/images/File/public%20finances%20in%20Geo/27-12-2022/FINAL_Georgia%20PEFA&GRPFM%20Presentations%20-%2020%20December%202022-final.pdf.
29. Organic law of Georgia “On economic freedom” (In Georgian Language). Year of issue 2011 (Last modified 2020), N 4979-6b: <https://matsne.gov.ge/ka/document/view/1405264?publication=3>.
30. Law of Georgia “on public debt” (In Georgian Language). Year of issue 1998 (Last modified 2023), N 1285: <https://matsne.gov.ge/ka/document/view/32452?publication=13>.

31. Law of Georgia “Budget Code of Georgia” (In Georgian Language). Year of issue 2009 (Last Modified 2023), N2440, <https://matsne.gov.ge/en/document/view/91006?publication=57>.
32. Order of Minister of Finance of Georgia “On approval budget classification” (In Georgian Language). Year of issue 2019 (Last modified 2019), N99. <https://www.matsne.gov.ge/ka/document/view/4530811?publication=0>.
33. WHAT IS PEFA?. Retrieved from: <https://www.pefa.org/about>.
34. Ministry of Finance of Georgia : www.mof.ge.
35. IMF. “Fiscal Monitor”: <https://www.imf.org/external/datamapper/datasets/FM>.
36. World Bank..<https://www.worldbank.org/en/topic/debt/overview>.



Industrial Conflict Management Strategies in the Teaching Service

Nneka Daniella Opene^{1,*}

¹ Nigeria Deposit Insurance Corporation¹; kolesup1999@gmail.com

* Correspondence: kolesup1999@gmail.com

Abstract: The purpose of this paper is to explore some industrial conflict management strategies in the teaching service in Nigeria with a focus on Osun State. The major findings in this study indicate that a great majority of them believe that other viable alternatives that could be engaged in resolving the conflicts between the teaching service and the Osun State government are yet to be explored. Some of those viable alternatives include involving the private businesses or business owners, and the Non-Governmental Organisations. Further on this, the bulk of the respondents are in favour of collective bargaining as opposed to executive orders or acts of cohesion from the government.

Keywords: conflict, teaching, Nigeria, collective bargaining, conflict management

1. Introduction

The purpose of this paper is to explore some industrial conflict management strategies in the teaching service in Nigeria with a focus on Osun State.

Historically, Nigeria has witnessed many conflicts which date back to the colonial era when there were clashes and conflict of interest between Nigerian workers and the colonialists over the alienation and discrimination of indigenous Nigerian workers by their white counterparts in the civil service (Abiala 2012). The conflict between the workers and their employers have been championed by Nigerian trade unions who aim to protect workers' interest and support on-going nationalist struggles. Notable examples are the conflicts brokered between the Lagos Union of Teachers (LUT) created in 1925, the Association of Headmasters of Ijebu schools (AHIS) formed in 1926, the colonial administrators, the Nigeria Union of Teachers (NUT) formed in 1931 and the Nigerian Labour Congress (NLC) formed in 1978. These conflicts have continued to surface even in modern Nigeria and can be seen in the modern teaching service in Nigeria.

The teaching service in Nigeria has witnessed multiple industrial actions in the last two decades. Much of the industrial actions have been caused by poor working conditions, meager salary, low quality of education, institutional violence, injustice, the rivalry between teachers and the government, and the government's habit of reneging on the implementation of previous agreements (Omole, 1987; Abiala, 2012; Otitigbe, 2016). For example, a typical NUT-Government conflict is often characterised by the government instructing the protesting teachers to go back to the classrooms or face disciplinary action. These types of assertive tactics used by government have led to standoffs and violence which have yielded little to no results. Although other mechanisms have been adopted to resolve the industrial conflict in the teaching profession, there is little discussion about their efficacy in Nigeria. Therefore, this paper delves into the strategies and their efficacy. The study focus on the teaching service in Osun State in Nigeria.

The study used questionnaires to offer a descriptive statistic assessment of the industrial conflict management strategies in the Nigerian teaching service. The findings of this study indicate that the respondents believe that other viable alternatives could be engaged in resolving the conflicts between the teaching service and the Osun State government. Some of those viable alternatives include involving private businesses or business owners, and Non-Governmental Organisations.

This study contributes to the conflict management and peace literature that examine some strategies for resolving conflicts. The present study contributes to the existing literature by assessing the areas of a possible collaboration for conflict resolution.

Citation: Opene, N. D. (2024). Industrial Conflict Management Strategies in the Teaching Service. *Journal Of Economic and Business Issues*, 4(1), 64-76.

Received: 21/08/2023

Accepted: 12/01/2024

Published: 29/02/2024

2. Literature review

2.1. Theoretical framework

There are two theories that explain conflicts in industrial settings. The first theory is the theory of relative deprivation while the second theory is the Karl Marx's conflict theory. The theory of relative deprivation, propounded in 1970 by Robert T. Gurr in his book titled *Why Men Rebel*, has its roots in ancient Greece. Aristotle the Greek had blamed revolutions on the feelings of discontent among the common people as they clamour for economic and political equality, and then on the oligarchs who continue to push and promote social inequality so as to maintain absolute control. The relative deprivation theory explains how frustration at not getting one's entitlement could be a source of conflict, and conflict is also a result of the collective discontent in the gap between what is, and what is expected. The applicability of this theory is most appropriate in situations where the welfare needs of individuals are not met, as is the case of the industrial conflict between the teaching service in Osun State and the government. Karl Marx's conflict theory describes conflict in industrial relations within a capitalist system. The theory explains that those at the top of the social ladder had the exclusive right of owning the means of production and were pre-occupied with profit gains while those at the bottom of the ladder had only labour which they gave in exchange of food, shelter and clothing. This also describes the conflict in present-day relations between employers and employees where employers own the resources and employees must give their labour in exchange for wages. But conflict arises when those at the top of the ladder (or employers) do not reward those at the bottom a wage that is commensurate with their efforts.

The deprivation theory is very relevant in the Nigerian industrial context because the industrial setting in Nigeria is dominated by government cabals and oligarchs who deprive employees of their right until employees revolt and employers are forced into negotiation with employees. This characteristic of the Nigerian industry is one of the reasons why the teaching service in Nigeria has witnessed multiple industrial actions in the last two decades. Much of the industrial actions have been caused by poor working conditions, meager salary, low quality of education, institutional violence, injustice, the rivalry between teachers and the government, and the government's habit of renegeing on the implementation of previous agreements (Omole, 1987; Abiala, 2012; Otitigbe, 2016).

2.2. Related review

Dunlop (1958) and Esan (1986) have termed this 3-layered model, the tripartite system. They believe that by nature the industrial system is adversarial in itself because each hierarchy operates by a different set of rules and interests thus making the inevitability of conflict in industries ever more an illusion. Fashoyin (1992) opines that before the advent of colonialism, Africa had an organised and developed social system and guilds, capable of providing the much-needed social services. The idea of wages and a monetary economy, and the stratification of classes within industries all began with the colonial administrators. The history of Nigeria's industrial relations dates back to that colonial era. Adebisi (2013) believes that it is a history that significantly reflects signs of a possible fusion of the European model of industrial relations into Nigeria. According to Ubeku (1993), the balkanization of 1884-85 witnessed the total control and hand-over of the private entrepreneurs to the Royal Niger Company.

Adebisi (2013) showed that, by the time Nigeria eventually gained her independence, the colonial administrators had already successfully enacted and carried out a lot of reforms in Nigeria's labour industry, leaving the country with the Anglo-Saxon model of industrial relations. It was a model of industrial relations that left a spectrum of industrial dispute resolution mechanisms in the hands of both employers and employees, particularly on issues relating to employment. Among these mechanisms were arbitration, adjudications and collective bargaining. The system also recognised the right of workers to engage in strike action. Kilby (1976) showed that at first the Anglo-Saxon model of industrial dispute resolution was effective; however, as the number of wage-earners in Nigeria grew, together with the awareness on issues of human rights which invariably encompassed workers' rights as well, and then with the nationalist movement that was driven by World War I veterans who were interested in democratic reforms in the labours, the British immediately changed their industrial policy. They abandoned volunteerism in for interventionism. Kilby recalls the sheer brutality of industrial management model used to quell *Aba Womens' riot of 1929* and the *Coal Miners' Strike of 1940*. It was a conflict management model that clearly showed that the colonial administrators were less than willing to negotiate nor collaborate with the aggrieved workers.

The industrial mayhem caused by the military regime did not just end with the adoption of the Structural Adjustment Programme. In 1976, the military set up a tribunal to look into the activities of the trade unions. By the 19th of February of that same year, the Trade Dispute Decree No. 7 was enacted. It was a radical decree that empowered both the police and the military to counter forcefully any perceived unofficial or illicit strikes and lockouts (Adeniji 2015). In a counter reaction, the workers had asserted that in the event that the injustice meted out to them by the government intensifies, that no level of police and military might can deter them from protesting.

From a global perspective, Guttal (2002) opines that the activities of the organised labour seem to be on a downward spiral. He identified factors such as the resistance to labour unions by private companies, structural change and migration from what he describes as “blue collar jobs”, as responsible for the decline. Williams (2009) showed that labour union activities reduced in the United States, and it decreased from 22% to 16% between 1980 and 1990. The same situation was in the United Kingdom. Nigeria on the contrary experienced a level of stability in union activity from the early 80s to the 90s (Wordofa, 2008).

Going by present-day industrial relations in Nigeria, a typical labour environment according to Adeyinka et al (2006) shows that, apart from the numerical representations, an average Nigerian worker both in the rural and urban settlement, has more than one job. The reason was not far-fetched. Those second jobs were meant to augment the meager resources that came from the primary jobs. As a matter of fact, it was a distinct feature of the period under the Structural Adjustment Programme, and the situation unfortunately still persists. With Nigeria’s present day economic recession, the cost of living has steadily been on the increase while salaries or wages continue on a downward trajectory, with the Naira losing its value against the Dollar every day. As Adeniji (2015) puts it, those who work in Nigeria are marginally employed. So far, the government has remained stoically resistant towards any move to increase wages. The only sectors in Nigeria as it is that has the capacity to make the government recapitulate are the trade unions of the petroleum industry and those of the university.

There is no gainsaying that the state of affairs with Nigeria’s trade Unions has equally trickled down to the education sector particularly at the primary and secondary school level. Industrial relations between the academia and the Nigerian government have been fouled over the years. It is either ASUU against the Federal Government, or the State governments against either the primary and secondary schools, or the State universities. While all may seem lost in this area, there may yet be prospects coming from the merits of shifting attention away from government-oriented solutions alone to that which is multi-sectorial and is all engaging of all the actors not just in industry but the larger society. Attention at this point goes to the principle of multi-track diplomacy.

3. Methodology

The survey method was used for the study. Teaching service in Osun State is the subject of the survey (see appendix A). Osun state is one of six States in the South-West region of the country. Figures from Osun Ministry of Education show that Osun State in 2017 had a total number of 1393 schools in the State. The researcher solicited survey responses from teachers in the three senatorial districts of the state that are members of the Nigeria Union of Teachers. The total number of teachers in Osun Teaching Service is 18,298 as shown in the breakdown in table 1. The target population for this study is a total number of 948 teachers that are members of NUT, from three schools (one high school, one middle school and one elementary school) each from four local governments selected from the three senatorial district of Osun State teaching service. The target population consist of headmasters, principals, the general teaching staff, leadership of the NUT, and staff of the State Ministry of Education. The sample consist of 36 selected schools from the 12 local government (see table 2). The data source is based on questionnaire that is divided into four sections. Section A presents the biodata of the respondents. Section B explore other viable alternatives away from the government that could be engaged in the resolution of the conflict between the teaching service and the government of Osun State. Section C ascertains whether the review of the Act establishing the NUT holds any prospects in terms of galvanizing the teachers’ labour force to become more productive. Section D examines the significant role that globalisation could play in the total restructuring of industrial relations amongst the key players in the education sector at the primary and secondary school levels. The instrument shall be proportionally distributed to the 711 sampled respondents that have been systematically drawn from 36 schools in 12 local governments from the 3 senatorial districts in Osun State teaching service. The questionnaire shall have the combination of the Likert measuring scale and open-ended questions. The Likert scale shall carry five options as follows; Strongly agree, Agree, Undecided, Disagree and Strongly disagree. The open-ended question shall give the respondent the opportunity to give his/her personal opinion on the question

asked. The statistical software used to analyse the data is the Statistical Package for Social Sciences (SPSS). Ethical considerations were also made. I sought and obtained permission to carry out the field work and the respondents gave their consent to be part of the research. The respondents were assured that the questionnaire will not bear their personal identification information to ensure anonymity and protection of the respondents.

Table 1. List of Local Governments and Senatorial District in Osun State

Senatorial District	Local Governments	Total no. of high schools	Total no of middle schools	Total no of elementary schools	Total no of Teachers			
					Elementary schools		Middle and high schools	
					M	F	M	F
Osun Central	Boluwaduro	3	5	26	40	79	55	26
	Ila	2	5	27	60	133	103	114
	Ifedayo	3	4	19	67	224	66	26
	Irepodun	3	9	19	48	195	125	159
	Orolu	1	3	20	91	794	166	434
	Odo-otin	3	6	50	140	220	196	62
	Olorunda	2	6	34	73	665	159	351
	Boripe	3	7	35	68	18	107	91
	Ifelodun	3	5	33	74	320	87	148
	Osogbo	4	10	43	71	296	91	73
Osun West	Ayedaade	4	8	66	134	269	100	149
	Ayedire	3	3	32	106	194	71	28
	Ede North	2	3	27	128	257	87	61
	Ede South	2	2	33	82	233	71	67
	Egbedore	1	5	32	65	169	50	127
	Ejigbo	2	6	61	220	259	299	122
	Irewole	3	8	65	136	284	143	171
	Isokan	2	6	61	139	231	139	83
	Iwo	3	6	59	172	487	182	190
	Olaoluwa	2	3	37	156	200	51	25
Osun East	Atakunmosa East	1	0	69	132	128	53	14
	Atakunmosa West	2	2	47	93	177	79	43
	Ife central	4	6	41	63	555	156	242
	Ife East	8	15	63	68	345	77	108
	Ife North	3	6	65	110	194	101	54
	Ife South	3	4	92	305	82	92	12
	Ilesa East	3	9	33	120	320	96	212
	Ilesa West	2	9	24	93	627	99	237
	Obokun	3	3	52	156	200	51	25
	Oriade	2	3	68	200	275	66	30

Table 2. Sample Characteristics

Senatorial District	Local Governments	Selected Schools	No. of Teachers	Proportional Sample
Osun central	Ifedayo	Oke-Ila high School, Oke-Ila orangun	35	26
		St Stephen middle School, Ora	25	19
		St Mathew primary School, alagbede	15	11
	Boripe	Baptist High School, Iree	30	22
		African church middle school, Iree	20	15
		St John, Iree	15	11
	Osogbo	Baptist high school, Osogbo	40	30
		Laaro middle School, Osogbo	30	22
		AUD Govt. Elementary school A, Osogbo	30	22
	Odo-otin	Inisa high school, Inisa	25	19
		NUD middle School, Oyan	16	12
		Oyekunle D. C Okuku	40	30
Osun East	Ife central	Moremi high school, OAU, Ile Ife	28	21
		Anglican central middle school, Ile Ife	28	21
		Anglican central pry school, A, Ilare, Ile-Ife	20	15
	Ife East	AUD high school, Iloro, Ile-Ife	29	22
		Community Middle school, Ile-Ife	25	19
		C.A.C. primary school A, Moore	08	6
	Ilesa East	Ilesa high school, Okesa, Ilesa	58	45
		St Lawrence middle school, Ilesa	30	22
		Irojo community primary School	10	8
	Oriade	Ipetu-jesa high school, Ipetu-jesa	43	32
		Elefosan middle school	20	15
		St Mathew primary school, Ijebu-jesa	20	15
Osun West	Irewole	Fatima high school, Ikire	30	22
		Baptist middle School, Ikire	18	14
		Baptist day primary school 1, Ikire	12	9
	Iwo	Iwo high school, Iwo	32	24
		St Anthony Catholic middle school	16	12
		Aipate Baptist school 1	18	14
	Ede South	Adventist high school, Ede	49	37
		Obalaoye middle school, Ede	32	24
		St Peter Anglican pry school, Oke-Egan, Ede	30	22
	Ejigbo	Ejigbo Baptist school, Ejigbo	25	19
		L.A. Middle School, Ejigbo	21	16
		AUD Elementary school 1, Ejigbo	25	19

4. Results

This section presents the results regarding other conflict resolution mechanisms. In this section, I assess whether there are viable alternatives, away from the government, that could be engaged in the resolution of the conflict between the teaching service and the government of Osun State. The result from table 3 reveals that 40.3% strongly disagree and 28.7% disagree, that government has utilized the best alternatives in handling ongoing conflict within the teaching service of Osun State. 14.4% agree and 9.5% strongly disagree that government has utilized the best alternatives in handling ongoing conflict within the teaching service of Osun State. 7.1% of respondents remain undecided. The table shows that 3.3% of the respondents strongly disagree and 11.8% disagree that private business has a role to play in mitigating the industrial conflict in the teaching service of Osun State, while 42.8% agree and 33.8% strongly agree that private business has a role to play in mitigating the industrial conflict in the teaching service of Osun State. 8.2% of the respondent remains undecided and the missing invalid response is 3.2%. The result shows that majority of the respondents agree to the assertion that private business has a role to play in mitigating conflict and should be encouraged. The respondents that agree are 77% while those that disagree are 10.6% to the assertion that track- two diplomacy (intervention of non- governmental organization) have the capacity of mitigating industrial conflict in Osun State. 33.5% strongly agree and 43.5% agree to this assertion while 1.6% strongly disagree and 9.0% disagree and 12.5% remain undecided on the research question.

Table 6 shows the different responses of respondents in the order of usage of the following strategies used for managing industrial conflicts between the teaching service and Osun State government. The responses show that in the conflict between the teaching service and Osun State government, 77.8% agree that collective bargaining is used often to settle industrial conflict, 61.1% agrees that setting up of ad-hoc is seldom, and the use of Third party not in use because 42.0% agree that it is not in use as against 26.7% that feel it is often used, and 31.3% that believe it is seldom used. 44.7% feel that the use of executive order (cohesion, threats and arrest of labour leaders) has been the option that is seldom explored in the industrial conflict between the teaching service and the Osun State government. In all the strategies mentioned, the respondents showed that collective bargaining is frequently used as 508 respondents were of the opinion that it is frequently utilized.

Table 7 reveals that collective bargaining is the most effective mechanism of managing conflict with 67.4% in favour of setting up of ad hoc committee as an effective strategy with 57.2% of respondents in support. The result further shows that 73.4% are of the opinion that the use of executive order (cohesion, threats, and arrest of labour leader) is not an effective strategy of managing industrial conflict. Therefore, it should not be encouraged, rather the use of collective bargaining and setting up of ad hoc committees for proper inquiry and implementation of findings of the committees should be encouraged as effective strategies in managing the industrial conflict between the teaching service and Osun State government.

Table 3. Do you think that the government has utilized the best alternatives in handling ongoing conflict within the teaching service of Osun State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SD	280	39.2	40.3	40.3
	D	199	27.8	28.7	69.0
	U	49	6.9	7.1	76.1
	A	100	14.0	14.4	90.5
	SA	66	9.2	9.5	100.0
	Total	694	97.1	100.0	
Missing	System	21	2.9		
	Total	715	100.0		

Table 4. Do you think private business have a role to play in mitigating the industrial conflict in the teaching service of Osun State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SD	23	3.2	3.3	3.3
	D	82	11.5	11.8	15.2
	U	57	8.0	8.2	23.4
	A	296	41.4	42.8	66.2
	SA	234	32.7	33.8	100.0
	Total	692	96.8	100.0	
Missing	System	23	3.2		
Total		715	100.0		

Table 5. Do you feel that the track-two diplomacy (interventions of Non-governmental organization) can assist in mitigating industrial conflict in Osun State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SD	11	1.5	1.6	1.6
	D	62	8.7	9.0	10.6
	U	86	12.0	12.5	23.0
	A	300	42.0	43.5	66.5
	SA	231	32.3	33.5	100.0
	Total	690	96.5	100.0	
Missing	System	25	3.5		
Total		715	100.0		

Table 6. Please rank the type of strategies used for managing industrial conflicts between the teaching service and Osun State government in order of usage.

Collective bargaining					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Often	508	71.0	77.8	77.8
	Seldom	99	13.8	15.2	93.0
	Not Use	46	6.4	7.0	100.0
	Total	653	91.3	100.0	
Missing	System	62	8.7		
Total		715	100.0		

Setting up of ad-hoc bodies (commissions and committees)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Often	209	29.2	31.8	31.8
	Seldom	402	56.2	61.1	92.9
	Not Use	47	6.6	7.1	100.0
	Total	658	92.0	100.0	
Missing	System	57	8.0		
	Total	715	100.0		

using third party

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Often	174	24.3	26.7	26.7
	Seldom	204	28.5	31.3	58.0
	Not Use	274	38.3	42.0	100.0
	Total	652	91.2	100.0	
Missing	System	63	8.8		
	Total	715	100.0		

through executive order (cohesion, threats and arrest of labour leaders)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Often	171	23.9	26.8	26.8
	Seldom	285	39.9	44.7	71.5
	Not Use	182	25.5	28.5	100.0
	Total	638	89.2	100.0	
Missing	System	77	10.8		
	Total	715	100.0		

others (Please specify)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NUT not recognized	1	.1	7.7	7.7
	2.00	2	.3	15.4	23.1
	3.00	10	1.4	76.9	100.0
	Total	13	1.8	100.0	
Missing	System	702	98.2		
	Total	715	100.0		

Table 7. How effective are these mechanisms in managing industrial conflict in the teaching service?

Collective bargaining					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Most Effective	441	61.7	67.4	67.4
	Effective	142	19.9	21.7	89.1
	Not Effective	71	9.9	10.9	100.0
	Total	654	91.5	100.0	
Missing	System	61	8.5		
	Total	715	100.0		

Setting up of ad-hoc bodies (commissions and committees)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Most Effective	211	29.5	31.9	31.9
	Effective	378	52.9	57.2	89.1
	Not Effective	72	10.1	10.9	100.0
	Total	661	92.4	100.0	
Missing	System	54	7.6		
	Total	715	100.0		

using third party					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Most Effective	141	19.7	21.7	21.7
	Effective	196	27.4	30.2	51.8
	Not Effective	313	43.8	48.2	100.0
	Total	650	90.9	100.0	
Missing	System	65	9.1		
	Total	715	100.0		

through executive order (cohesion, threats and arrest of labour leaders)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Most Effective	45	6.3	7.0	7.0
	Effective	125	17.5	19.5	26.6
	Not Effective	470	65.7	73.4	100.0
	Total	640	89.5	100.0	
Missing	System	75	10.5		
	Total	715	100.0		

		others (Please specify)			
		Frequency	Percent	Valid Percent	Cumulative Percent
	Most Effective	1	.1	8.3	8.3
Valid	Effective	2	.3	16.7	25.0
	Not Effective	9	1.3	75.0	100.0
	Total	12	1.7	100.0	
Missing	System	703	98.3		
	Total	715	100.0		

5. Conclusions

The purpose of this paper is to explore some industrial conflict management strategies in the teaching service in Nigeria with a focus on Osun State. The major findings in this study indicate that a great majority of them believe that other viable alternatives that could be engaged in resolving the conflicts between the teaching service and the Osun State government are yet to be explored. Some of those viable alternatives include involving the private businesses or business owners, and the Non-Governmental Organisations. Further on this, the bulk of the respondents are in favour of collective bargaining as opposed to executive orders or acts of cohesion from the government. It is recommended that the government should consider alternative viable measures for resolving the conflict between teachers and the Osun state government.

The implication of the findings is that other remedies could be applied in settling the age-long industrial crisis between the teaching service and the government. All stakeholders involved in this sector should be actively consulted and engaged if there is to be an overhaul and positive outcome. Also, policymakers should review the provisions of the NUT Act to ensure that the law does not grant too much power to the government compared to teachers in order to create a level playing ground in the area of dispute resolution. Furthermore, legislation should give teaching employees more power to negotiate their wages with government employers so as to avoid the incessant strikes and industrial actions that have plagued the teaching service in the last decade.

Future research can use sophisticated quantitative methods to determine the appropriate strategies for resolving industrial in the teaching service in Osun state. Future studies can also extend this research by examining the strategies that could be used to resolve industrial conflict in other critical sectors such as the medical profession, the civil service and in the transportation sector.

Supplementary Materials: None.

Author Contributions: All parts of this research article was written by the sole author.

Funding: This research received no external funding.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Acknowledgments: I acknowledge the encouragement and support Mr Francis Opene in completing this research.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Abiala, E. O. (2012). *Trade Union Movement and National Development in Nigeria: Memoirs of Labour Struggle*. Ibadan: St. Paul's Publishing House.
2. Omole, M. (1987). *Labour education and industrial relations in Nigeria: Growth and development*. A Ph.D thesis of the Faculty of Education, University of Ibadan, 1974.
3. Otitigbe, F. (2016). The effects of teachers' strike on the educational system in Ife North Local Government Area of Osun State, Nigeria. *Journal of Education, Arts and Humanities*, Volume. 4, Issue 1. Ife-Osun State: Oduduwa University, Ile-Ife.
4. Dunlop, T. (1958). *Industrial relations systems*. South Illinois University Press, Ibadan.
5. Esan, RSM. (1986). Legal framework of industrial relations in Nigeria. In. *Otobo and Omole, Readings in industrial relations in Nigeria*. Malthouse Press L.T.D. Lagos.
6. Fashoyin, T. (1992). *Industrial relations in Nigeria: Development and practice*. Lagos: Longman Nigeria Plc. pp. 219-253.
7. Adebisi, A. (2013). History and development of industrial relations in Nigeria: Hybridity of western models versus military interventionism culture. *Mediterranean Journal of Social Sciences*, Volume 4, No 14. Rome-Italy: MCSER Publishing.
8. Ubeku, K. (1983). *Industrial relations in developing countries: A case of Nigeria*. London: Macmillian Press.
9. Kilby, P. (1967). Industrial relations and wage determination: Failure of the Anglo-Saxon model. *The Journal of Developing Areas*, Volume 1, Issue 4, pp. 489-520.
10. Adeniji, M. A. (2015). An analysis of industrial relations practice in Nigeria and Ghana (Similarities and differences in their systems). *Global Journal of Research in Engineering*, 2(3), 145.
11. Guttal, S. (2002). Disclosure, or deception? multilateral institutions and access to information. Good Governance or Bad Management: An Overview of the ADB's Decision Making Processes and Policies.
12. Williams, J. (2009). Assault on the social and political practices of democracy in Nigeria: The fourth republic in perspective. *Journal of Legislative Studies*, Volume 1, No 2. Abuja: Institute of legislative studies, university of Abuja.
13. Wordofa, D. (2008). *Violent conflict: key obstacles for the sub-Saharan Africa to achieving the Millennium Development Goals: Where is the evidence?* A Paper presented at the international conference on peace and security in Africa, Hilton Hotel, Addis Ababa.

Appendix A

Section A: Bio Data

Instruction: please tick the blank space using [X]

1. What is your age?
 - Below 30 years []
 - 30-40 years []
 - 40 – 50 years []
 - 50 – 60 years []
2. Sex: Male [] Female []
3. Marital Status: Single []
 - Married []
 - Separate []
 - Divorced []
 - Widowed []
 - Other (please Specify) []
4. What is / are your academic qualification []
 - i. OND []
 - ii. NCE []
 - iii. HND []-Higher National Diploma
 - iv. Bachelor's Degree []
 - v. Post Graduate Qualification []

SECTION B: Explore other viable alternatives; away from the government that could be engaged in the resolution of the conflict between the teaching service and the government of Osun State.

Please indicate the level of effectiveness of the following questions

1. Do you think private business have a role to play in mitigating the industrial conflict service in the teaching service of Osun State?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []
2. Do you feel that the track-two diplomacy (interventions of Non-Governmental Organisation) can assist in mitigating industrial conflict between in Osun State?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []
3. Do you belief Multinational companies can positively overhaul the operations of the Industrial system in the teaching service?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []
4. Please rank the type of strategies used for managing industrial conflicts between the teaching service and Osun state government in order of usage.

Please rank in these order: 1= often, 2= seldom, 3= Not use.

 - [] collective bargaining
 - [] setting up of ad-hoc bodies (commissions and committees)
 - [] using of third party
 - [] through executive order (cohesion, threats and arrest of labour leaders)

[] others (please specify).....

5. How effective are these mechanism in managing industrial conflict in the teaching service? Please rank in order of effectiveness as

1= Most effective, 2= effective, 3=not effective

[] Collective bargaining

[] setting up of ad-hoc bodies (commissions and committees)

[] using third party

[] through executive order (cohesion, threats and arrest of labour leaders)

[] others (please specify).....

SECTION C: Ascertain whether the review of the Act establishing the NUT holds any prospects in terms of galvernising the teachers' labour force to become more productive.

1. How many years have you been in the Teaching Service? A. 0-5years [] B. 6-10years [] C. 11-15years [] D. 16- 20years [] E. 21years and above []

2. How often do you attend Nut meetings?

Often [] seldom [] not all []

3. Have you gone through the Act establishing the NUT?

Yes [], No []

4. Do you think that the Act establishing the NUT addresses the financial benefits challenges suffered by NUT members that other ministries enjoy?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []

5. Do you think that the Acts establishing the NUT holds prospect in terms of improving the productivity of the teaching service?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []

SECTION D: Examine the significant roles globalisation could play in the total re-structuring of industrial relations amongst the key players in the education sector at the primary and secondary school levels.

1. Do you feel that globalisation can have positively effect on present-day industrial relations?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []

2. Do you feel improved synergy of information and sound feedbacks can improve the Industrial relations?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []

3. Do you think that the Public Private Partnership (PPP) of educational administration will promote the education quality and industrial relation?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []

4. Do you think that the government has utilized the best alternatives in handling ongoing conflict within the teaching service of Osun State?

Strongly, Agree [], Agree [] undecided [] disagree [], strongly disagree []

5 what in your opinions are the issues in contention in Osun teaching service not addressed by the Acts establishing the NUT and by the government in two words?

.....

Thank you for your cooperation



The Impact Of The Hamas-Israel Conflict On Stock Market Indices in The Middle East And Turkey: An Event Study Analysis

Necati Altemur^{1,*}, Binali Selman Eren² and Süleyman Serdar Karaca³

¹ Giresun Universities; necati.altemur@giresun.edu.tr

² Bitlis Eren Universities; bseren@beu.edu.tr

³ Malatya Turgut Özal Universities; suleymanserdar.karaca@ozal.edu.tr

* Correspondence: necati.altemur@giresun.edu.tr

Abstract: This study examines the impact of political events, wars, and terrorist attacks in the Middle East on financial markets. The Hamas-Israel conflict that began on October 7, 2023, deeply affected the political dynamics in the region. The research aims to understand the effects of this conflict on financial markets by analyzing the stock indices of significant Middle Eastern countries, including the United Arab Emirates, Israel, Qatar, Egypt, Oman, Jordan, and Turkey. Using the event study method, the analysis reveals that on the day of the event, the United Arab Emirates and Israel experienced a negative abnormal return at the 1% significance level, while Qatar and Egypt had negative abnormal returns at the 5% significance level, and Turkey at the 10% significance level. Four days before the event, only Israel had a positive abnormal return at the 10% significance level. Two days after the event, Israel had a negative abnormal return at the 10% significance level. Four days after the event, the United Arab Emirates and Oman had a negative return at the 1% significance level, while Egypt had a positive abnormal return at the 1% significance level. On the fifth day after the event, Egypt showed a positive abnormal return at the 1% significance level. Over the selected 15-day period, the United Arab Emirates and Israel had a negative cumulative abnormal return at the 10% significance level. These findings indicate that the Hamas-Israel conflict had a statistically significant impact on stock indices.

Keywords: Hamas-Israel Conflict; Middle Eastern; Event Study;

Citation: Altemur, N., Eren, B.S. & Karaca, S.S. (2024) The Impact Of The Hamas-Israel Conflict On Stock Market Indices in The Middle East And Turkey: An Event Study Analysis. *Journal Of Economic and Business Issues*, 4(1), 77-85.

Received: 07/11/2023

Accepted: 17/02/2024

Published: 29/02/2024

1. Introduction

With the increase of globalization, crises, pandemics, wars, terrorist attacks, and natural disasters have become events that not only affect regional but also global financial markets. Since the end of the Cold War in the 1990s, many political and financial events have had a significant impact on the global economy. One of the most notable among these is the COVID-19 pandemic, declared by the World Health Organization (WHO) at the beginning of 2020. Another recent event that had an impact on financial and economic markets is the Ukraine-Russia war in February 2022. The effects of this war on global markets can be listed as sanctions, disruptions in the supply chain, and increases in commodity prices (Güneysu, 2022). The Gaza-Israel War that started in October 2023 is also one of the significant events globally, both economically and politically.

Gaza is a part of the Palestinian territories, situated on the eastern coast of the Mediterranean Sea. It shares a border with Egypt and has an area of 365 square kilometers, with a population of approximately 2 million. Following Hamas's victory in the 2006 elections, it has faced international isolation, and Gaza is often characterized as the world's largest open-air prison (Ateş, 2009).

On October 7, 2023, Hamas initiated an operation against Israel named "Aqsa Storm." The operation targeted military points, airports, and strategic locations. Numerous Israeli cities, including Tel Aviv, experienced rocket, parachute, and motorcycle attacks. Hamas took several civilians

and military personnel as hostages. In response, Israel launched an operation called "Iron Swords" to target objectives in Gaza. The shift of Israeli attacks towards civilian targets led to a significant humanitarian crisis (NTV 2024).

In this research, we aim to understand the impact of the Hamas-Israel conflict on financial markets by examining the effects on key Middle Eastern countries' stock indices such as the United Arab Emirates, Israel, Qatar, Egypt, Oman, Jordan, and Turkey. The primary focus is on identifying abnormal returns in stock indices since October 7, 2023, and comparing these returns with periods before and after the conflict. The event study method will be employed as a robust tool to analyze the effects of the conflict on stock indices. This analysis goes beyond short-term fluctuations in stock valuations, helping us comprehend the long-term effects of the conflict on financial markets.

This study represents a significant initial step in examining the impact of the Hamas-Israel conflict on Middle Eastern stock indices; however, there are some shortcomings and suggestions for future research. The focus of this study is on abnormal returns in stock indices, delving into the micro-level effects on sectors and individual firms. It is essential to further investigate the impact of the conflict on sectoral and firm performances. Additionally, a combined analysis with other economic indicators before and after the conflict could provide a more comprehensive understanding of financial market reactions.

Another limitation is the focus of the study on a restricted time frame due to the employed methodology. Future research endeavors could explore the long-term financial impacts of the conflict and perhaps assess economic improvements or declines emerging after the conclusion of the conflict. Furthermore, to comprehend the resistance and response capacities of stock indices to similar political events, studies could be conducted over an extended time frame. Lastly, the study solely concentrates on stock indices. Future investigations might delve into the effects on foreign exchange rates and gold prices. Addressing these limitations will contribute to future research achieving a more comprehensive and in-depth understanding.

2. Literature Review

The Hamas-Israel conflict is a consequence of a longstanding dispute and tension in the region. Studies examining the impact of this conflict on financial markets are limited. This literature review aims to identify existing knowledge gaps regarding the effects of the Hamas-Israel conflict on stock indices by summarizing previous research that employed a similar methodology, focusing on the recent Russian invasion of Ukraine and the COVID-19 pandemic. The goal is to outline the current gaps in understanding the impact of the Hamas-Israel conflict on stock market indices.

Chen & Thomas, (2006) utilized event study methodology to assess the impacts of terrorism on global capital markets. They examined the response of the United States capital market to 14 terrorist/military attacks dating back to 1915. Additionally, they investigated the reactions of global capital markets to two recent events: Iraq's invasion of Kuwait in 1990 and the terrorist attacks on September 11, 2001. The findings indicate that the United States capital markets exhibit greater resilience compared to the past and recover more swiftly from terrorist attacks than other global capital markets.

Guidolin & Eliana, (2010) applied the event study methodology to examine 101 instances of intra and interstate conflicts between 1974 and 2004. They found that a significant portion of these events had a substantial impact on stock indices, exchange rates, and commodity prices. On average, national stock markets were more likely to exhibit positive responses to the onset of conflicts than negative reactions. The authors also identified that most events occurred in the Asia and Middle East regions.

Kollias, Stephanos, & Apostolos, (2011) focused on the analysis of the impact of two terrorist attacks, the March 11, 2004, Madrid bombings, and the July 7, 2005, London bombings, on stock markets using Event Study and GARCH methods. It revealed significant negative abnormal returns in most sectors in Spain, while London markets did not show a similar pattern. The study indicated that the recovery in the Spanish market was slower compared to the London market. The overall findings suggested a temporary impact on returns and volatility, rather than a prolonged effect.

Mnasri & Salem, (2016) employed an event study method and a developed bootstrap test to evaluate the impact of terrorist attacks on the volatility of stock markets in 12 MENA countries. The results indicated that the impact of terrorist attacks on financial markets lasted for approximately 20 days, longer than in advanced markets. The study emphasized the need to consider regional specifics in understanding the aftermath of terrorist events.

Güneysu, (2022) investigated the impact of Russia's military operation against Ukraine on the stock returns of companies listed in the BIST Food Index using the event study method. The positive abnormal returns observed on the day of the event (February 24, 2022) were deemed insignificant. However, both positive and negative abnormal returns obtained before and after the event were found to be significant. The presence of abnormal returns in the BIST Food Index suggested that the market was not semi-strong form efficient.

Yousaf, Patel, & Yarovaya, (2022) examined the impact of the conflict between Russia and Ukraine on G20 countries and selected other country stock markets using the event study method. The analysis of abnormal returns before and after the event date (February 24, 2022) indicated strong negative effects, especially on stock prices. Hungary, Russia, Poland, and Slovakia were among the first markets to exhibit negative responses before the event, while Germany, India, Italy, Japan, Romania, South Africa, Spain, and Turkey were negatively affected after the event. Regionally, both Europe and Asia were negatively impacted by the invasion.

Sun, Song, & Zhang, (2022) aimed to measure the response of stock markets to the Russian invasion using the event study method. The study documented the differential impact on markets depending on the severity of the conflict on countries' industries. In European Union countries, firms experienced substantial cumulative abnormal returns after the event, with a gradual reduction as distance from the conflict increased. The financial and services sectors in EU countries were most negatively affected, while the manufacturing sector also experienced negative effects. Notably, Russian oil and gas firms were adversely affected, contributing to the perception that the crisis could exert pressure for a swift resolution.

Yudaruddin et al., (2023) examined 2376 companies operating on the Fast-Moving Consumer Goods (FMCG) sector investigating the impact of Russia's invasion of Ukraine. The invasion significantly affected the global FMCG market negatively. Measurements of the sector's negative reactions were taken both before and after the event, with the beverage and home products sectors experiencing the most severe consequences. NATO member countries shifted from soft reactions before the invasion to strong responses after the invasion commenced.

Charkasov, Ari, & Sarikovanlık, (2023) focused on the comprehensive operation initiated by Russia against Ukraine, using the event study method and designating the start date of the operation, February 24, 2022, as the event day. The impact on selected investment instruments, including gold, crude oil, Euro/Dollar exchange rate, and the MSCI ACWI index representing world stock markets, was examined. While gold and crude oil prices exhibited positive responses, the Euro/Dollar exchange rate and the MSCI ACWI index showed negative reactions. Particularly, gold prices demonstrated stronger reactions, supporting the view that gold is considered a safe haven during crisis periods. The study concluded that the examined variables' significant abnormal returns suggested that the financial markets where these variables traded were not semi-strong form efficient.

Sahl, Wijayanto, & Listyorini, (2023) investigated the impact of the escalation of tension between Ukraine and Russia, turning into a conflict on February 24, 2022, on the coal and gold sectors of the Indonesian capital market, using the event date as the focal point. Following the event, the activity volume in Indonesia's coal subsectors notably increased. The market volatility in shares within the coal and gold sectors experienced significant changes after the event.

Obi, Waweru, & Nyangu, (2023) used the EGARCH model and event study methods to examine stock markets in African and G7 countries, the event date of the Ukraine-Russia conflicts starting on February 24, 2022, as the key date. The analysis explored the impact of the conflict on stock markets in terms of political and economic connections. G7 countries strongly opposed Russia's invasion of Ukraine, resulting in significant and lasting abnormal losses in the early stages of the conflict. This contradicted the perception that developed markets were more efficient. The EGARCH results indicated the presence of volatility, with leverage effects observed only in Canadian and U.S. markets. A sharp rise in commodity prices, particularly in grains and fuel, caused significant adverse effects on countries dependent on the dollar and imports. The study provided insights into mitigating the impact of shocks on currency and commodity prices in dollar-dependent and import-dependent countries.

Pandey, Kumari, Palma, & Goodel, (2024) aimed to assess whether happier countries are more or less concerned about tragic events affecting others by measuring the impact of the Hamas-Israel conflict on the markets of happy countries. Using the event study method with 71 global stock indices, the study found that the conflict had an immediate impact on markets, emphasizing the importance of happiness levels and socio-economic well-being in market resilience. The research highlighted the need for governments to focus on comprehensive measures to increase societal well-being and contribute to more market stability and resilience in the face of geopolitical conditions.

3. Methodology

Event study, which has a long history in the financial literature, is generally an ideal method for analyzing abnormal changes in the prices of financial assets in the sample after a certain event has occurred. Event study has three important assumptions. The first assumption is related to the efficient markets hypothesis, which is one of the most important pillars of the event study. The efficient markets hypothesis is based on the assumption that securities reflect all information in the market (Fama, 1991). Fama (1970) explains the efficiency of markets in three forms: weak form efficient market, semi-strong form efficient market and strong form efficient market. All

information reflected in the prices of financial assets in a weak-form efficient market is historical data. Therefore, in a weak-form efficient market, investors cannot generate abnormal returns using historical information. In a semi-strong form efficient market, all publicly available information as well as historical information is reflected in the prices of financial assets. The information in this form reflects not only historical data, but also information such as dividend announcements, monthly and annual reports, information in the press, and sustainability reports. Therefore, market participants can earn above-average returns from all kinds of information disclosed to the public by having prior knowledge. In a strong-form efficient market, it is assumed that all information about financial assets is reflected in prices. Therefore, market participants cannot earn abnormal returns in such a market.

In the event study, the effect of new information on the price of financial assets is tested. Therefore, event study assume that markets are efficient in a semi-strong form (McWilliams and Siegel, 1997; Ang, 2015).

The second assumption is that the event should be unexpected by market participants and represent new information for investors. In the event study, abnormal returns can be assumed to be a reaction to new information in the market. The third assumption is based on the claim that a researcher isolates the effect of one event from the effects of other events. This is perhaps the most critical assumption of the methodology (McWilliams and Siegel, 1997).

Event study generally consists of seven steps (Campbell et al., 1997): Event definition, choice of selection criteria, measuring normal and abnormal returns, choice of estimation procedure, testing procedure, empirical results, and interpretation of results.

In this study, October 7, 2023, the date when the Israeli-Palestinian war started, is taken as the event date for the analysis.

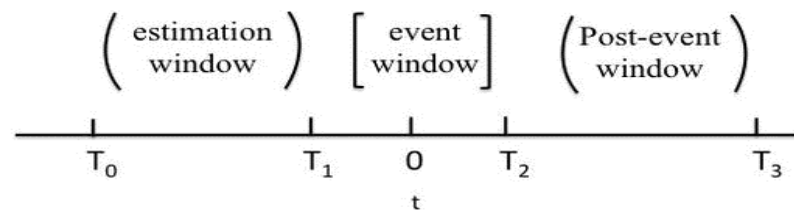


Figure-1: Event Study Timeline

In the study, the estimation window is determined as 120 days with T_{-130} and T_{-10} (Benninga, 2014). In Figure 1, the estimation window represents the period between T_0 and T_1 . In Figure 1, the pre-event period is between T_1 and t ; event day t ; the post-event period represents the periods between t and T_3 . In the second step, the event windows must be determined. In the study, abnormal returns (AR) are calculated in the $(-7...+7)$ window for a total of 15 days. Additionally, cumulative abnormal returns (CAR) are calculated in the $(-7...+7)$ event window.

There are many different methods of applying the event study method. Dyckman et al. (1984) stated that the Least Squares market model produced better results in their studies with different models. Accordingly, in the market model, normal returns are calculated with the following formula:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \tag{1}$$

where $R_{i,t} = \ln(p_{i,t}/p_{i,t-1})$ is the daily return of the index in t period (dependent variable); α_i constant term; β_i represents the systematic risk that measures the sensitivity of the index return ($R_{i,t}$) to the market index (MSCI All-Country World Equity Index). $R_{m,t} = \ln(p_{m,t}/p_{m,t-1})$ represents the return on day t of the relevant market index. $\varepsilon_{i,t}$ represents the error term of the model. Accordingly, the expected return of a index is calculated as in the following equation:

$$E(R_{i,t}) = \alpha + \beta(R_{m,t}) \tag{2}$$

where α and β show the constant and slope coefficients of the regression model. RM_{mt} represents the rate of return of the benchmark index (MSCI All-Country World Equity Index) on day t . The α and β coefficients are calculated with (T_{-130} and T_{-10}) 120-day estimation data. Accordingly, abnormal returns are calculated as in the following equation:

$$AR_{it} = R_{it} - ER_{it} \quad (3)$$

where AR_{it} represents the abnormal return of i index on day t . R_{it} represents the realized return of i index on day t and ER_{it} represents the normal return of i index on day t .

The abnormal returns (AR) and average abnormal returns for each day in the event window period are calculated as in the following equations:

$$AR_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (4)$$

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AAR_{it} \quad (5)$$

where AR_t is the abnormal return on day t and N is the total number of indices. The cumulative abnormal returns and cumulative average abnormal returns for the event window period are calculated as in the following equations:

$$CAR_{(t_1, t_2)} = \frac{1}{N} \sum_{i=1}^N AR_{(t_1, t_2)} \quad (6)$$

$$CAAR_{(t_1, t_2)} = \frac{1}{N} \sum_{i=1}^N AAR_{(t_1, t_2)} \quad (7)$$

where cumulative abnormal returns (CAR) and cumulative average abnormal returns (CAAR), shows the start of the t_1 event window and the date when the t_2 event window ends. This means that the cumulative abnormal return (CAR) and cumulative average abnormal returns (CAAR) are the sum of all abnormal returns during the event window.

The Materials and Methods should be described with sufficient details to allow others to replicate and build on the published results. Please note that the publication of your manuscript implicates that you must make all materials, data, computer code, and protocols associated with the publication available to readers. Please disclose at the submission stage any restrictions on the availability of materials or information. New methods and protocols should be described in detail while well-established methods can be briefly described and appropriately cited.

Research manuscripts reporting large datasets that are deposited in a publicly available database should specify where the data have been deposited and provide the relevant accession numbers. If the accession numbers have not yet been obtained at the time of submission, please state that they will be provided during review. They must be provided prior to publication.

Interventionary studies involving animals or humans, and other studies that require ethical approval, must list the authority that provided approval and the corresponding ethical approval code.

4. Data Series and Application

This study aims to examine the effects of the Hamas-Israel conflict on the key stock market indices of Middle Eastern countries and Turkey, starting from October 7, 2023. For this purpose, the fundamental stock market index prices of seven countries, namely the United Arab Emirates, Israel, Qatar, Egypt, Oman, Jordan, and Turkey, as shown in Table 1, have been utilized.

Table 1: Countries and Indices Included in the Analysis

Countries	Indices	Event Date
United Arab Emirates	DMF	7.10.2023
Israel	TA35	7.10.2023
Qatar	QE	7.10.2023
Egypt	EGX30	7.10.2023
Oman	MSM30	7.10.2023
Jordan	SE	7.10.2023
Turkey	BIST100	7.10.2023

The data for the study were generated using the daily closing prices of stock market indices for seven selected countries between .../.../2022 and October 14, 2023. As per the structure of the Event Study, the MSCI-ACWI index was chosen as the comparison index. The data used in the study were obtained from the Yahoo Finance website. Abnormal Returns (AR) values and t-values for the selected country indices, designated as the event date on October 7, 2023, are presented in Table 2a and Table 2b.

Table 2a. Abnormal Returns 7 Days Before and After the Event Day

AR	UAE (DFM)	t-value	Israel (TA 35)	t-value	Qatar (QE)	t-value	Egypt (EGX 30)	t-value
-7	- 0.0063	0.2874	- 0.0064	0.4877	0.0072	0.498	0.0205	0.1767
-6	0.0007	0.9057	0.006	0.5153	- 0.0053	0.6178	0.0112	0.4594
-5	0.0041	0.4882	- 0.0017	0.8537	- 0.0012	0.91	0.0056	0.7113
-4	0.0051	0.3888	0.0177	0.0563*	0.0014	0.8951	-0.01	0.5088
-3	- 0.0038	0.5205	- 0.0003	0.974	0.0034	0.7488	-0.015	0.3221
-2	- 0.0132	0.0268**	- 0.0108	0.2423	- 0.0082	0.4404	- 0.0051	0.736
-1	0.0027	0.6479	- 0.0057	0.5365	-0.012	0.2594	0.0058	0.7015
0	- 0.0278	0.0000***	- 0.0628	0.000***	- 0.0235	0.0281**	- 0.0324	0.0335**
1	- 0.0037	0.5315	0.0071	0.4415	0.001	0.925	0.0099	0.5131
2	0.0058	0.3272	- 0.0157	0.09*	0.0173	0.1048	- 0.0075	0.6201
3	- 0.0068	0.251	- 0.0049	0.5951	0.0105	0.3235	0.018	0.2351
4	- 0.0228	0.0002***	- 0.0111	0.2295	- 0.0068	0.5222	0.0505	0.001***
5	- 0.0075	0.2057	- 0.0022	0.8113	- 0.0009	0.9325	0.0472	0.0021***
6	- 0.0029	0.6238	0.0133	0.1504	- 0.0062	0.5595	0.006	0.6917
7	- 0.0134	0.0246	- 0.0131	0.1566	-0.014	0.1886	- 0.0197	0.194
CAR	- 0.0898	0.0001***	- 0.0906	0.012***	- 0.0373	0.3651	0.085	0.1482

The symbols *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-sided test.

With the impact of the Hamas-Israel conflict that started on October 7, 2023, the market values of some examined countries' stock indices declined on the day of the event. To determine that these declines were not statistically random, we examined the p-values. The smaller the p-value, the more

significant the decline. It is observed that there is a significant decline at the 1% level in the market values of the selected indices for the United Arab Emirates and Israel, a significant decline at the 5% level for Qatar and Egypt, and a significant decline at the 10% level for Turkey. The p-values are provided in parentheses.

Table 2b. Abnormal Returns 7 Days Before and After the Event Day

AR	Oman (MSM 30)	t-value	Jordan (SE)	t-value	Türkiye (BIST100)	t-value
-7	-0.0043	0.4271	0.0005	0.9314	-0.0033	0.8759
-6	-0.0025	0.6441	0.0015	0.7963	0.0107	0.6128
-5	0.0005	0.9264	0.0013	0.823	0.0153	0.4695
-4	0.0144	0.0085***	0.0077	0.1864	0.0013	0.951
-3	0.0004	0.9411	0.0051	0.3807	-0.0249	0.2399
-2	-0.001	0.8533	0.0054	0.3534	0.0149	0.4812
-1	0.0006	0.9117	0.0076	0.1921	-0.0073	0.7299
0	0.0044	0.4165	-0.0061	0.2946	-0.036	0.0901*
1	0.0042	0.4379	-0.0075	0.198	0.0258	0.2234
2	0.0026	0.6309	-0.0084	0.1497	-0.0173	0.4136
3	0.0016	0.7674	0.006	0.3026	-0.0115	0.5866
4	-0.0148	0.0069***	-0.0014	0.8096	-0.0202	0.34
5	0.0022	0.6843	0.0043	0.4596	-0.0263	0.2146
6	-0.0045	0.406	-0.0084	0.1497	0.0191	0.3668
7	-0.0051	0.3465	0.0045	0.4391	-0.0356	0.0937
CAR(-7...+7)	-0.0013	0.9505	0.0121	0.5909	-0.0953	0.2454

The symbols *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a two-sided test.

Before the event day, only Israel showed a significant increase of 10% in the market value of the selected index on the 4th day. However, following the event day, a significant decrease of 10% in the market value of Israel's selected index was observed on the 2nd day. On the 4th day, the United Arab Emirates and Oman experienced a significant decline of 1% in the market values of their selected indices, while Egypt showed a significant increase of 1% in the market values of its selected index. On the 5th day, only Egypt exhibited a significant increase of 1% in the market values of its selected index. This trend is more clearly depicted in Graph 1.

Over the observation period (15 days), when examining cumulative abnormal returns, significant negative returns at the 1% level were observed for the United Arab Emirates (-0.0898) and Israel (-0.0906). However, no significant value was obtained for other countries.

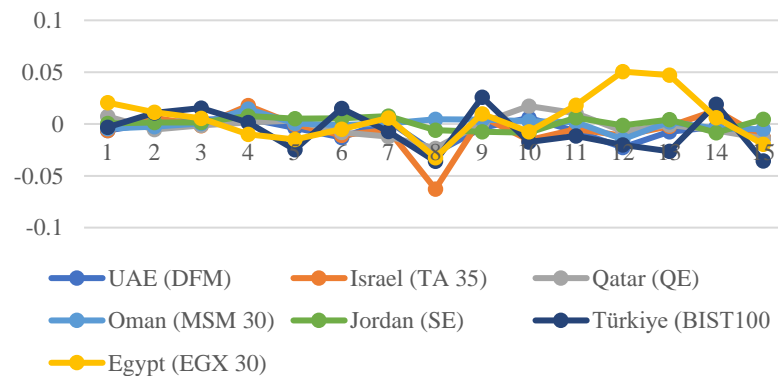


Figure 2. (-7...+7) Abnormal Returns (AR)

The graph clearly illustrates the return losses for the United Arab Emirates, Israel, Qatar, Egypt, and Turkey on the event day. Subsequently, abnormal returns in Egypt are distinctly visible after the event day.

5. Results

This study aims to examine the impact of the Hamas-Israel conflict, which began on October 7, 2023, on the stock market indices of the United Arab Emirates, Israel, Qatar, Egypt, Oman, Jordan, and Turkey. For this purpose, the performance of selected stock market indices was analyzed using the Event Study method for the 7 days before and after the day the conflict started.

On the day of the event, the United Arab Emirates (-0.0278) and Israel (-0.0628) experienced negative abnormal returns at the 1% significance level, while Qatar (-0.0235) and Egypt (-0.0324) at the 5% significance level, and Turkey (-0.036) at the 10% significance level. Four days before the event, only Israel (0.0177) obtained a positive abnormal return at the 10% significance level, while two days after the event, Israel experienced a negative abnormal return at the 10% significance level. Four days after the event, the United Arab Emirates and Oman obtained negative returns at the 1% significance level, while Egypt obtained a positive abnormal return at the 1% significance level. On the 5th day after the event, Egypt obtained a positive abnormal return at the 1% significance level. Looking at the entire selected 15-day period, both the United Arab Emirates and Israel obtained negative cumulative abnormal returns at the 10% significance level. These findings indicate that the Hamas-Israel conflict had a statistically significant impact on stock market indices.

In the analysis conducted using the event study method, examining the relationship between the MSCI-ACWI index and the stock market indices of Middle Eastern countries (United Arab Emirates, Israel, Qatar, Egypt, Oman, Jordan) and Turkey, this study found that negative and positive abnormal returns could be obtained before and after the event within the index scope. This suggests that even in a semi-strong form, the market is not efficiently operating. This study focuses on abnormal returns in stock indices and examines the effects at the micro level, including sectoral and firm-level impacts. Additionally, it is necessary to further investigate the effects of the conflict on sectoral and firm performances. Moreover, a combined analysis with other economic indicators before and after the conflict could provide a more comprehensive understanding of financial market reactions. The findings in this study align with similar studies by Yudaruddin et al. (2023), Güneysu (2022), and Sahl, Wijayanto, & Listyorini (2023). The subject of this study is the impact of a war that occurred in the Middle East and Turkey's financial markets approximately 4 months ago, and no similar study on this event has been found in the literature within such a short period.

References

1. Ang, C. (2015). *Analyzing Financial Data and Implementing Financial Models Using R*. Springer.
2. Ateş, D. (2009, 6(1)). Gazze Trajedisi: Sorumluluk Ve Kavramların Haklılaştırma İşlevi. *Çağ Üniversitesi Sosyal Bilimler Dergisi*.
3. Charkasov, M., Ari, G., & Sarıkovanlık, V. (2023, 24(2)). Finansal Piyasalarda Seçili Yatırım Araçlarının Rusya-Ukrayna Savaşına Tepkisinin Olay Çalışması Yaklaşımı ile İncelenmesi. *Journal of Economics and Administrative Sciences*, s. 257-265.
4. Chen, A., & Thomas, F. (2006). *The Effects of Terrorism on Global Capital Markets*. First Edition, Part 3, Chapter 6, pp:83-106: Edited by Tilman Brück, Routledge Taylor and Francis Group.
5. Dyckman, T., Philbrick, D., & Stephan, J. (1984). A comparison of event study methodologies using daily stock returns: A simulation approach. *Journal of Accounting Research*, s. 1-30.
6. Fama, E. (1991, 46(5)). Efficient Capital Markets: II. *The Journal of Finance*, s. 1575- 1617.
7. Guidolin, M., & Eliana, L. (2010, Vol:47,Issue:6). The Economic effects of Violent Conflict: Evidence from Asset Market Reactions. *Journal of Peace Research*, s. 671-684.
8. Güneysu, Y. (2022, 15(2)). Rusya-Ukrayna savaşının BIST gıda, içecek endeksi üzerindeki etkisinin incelenmesi. *Hitit Sosyal Bilimler Dergisi*, s. 361-372. doi:10.17218/hititsbd.1162813 .
9. Kollias, C., Stephanos, P., & Apostolos, S. (2011, 20). Terrorism and Capital Markets: The Effect of the Madrid and London Bomb Attacks. *International Review of Economics and Finance*, s. 532-541.
10. McWilliams, A., & Siegel, D. (1997, 40(3), 626-657.). *Event Studies in Management Research: Theoretical and Empirical Issues*. *Academy of Management Journal*, s. 626-657.
11. Mnasri, A., & Salem, N. (2016). Impact of Terrorist Attacks on Stock Market Volatility in Emerging Markets. *Emerging Markets Review*, s. Vol:28, pp:184-202.
12. Obi, P., Waweru, F., & Nyangu, M. (2023, 16(5)). An Event Study on the Reaction of Equity and Commodity Markets to the Onset of the Russia-Ukraine Conflict. *Journal of Risk and Financial Management*, s. 256; <https://doi.org/10.3390/jrfm16050256>.
13. Pandey, D., Kumari, V., Palma, A., & Goodel, J. (2024). Are markets in happier countries less affected by tragic events? Evidence from market reaction to the Israel-Hamas conflict. *Finance Research Letters*, s. <https://doi.org/10.1016/j.frl.2023.104893> .

14. Sahl, E., Wijayanto, A., & Listyorini, S. (2023, 18(01)). Reaction of the Indonesian capital market to the conflict between Russia and Ukraine: Event study approach to abnormal returns and trading volume activity of coal issuers' shares on the IDX. *World Journal of Advanced Research and Reviews*, s. 197–205 DOI: 10.30574/wjarr.2023.18.1.0576.
15. Sun, M., Song, H., & Zhang, C. (2022). The Effects of 2022 Russian Invasion of Ukraine on Global Stock Markets: An Event Study Approach. *S&P Global Market Intelligence Research Paper Series*, s. 1-27.
16. Yousaf, I., Patel, R., & Yarovaya, L. (2022, 32). The reaction of G20+ stock markets to the Russia–Ukraine conflict “black-swan” event: Evidence from event study approach. *Journal of Behavioral and Experimental Finance*, s. <https://doi.org/10.1016/j.jbef.2022.100723>.
17. Yudaruddin, R., Fitriansyah, Lesmana, D., Bintoro, R., Purnomo, A., Nugroho, B., & Santi, E. (2023, 9). Does invasion Russia-Ukraine affect to global financial market? evidence from consumers' staples sectors. *Journal of Open Innovation: Technology, Market, and Complexity*.

IAS 29 Financial Reporting Standard in High Inflation Economies: A Hypothetical Study

Elif Umut^{1,*}

¹ Baskent University; esarman@baskent.edu.tr

* Correspondence: esarman@baskent.edu.tr

Abstract: The research paper addresses how inflation disrupts the unbiased and accurate preparation and presentation of financial reports. During periods of general inflation, the discrepancy between historical costs and reporting period values leads to questioning the consistent reflection of a company's current financial position or recent performance. This study first examines the requirements of the IAS 29 standard for Financial Reporting in High Inflation Economies and then applies these requirements to selected items in a case study. The document concludes that the process of inflation adjustment is complex and challenging for both businesses and auditing firms. Despite the alignment of IFRS (International Financial Reporting Standards) and TFRS (Turkish Financial Reporting Standards) requirements in Turkey, there are aspects where they do not fully coincide in terms of inflation adjustment applications.

Keywords: Inflation, Financial Reporting, IAS 29

1. Introduction

"Inflation" is one of the most familiar terms in the field of economics, notorious for causing politicians who promise to combat it to win elections, only to lose power when they fail. It led countries into prolonged periods of instability and was declared "Public Enemy Number One" by US President Gerald Ford in 1974 (Oner, 2010). Central Banks, in their struggle against inflation, often want to feel like "hawks" (Kennedy, 2020). Although it can be calculated and defined in a narrower scope, inflation is generally a broad measure, typically defined as an overall increase in prices or cost of living in a country.

The cost of living for consumers is tied to the prices of many goods, and government institutions commonly use a set basket to measure this cost, tracking the costs of purchased goods over time through household surveys. The cost of this basket at a given time, compared to a base year, is known as the Consumer Price Index (CPI). The percentage change in the CPI over a certain period is the most commonly used measure of inflation, known as consumer price inflation. To calculate a more comprehensive rate of inflation, a broader index like the GDP deflator is needed.

2. Inflation – Accounting Relationship

Solomons (1978, 1991) argued in his studies that accounting practice is motivated and responds to developments that enhance its ability to represent a certain economic reality in an unbiased manner. This view is close to the theory known in epistemology as the "correspondence theory of truth": there is (computational) knowledge, and it can be judged based on its conformity to the external world (Keat and Urry, 1975; Rorty, 1979, 1991). The relation of this argument to inflation accounting is invaluable: inflation distorts the ability of financial reports to represent accurately and impartially; inflation accounting responds to the needs for undistorted accounting information. Therefore, states are expected to reflect superior judgment on how inflation should be calculated accurately and impartially.

The "Fisher Effect," proposed by Irving Fisher in the field of economics, is a theory that explains the relationship between nominal and real interest rates. Its fundamental prediction is that the real interest rate can be calculated by deducting the expected inflation from the nominal interest rate. In

Citation: Umut, E. (2024) IAS 29 Financial Reporting Standard in High Inflation Economies: A Hypothetical Study. *Journal Of Economic and Business Issues*, 4(1), 86-112.

Received: 02/12/2023

Accepted: 24/01/2024

Published: 29/02/2024

this context, a positive real interest rate means overcoming inflation for an investor or lender, whereas a negative rate means being defeated by inflation. If the assumption of the Fisher Effect is accepted, "holding money loss" should be considered as a deduction from interest received (as an element compensating the loss in purchasing power of the principal) and "borrowing gain" similarly as a deduction from interest (Whittington et al., 1998). The impact of inflation on balance sheet items will manifest in determining unreal financing costs.

Traditionally, accountants record the items they account for by referring to the monetary value of the financial transaction in which they occur. During general inflation periods, the mismatch between historical costs and their values at the reporting period is questioned as it does not consistently reflect the current financial status or recent performance of the business. As historical costs are determined at different dates, it is possible to speak of a fundamental measurement error when bringing together heterogeneous measurement units, as the currency does not represent the real purchasing power as historical cost does.

Balance sheet items consist of monetary and non-monetary items. The main criterion in determining whether an item is monetary or non-monetary is whether its value changes with purchasing power. In this context, monetary items are assets and liabilities to be received or paid only in current monetary value (e.g., cash in hand and at banks, other receivables to be collected in cash, receivables (including all provision accounts), deferred tax assets, advances given, bond investments, etc.) Monetary liabilities are items expressed in nominal currency that do not change with inflation (e.g., financial and trade debts, received order advances, debt and expense provisions, etc.) In historical cost accounts for monetary items, the consequences of inflation do not result in "borrowing gain" (gain on borrowings) (Bourn, 1976) and "holding money loss" (loss on holding money) (Bourn, 1976). Borrowing gain arises from only repaying the lender in nominal units. For example, if an L loan is taken at time t and repaid at time $t+1$ when the general price index increases by a factor $(1+i)$, then the gain from borrowing is Li . Holding money loss, on the other hand, is symmetrical to the gain in borrowing: this is because money and other items denominated in money are not adjusted to compensate for real purchasing power losses during inflation. Therefore, during an inflation period, if a company's monetary assets exceed its liabilities ($M > L$), there will be an unrecorded net loss on these items in historical cost accounts. Conversely, if liabilities exceed monetary assets ($M < L$), there will be an unrecorded net gain.

Items that cannot be expressed in a fixed monetary value are referred to as non-monetary items. Such items represent assets and liabilities that do not embody specific monetary claims. For example, biological assets, inventories (including all provision accounts), investments in equity instruments (stock purchases), plant, machinery and equipment, intangible fixed assets, and liabilities like advances received, trade debts, deferred revenues, deferred tax liabilities. The main problem encountered in the inflation adjustment of non-monetary assets is that it is not possible to assume that the monetary amounts of these types of assets are fixed. Their monetary prices will fluctuate in response to changing market conditions. In inflation adjustment operations for these assets, historical cost is adjusted by referring to general inflation, using a general price index. This kind of adjustment disregards the effects of relative price changes but reflects the impact of inflation on the non-monetary item. For example, if a non-monetary asset (assuming it's a vacant land or an investment under construction, not subject to depreciation and ignoring depreciation expense) is purchased at a cost of N_t at time t , and if the general price level rises by $1+i$ at time $t+1$, the adjusted cost will be expressed as $N_{t+1} = N_t(1+i)$. This way, the historical cost of the item maintains its real value, and the adjusted value is considered to have kept pace with inflation.

Many non-monetary assets have a limited useful life. Therefore, their partial use/consumption within a period should be reflected in their recorded value as depreciation. The approach regarding a non-depreciable asset (like land investment) was mentioned in the previous paragraph. When considering the effect of inflation on all depreciable assets, it is possible to say that during price increases, a higher amount of depreciation than historical cost will result in a lower calculated profit (Whittington et al., 1998). The depreciation expense to be calculated based on the relevant index from the period of acquisition of the asset will increase as prices rise.

A similar approach to depreciable assets should also be applied to inventories. A similar adjustment needs to be made for the cost of inventories consumed during a period. Increases in inflation or the prices of products in stock will result in an increase in the value of purchased or used inventories. To eliminate the effects of price changes and produce a real measure, the inflation adjustment for inventories should be deducted from profit. Like in depreciation, the adjustment can be made using either a general index or a specific index. In both cases, the profit figure, after adjusting for the

effects of rising prices, will be lower than the profit figure calculated using historical costs. Upon reviewing the literature related to the topic, a tripartite classification of inflation accounting methods is observed:

- General price level method: This method indicates adjusting the financial statements using a determined general index. This method will also be used in example applications within this study. Detailed explanations about the method will be given in the following sections.

- Replacement (Substitution) cost method: The replacement cost refers to the price that a business would incur to acquire an asset of the same quality and with equivalent productive power or service or operational capacity as of the asset in hand at the time of preparing the financial statement (Uman, 2002). In this method, a specific index (e.g., official price indices announced by official institutions) is used for adjustment instead of a general one.

- Mixed Approach (Combination of general price level and substitution cost): This method can be applied in two different ways: (i) adjusting the financial statements first using a general index and then again according to relative price increases; (ii) first adjusting the financial statements according to relative price increases and then again using a general index. The method requires dual adjustment, making it challenging in practice.

In this study, the method to be addressed is the General Price Level method. The General Price Level Method emerges as the method recommended by the International Accounting Standards Board (IASB) for use in high inflation economies (IAS 29). This mentioned standard was opened for comment as a draft in 1987, published in 1989, and received its last update in 2009 (Singh and Hamid, 1992).

The first step of the method is determining the adjustment factor to be used in the correction. An index is required that shows the changes in the purchasing power of the historical purchase prices to convert them into equivalent current purchase prices as of the balance sheet date; this index is the adjustment factor. The adjustment factor can be calculated as follows:

Adjustment Factor = Price index at the conversion date / Price index at the date of the transaction

Table 1. Calculation of the Adjustment Factor*

Example

A business wants to calculate the inflation-adjusted value of a machine included in its tangible fixed assets in 2020. The asset was purchased in 2015 for 10,000 TL when the price index was 300. The price index in 2020 is 600. To find the new value using the general price level method, the historical cost must be multiplied by the conversion factor.

$$\begin{aligned} \text{Adjustment Factor} &= 600 / 300 \\ \text{Inflation-adjusted cost} &= 10,000 * (600/300) \\ &= 20,000 \text{ TL} \end{aligned}$$

In the business's 2020 inflation-adjusted financial statements, the new value of the asset will be recorded as 20,000 TL.

* Source: Created by the author.

The second stage in the method is the determination of monetary and non-monetary items. At this stage, it is beneficial to focus on some details. For instance, if an advance payment for inventory to be delivered will not be affected by price increases until the delivery date and if the delivery of the goods does not require a payment more than what is specified in the contract, it should be considered monetary; otherwise, if the advance loses its purchasing power, it should be treated as a non-monetary item.

The third stage is the determination of gains and losses occurring in monetary items. A brief example explaining this stage is presented in Table 2.

Table 2. Determination of Gains and Losses in Monetary Items*

	JANUARY, 2020	JANUARY, 2021
	(TL)	(TL)
Current assets	125.000	137.000
Current liabilities	130.000	140.000
Price Index	200	300
Annual Average Price Index		240
Monetary Liabilities	$(130.000 \times 300) / 200 = 195.000$	
Increase in Liabilities	$(10.000 \times 300) / 240 = 12.500$	
Total	207.500	
Current Liabilities- End of Period	(130.000)	
Borrowing Gain	77.500	
Monetary Assets	$(125.000 \times 300) / 200 = 187.500$	
Increase in Assets	$(12.000 \times 300) / 240 = 15.000$	
Total	202.500	
Current Assets – End of Period	(137.000)	
Holding Loss	65.500	
Net Gain / Loss	77.500-65.500 = 12.000	

*Source: Created by the author.

The determination of the Stock Valuation method is the fourth stage. The principle of prudence, a fundamental concept, especially in situations of uncertainty, assumes that losses should be accounted for before gains. As pressure on the sustainability of financial performance increases during high inflation periods, the need for the application of the prudence principle also grows. Using the LIFO (Last In, First Out) method as the stock valuation method during inflationary periods will consistently result in the sale of the highest cost stock, causing unsold stock to be reported on the balance sheet at a lower value. This way, the concept of prudence is reflected in the stock items reported in the period's balance sheet. The purpose of the LIFO method is to protect businesses' equity items during high inflation periods by subjecting them to less tax (Şeker, 2020). Accounting techniques like depreciation are often chosen as a partial solution to excessively declared profits because they temporarily reduce reported profits, depending on the alternative accounting methods that could be selected (Poroy and Gücenme, 2009). This is because businesses cannot replace the stock they sell during inflation periods at the same price, leading to a disruption in their capital structures. The use of the LIFO method in stock valuation demonstrates a kind of ability to match current costs with current revenues for the business.

IAS 2 Inventories standard allows for the valuation of stocks using FIFO (First In, First Out) or Weighted Average Cost Method but has eliminated the application of the LIFO method (IAS 2-25).

The final stage is the preparation and presentation of financial statements in accordance with the general framework mentioned above.

3. IAS 29 Financial Reporting in Hyperinflationary Economies

Theoretically, IAS 29 is based on the general purchasing power approach (IAS 29.37), and therefore, it's possible to say that it also fundamentally relies on its principles. This means that the financial information in the financial statements is reorganized by applying a general price index, provided that these principles and judgments are consistently applied from period to period.

The implementation of IAS 29 can lead to the creation of additional temporary differences under IAS 12 Income Taxes, as the reorganization of an item under IAS 29 will often lead to adjustments in the book values of the items without corresponding changes in tax bases. The effect of such temporary differences must be accounted for in profit or loss under IAS 12 (IAS 29.32).

IAS 29 does not determine an absolute rate of inflation for hyperinflation in an economy. Instead, it considers various characteristics of the economic environment, which are strong indicators of prevailing high inflation. The inflation data is based on the International Monetary Fund (IMF) World Economic Outlook (WEO) published in April 2022 (IMF 2022). The International Accounting Standards Board (IASB) in April 2022, in its publication IFRS Alert 2022-2, listed countries with economic conditions that would require compliance with IAS 29 'Financial Reporting in Hyperinflationary Economies.' Among these countries is Turkey. In this context, businesses operating in Turkey and obligated to arrange their financial statements in full compliance with Turkish Financial Reporting Standards are expected to reflect the Standard in their financial statements for interim or annual reporting obligations after June 30, 2022. According to the requirements of International Financial Reporting Standards, eleven countries globally are required to apply IAS 29: Argentina, Iran, Lebanon, South Sudan, Sudan, Suriname, Syria, Turkey, Venezuela, Yemen, and Zimbabwe. Table 3 presents hyperinflationary economies adopting International Accounting Standards, the cumulative rates for these economies for the last three years, and inflation forecasts for 2022 and 2023.

Table 3. IMF WEO 2022 (International Monetary Fund, World Economic Outlook) Hyperinflationary Economies*

Countries	Cumulative Inflation Rate for the Last Three Years ¹	2022 Inflation Forecast	2023 Inflation Forecast
Argentina	%216 (December, 2021)	%48	%42
Iran	%144 (December, 2021)	%30	%25
Lebanon	%173 (December, 2020)	Forecast not available due to high uncertainty.	Forecast not available due to high uncertainty.
Sudan	%2325 (December, 2021)	%244	%69
Suriname	%169 (December, 2021)	%26	%18
Syria	Known to exceed 100%, but exact figures are unavailable.	Forecast not available due to high uncertainty.	Forecast not available due to high uncertainty.
Turkey	%74 (December, 2021)	%138	%169
Venezuela	%2,230,000 (December 2021)	%500	%500
Yemen	%175 (December, 2021)	%265	%240
Zimbabwe	%4379 (December, 2021)	%86	%42

¹ Compiled by the author from IMF WEO 2022 April data.

The standard covers consolidated financial statements of groups operating outside Turkey whose functional currency is the Turkish Lira or that operate in economies considered hyperinflationary (for example, subsidiaries, associates, or joint arrangements). Article 3 of the Standard pertains to the definition of a high inflation economy:

- If the cumulative inflation rate over three years is approaching or exceeds 100%²,

¹ Cumulative inflation represents the decrease in the purchasing power of nominal money over a period longer than annual inflation, similar to the lifespan of an individual.

² Although the 100% criterion is a key factor in determining high inflation, it is not the only factor and should not be considered in isolation. For example, even though Turkey's cumulative inflation rate for the last three years is determined to be 74%, it is defined as "hyperinflationary" under IFRS, and the application of inflation accounting is expected from the beginning of the reporting period in which high inflation is identified (IAS 29.4).

- If a significant portion of the country's population prefers to keep their wealth in non-monetary assets or in a relatively stable foreign currency, and monetary amounts are valued in a foreign currency considered more balanced and stable than the currency,
- If the held local currency is urgently converted into investments to preserve its purchasing power,
- If credit sales and purchases, even with short maturities, are made at prices that can compensate for expected losses in purchasing power over the period, and
- If market wages, prices, and interest rates are indexed to a price index.

Under IAS 29, acceptance of high inflation in this country will occur, supported by these and other indicators. The Public Oversight Authority has announced that companies applying TFRS and BOBİ FRS will not make inflation adjustments for their 2021 financial statements, citing the Turkish Statistical Institute's TÜFE rate reflecting a change in purchasing power over the last three years of 74.41%.

IAS 29 requires that the financial statements of a business reporting in the currency of a hyperinflationary economy be expressed in terms of the current measurement unit at the balance sheet date. Comparative figures for previous period(s) should be restated in the same current measurement unit.

The scope of procedures to be followed in inflation-adjusted financial statements under IAS 29 is as follows:

- Selection of a general price index.
- Separation of monetary and non-monetary items.
- Restatement of non-monetary items (excluding equity).
- Restatement of equity.
- Restatement of comprehensive income.
- Taxation.
- Calculation and proof of monetary gain or loss.
- Cash flow statement.
- Comparisons.
- Group reporting.
- Inflation adjustment in interim financial statements.
- Other matters.

The standard does not permit inflation-adjusted financial statements to be presented as supplementary information to unadjusted financial statements.

3.1. Selection of a general price index

According to the standard, all financial statements should be restated to reflect the effects of inflation using a general price index based on the current measurement unit at the closing date. The standard also prefers that all organizations reporting in the same economy and currency use the same index.

3.2. Separation and restatement of monetary and non-monetary items

All balance sheet items, whether expressed in the current measurement unit at the balance sheet date or not, must be classified as monetary and non-monetary items. Monetary items do not require restatement because they represent money held, received, or paid. Therefore, monetary items are already expressed in terms of the current purchasing power at the reporting date.

All non-monetary assets and liabilities, and all income statement items, including comprehensive income statement items, should be adjusted to reflect their "fair values" as of the closing date. If the restated value of a non-monetary item exceeds its recoverable amount, it should be reduced in accordance with the relevant other standards. Table 4 provides examples of monetary and non-monetary items.

Non-monetary items, except for equity items, are restated according to the current measurement unit at the end of the reporting period. The enterprise should use the increase in the general price index from the date of acquisition to the end of the reporting period (IAS 29.29).

Non-monetary assets and liabilities carried at current amounts at the end of the reporting period, such as net realizable value or fair value, do not require restatement.

Non-monetary items generally appear in the financial statements at their cost or cost less depreciation, in other words, at their historical cost at the date of acquisition. The restated cost or cost less accumulated depreciation of each item is determined by applying the change in the general price index from the date of acquisition to the end of the reporting period to the item's historical cost and accumulated depreciation. If detailed records of the acquisition dates of tangible fixed assets are not available, an independent professional valuation may be required at the first application date of the standard.

Inventories, goodwill, patents, trademarks, and similar assets are also reported in the financial statements at their historical cost values, so they need to be restated from their acquisition dates (IAS 29.15).

Table 4. Examples of Monetary and Non-Monetary Items*

Monetary Assets	Monetary Liabilities
Cash and Cash Equivalents	Lease Liabilities
Contract Assets (IFRS 15)	Trade Payables
Notes Receivable and other receivables (to be collected in cash)	Employee Benefits Obligations (to be paid in cash)
Doubtful Trade Receivables and Provisions	Accruals and other liabilities
Financial Investments (based on debt instruments)	Debentures
Deferred Tax Assets	Liabilities based on financial assets held for sale
	Performance Obligations (IFRS 15)
	Current Period Tax Liabilities
	Deferred Tax Liabilities
Non-Monetary Assets	Non-monetary liabilities and equity
Prepaid Expenses for Future Months/Years	Deferred income (e.g., from government incentives)
Inventories and Provision for Decline in Value of Inventories	Contract Liabilities (IFRS 15)
Investments in Associates	Equity Items
Tangible Fixed Assets	
Intangible Fixed Assets	
Right-of-Use Assets (IFRS 16)	
Financial Investments (equity-based)	
Biological Assets	

* Source: Created by the author.

Non-monetary assets restated for inflation are subject to impairment assessment under the standard. Even if the recoverable amount of an asset is lower than its restated amount, it is assumed that the asset has decreased in value.

There are two important considerations regarding non-monetary assets and liabilities. Firstly, organizations that have previously tested their assets for impairment in earlier reporting periods should assess whether restating asset book values for inflation affects the outcome of the impairment test. Secondly, non-monetary assets and liabilities that are reported at fair value or revalued amounts, which may be carried at amounts valid on dates other than the acquisition or balance sheet date, need consideration. For example, tangible fixed assets revalued under the revaluation model permitted by IAS 16 should have their inflation-adjusted book values restated to reflect their book values at the end of the reporting period (IAS 29.16).

Restated non-monetary assets are still subject to impairment assessment according to relevant standards (IAS 29.19). All adjustments made should be reflected in net profit or loss under the heading "net monetary position gains and losses" (IAS 29.9).

3.3. Restatement of equity

At the beginning of the first period of applying IAS 29, equity components, excluding undistributed profits and special funds, are restated from the dates the items arose using a general price index. This should include reserves created by amounts recognized in other comprehensive income. Positive revaluation differences formed in previous periods should also be offset.

Capital shown in the balance sheet is expressed in terms of the purchasing power at the end of the reporting period. However, a company may present the capital amount expressed in historical cost and the related IAS 29 adjustment in the statement of changes in equity or in the notes, along with appropriate explanations.

3.4. Restatement of comprehensive income

All items in comprehensive income for the current year are restated from the date when income and expense items were initially recorded by applying the change in the index. Restated net income for the current year should be added to the balance of restated retained earnings in the opening statement.

Interest income and expenses, such as income statement items and exchange differences related to invested or borrowed funds, are adjusted for inflation and presented as separate items in the income statement together with monetary gain or loss.

3.5. Taxation

The enterprise, after restating the nominal book values of non-monetary items in the opening balance sheet using the measurement unit at that date, remeasures deferred tax items according to IAS 12 Income Taxes. Deferred tax items are restated to reflect changes in the measurement unit from the opening balance sheet date to the end of that reporting period.

IAS 29's restatement approach is based on distinguishing between monetary and non-monetary items. However, in practice, there is uncertainty about how a company will first restate its financial statements, especially deferred tax balances and comparative figures.

IFRS Interpretation 7 provides guidance on how an enterprise should restate its financial statements in the first year it identifies the presence of hyperinflation in the economy of the functional currency. According to the interpretation, the amounts of deferred taxes in the opening balance sheet are determined in two steps:

Deferred tax items are remeasured according to IAS 12 Income Taxes after restating the nominal book values of non-monetary items in the opening balance sheet using the measurement unit at that date. These remeasured deferred tax items are then restated to reflect changes in the measurement unit from the opening to the closing balance sheet date.

3.6. Calculation of monetary gain and loss and preparation of the income statement

One of the objectives of IAS 29 is to account for financial gains or losses (monetary gain or loss) arising from holding monetary assets or liabilities during a reporting period. All monetary assets and liabilities held throughout the year (net monetary position) are shown in the financial

statements, either in the balance sheet with non-monetary assets and liabilities or in comprehensive income or directly in equity with transactions recorded therein.

Monetary gain or loss can be defined as the difference between the historical cost amounts and the restated amounts of non-monetary items, equity, comprehensive income statement items, and index-linked items at the end of the year, and the purchasing power between the date of occurrence and the end of the year. Net monetary position gain or loss is included in profit or loss. Adjustments in asset and liability items linked to various agreements (such as index-linked bonds and loans) are offset against gains or losses in the net monetary position (IAS 29.13). Other income and expense items, such as interest income and finance costs, and exchange differences related to invested or borrowed funds, are also related to the net monetary position (IAS 29.28). While these items are explained separately, presenting them together with net monetary position gain or loss in the comprehensive income statement may be useful (IAS 29.28).

The steps to be followed in adjusting the income statement for inflation are as follows (Riordon and Riordon, 2009):

- Adjust items occurring evenly throughout the year, such as sales and purchases, using an adjustment rate (usually current Index/average index for the period).
- Calculate the depreciation expense based on the inflation-adjusted cost of depreciable assets (using the same indexes as for adjusting these items on the balance sheet).
- Calculate the gain or loss in purchasing power from holding monetary items.

3.7. Adjustment of the cash flow statement

All items in the equity group are considered non-monetary and therefore should be restated from the first measurement date to the year-end date. The cash flow statement is created based on restated figures.

Two special considerations for the cash flow statement:

- The pre-tax net profit is adjusted for the period's monetary gain or loss; and
- The monetary gain or loss on cash and cash equivalents is presented separately.

3.8. Group reporting

A parent company reporting in the currency of a high inflation economy may also have subsidiaries reporting in the currencies of hyperinflationary economies. The financial statements of these subsidiaries are restated using the CPI index of the country in which they report before being included in the consolidated financial statements prepared by the parent. The restated financial statements of foreign subsidiaries are translated at closing rates.

Subsidiaries not reporting in the currencies of high inflation economies are first addressed according to IAS 21. This means items included in comprehensive income are translated at the rates at the transaction dates (or average rate) and balance sheet items at the closing rates.

For presenting comparative amounts in a different presentation currency, IAS 21 - The Effects of Changes in Foreign Exchange Rates is applied. Balances should be translated at the closing rate according to IAS 21.42(b) and IAS 21: The effective date of the change in the currency used for the purpose of IAS 29 is in accordance with IAS 21.

When high inflation ends in a country, an enterprise will cease preparing and presenting financial statements under IAS 29. The enterprise should consider the amounts expressed in the current measurement unit at the end of the previous reporting period as the basis of the book values in subsequent financial statements (IAS 29.38).

The standard also specifies the following points that need to be included in the notes to the financial statements during high inflation periods.

3.9. Gain or loss on monetary items (IAS 29.9)

The rationale for having restated the financial statements and other prior period data for changes in the general purchasing power of the reporting currency (IAS 29.39) Whether the cost approach in the financial statements is based on historical cost or current cost (IAS 29.39)

The definition and level of the price index at the balance sheet date, and the movements in the index in the current and preceding reporting periods (IAS 29.39)

4. Sample Application - Inflation Adjustment under IAS 29³

The data related to the coefficients to be used in the adjustments are presented in the following tables.

Table 5: CPI Coefficients by Years, Months, and Quarters (2018-2019)

2018-2019	2018			2019		
	Monthly CPI Index	Monthly Average CPI Index	CPI Index by Quarters	Monthly CPI Index	Monthly Average CPI Index	CPI Index by Quarters
January	1,0102	1,0224		1,0106	1,0172	
February	1,0073	1,0135		1,0016	1,0111	
March	1,0099	1,004	1,0136	1,0103	1,0051	1,0111
April	1,0187	1,0524		1,0169	1,0182	
May	1,0162	1,0343		1,0095	1,0050	
June	1,0261	1,0129	1,0332	1,0003	1,00014	1,0078
July	1,0055	1,0904		1,0136	1,0254	
August	1,023	1,0751		1,0086	1,0142	
September	1,063	1,0310	1,0655	1,0099	1,0049	1,01488
October	1,0267	0,9946		1,02	1,0212	
November	0,9856	0,9888		1,0038	1,0093	
December	0,996	0,9979	0,9938	1,0074	1,0036	1,01143

³ The sample application was created by the author.

Table 6. Purchasing Power Coefficients Calculated Based on the Date of 31 December 2020⁴

2018-2020	2018	2019	2020
January	1,5257	1,2678	1,1305
February	1,5147	1,2658	1,1265
March	1,4998	1,2529	1,1201
April	1,4723	1,2321	1,1107
May	1,4488	1,2205	1,0958
June	1,4120	1,2201	1,0835
July	1,4042	1,2037	1,0773
August	1,3727	1,1935	1,0681
September	1,2913	1,1818	1,0578
October	1,2577	1,1586	1,0358
November	1,2761	1,1542	1,0125
December	1,2812	1,1457	1,0000

Table 7. Purchasing Power Coefficients Calculated Based on the Date of 31 December 2021

2018-2021	2018	2019	2020	2021
January	2,0762	1,7252	1,5383	1,33828717
February	2,0611	1,7224	1,5329	1,32621858
March	2,0409	1,7049	1,5242	1,31204846
April	2,0035	1,6765	1,5114	1,29037024
May	1,9715	1,6608	1,4911	1,27898725
June	1,9214	1,6603	1,4745	1,2546471
July	1,9109	1,6380	1,4660	1,23246277
August	1,8679	1,6240	1,4535	1,21881207
September	1,7572	1,6081	1,4395	1,20376501
October	1,7115	1,5766	1,4095	1,17566658
November	1,7365	1,5706	1,3778	1,1358
December	1,7435	1,5591	1,3608	1

4.1. Fixed Assets

As of 31 December 2021, there is no activated interest expense for the period ending on that date and there are no collateral, pledges, or mortgages on tangible fixed assets. Depreciation of tangible fixed assets is calculated using the normal depreciation method based on their economic lives. No depreciation is allocated for land, as it has an indefinite life. Moreover, the economic life of molds and models is determined based on the project life.

⁴ In calculating the purchasing power coefficients, the base years are assumed to be 1.00. For example, if the base year is 2020, the purchasing power coefficient for September is calculated as follows. (If coefficients for earlier months are required, the CPI coefficient for the month following the desired month is multiplied successively with each subsequent month's CPI coefficient until reaching the CPI coefficient for December 2020.)

*September 2020 Purchasing Power Coefficient: October 2020 CPI * November 2020 CPI * December 2020 CPI*

According to IAS 16 Property, Plant, and Equipment, maintenance and repair expenses, other than those resulting in an expansion or significant improvement of the asset, are expensed on the dates they are incurred.

Table 8. Fixed Assets

	Historical Cost	Acquisition Date	Useful Life (years)
Buildings	1.000.623	Jan.18	40
Equipment	2.863.335	Jan.18	12
Moldings and Models	2.890.202	Jan.18	7 (project period)
Fixtures and Furnishings	449.351	Feb.18	10
Vehicles	68.226	Apr.18	5

Table 9. Adjustment of costs according to the 2020 purchasing power.

	Historical Cost	Acquisition Date	Conversion Coefficient	Adjusted Value	Difference
Buildings	1.000.623	Jan.18	1,5257	1.526.682	
Equipment	2.863.335	Jan.18	1,5257	4.368.680	
Moldings and Models	2.890.202	Jan.18	1,5257	4.409.672	
Fixtures and Furnishings	449.351	Feb.18	1,5147	680.620	
Vehicles	68.226	Apr.18	1,4723	100.449	
Total	7.271.737			11.086.102	3.814.365

Table 10. Adjustment of costs according to the 2021 purchasing power

	Historical Cost	Acquisition Date	Conversion Coefficient	Adjusted Value	Difference
Buildings	1.000.623	Jan.18	2,0762	2.077.463	
Equipment	2.863.335	Jan.18	2,0762	5.944.770	
Moldings and Models	2.890.202	Jan.18	2,0762	6.000.551	
Fixtures and Furnishings	449.351	Feb.18	2,0611	926.168	
Vehicles	68.226	Apr.18	2,0035	136.688	
31 December 2021 Total Cost	7.271.737			15.085.640	13.903b

Table 11. Calculation of accumulated depreciation amounts as of 31 December 2020

	Buildings	Equipment	Moldings and Models	Fixtures and Furnishings	Vehicles	
2020 Adjusted Values	1.526.682	4.368.680	4.409.672	680.620	100.449	
2021 Adjusted Values	2.077.463	5.944.770	6.000.551	926.168	136.688	
Acquisition Date	Jan.18	Jan.18	Jan.18	Feb.18	Apr.18	
Useful Life (years)	40	12	7	10	5	
Useful Life at the end of 2020	3	3	3	3	3	
Useful Life at the end of 2021	4	4	4	4	4	
2020	114.501	1.092.170	1.889.859	204.186	60.269	3.363.006
2021	207.746	1.981.590	3.428.886	370.467	109.350	6.100.061
Difference						2.737.055
						c

Table 12. Calculation of depreciation expense for the Year 2021

	Useful Life	2021 Adjusted Values	Current Year Depreciation Amount	Total
Buildings	40	2.077.463	51.937	
Fixtures and Furnishings	10	926.168	92.617	
Vehicles	5	136.688	27.338	171.891 d
Equipment	12	5.944.770	495.398	
Moldings and Models	7	6.000.551	857.222	1.352.619 e
Total			1.524.510	

Table 13. Reconciliation of accumulated depreciation amounts as of 31 December 2021 (adjusted for 2021 purchasing power)

Accumulated Depreciation Amount as of 31 December 2020	6.100.061
Depreciation Expense for the Year 2021	1.524.510
Accumulated Depreciation Amount as of 31 December 2021	7.642.571

Table 14. Consolidated results (adjusted tangible fixed asset items and net monetary gains arising from the items)

	2020	2021
Gross Book Value of Tangible Fixed Assets (TFAs)	11.086.102	15.085.640
Accumulated Depreciation	(6.100.061)	(7.624.571)
Net Book Value of TFAs	4.986.041	7.461.069
Net Monetary Gain Arising from TFAs	(3.999.538) (b – a)	
Net Monetary Gain Arising from Accumulated Depreciation	2.737.55(c)	

4.2. Inventories and Production Expenses

Fixed production costs on finished goods are allocated based on normal production capacity. The cost of inventories is calculated using the monthly moving weighted average cost method. The cost of finished goods includes raw materials, direct labor, other direct expenses, and related general production overheads but does not include borrowing costs.

Expenses for idle capacity, resulting from unplanned production interruptions, are not associated with finished goods inventory and are accounted for in the cost of goods sold in the period they occur.

Table 15. Inventories and production expenses

Inventory items in the enterprise's balance sheet as of 31.12.2021		
	31.12.2021	31.12.2020
Raw Materials	3.339.957	962.381
Finished Goods	773.904	530.107
Miscellaneous Materials	385.651	277.493
	4.499.512	1.769.981

During the restatement of inventories for inflation, the production process should be followed. The holding periods of the inventories at the beginning of the period should also be considered. The beginning period inventories should be adjusted with the purchasing power at the end of the previous year. Since the difference arising from the inflation effect pertains to previous years, it should be added to the undistributed profits in the opening balance sheet.

The beginning period stock amount, adjusted according to the previous year's purchasing power, should be readjusted up to the current year-end purchasing power, and the resulting difference should be reflected in the current period's monetary gain.

The adjustment of the end-of-period inventories should follow the same method applied for the beginning-of-period inventories. Inventory items used in the production process can be adjusted using the end-of-year purchasing power (2021). The approach to this adjustment can be as follows:

$$2021 \text{ Beginning Period Stock Amount} - 2021 \text{ End Period Stock Amount} = \text{Cost of Goods Sold}$$

Table 16. Cost of sales for the periods ending 31 December 2021 and 2020

	31.12.2021	Percentage of Total	31.12.2020	Percent- age of To- tal
Raw material and supplies ex- pense	-50.548.947	92,36	-34.624.112	92,38
Direct labor expenses	-1.643.365	3,00	-1.146.207	3,06
Non-material general produc- tion expenses	-1.565.734	2,86	-1.158.847	3,09
Depreciation expenses	-974.441	1,78	-847.758	2,26
Total production cost	-54.732.487		-37.478.956	
Total cost of sales	-54.483.216		-37.478.956	

Table 17. Sales of the enterprise for the Years 2020 and 2021

	31.12.2021	31.12.2020
Foreign Sales	34.626.072	34.626.072
Domestic Sales	17.983.616	16.153.836
Other Sales	413.540	211.547
Less: Discounts	(1.811.049)	(1.540.048)
Total	71.101.258	49.451.407

50% of the direct raw material and direct labor expenses occur in the initial stage of production.

Table 18. The inventory holding periods⁵

(Monthly)	Holding in Inventory	Holding in Semi- Finished Process	Holding in Fin- ished Form
Raw Material	1,6	2	3,7
Miscellaneous Material	3,2	3,6	5,3
Finished (Product)	1,7	-	-

⁵ To simplify the explanation, average holding periods for inventory have been used. Under IAS 2, it is necessary to know the acquisition dates or acquisition costs of inventories. Therefore, the inventory holding period calculation approach used in this example is not in compliance with the Turkish Accounting Standards.

Table 19. Adjustment of raw materials

	Beginning Period Raw Material*	2021 Inflation (%36,08)	2021 Opening Balance	2021 Closing Balance
Historical Cost	962.381	c		3.339.957
Time of Conversion Factor	October 2020 CPI			September 2021 CPI
Conversion Factor	1,0213	0, 3608	b	1,0125
Adjusted Value for 2020	982.880	a	1.542.138 a+(a*b)	
Adjusted Value for 2021		559.259 (a*b)	579.757 (a+(a*b))- c	3.381.706
Difference	20.499			41.749 B
	A			

* The adjustment coefficient for raw material is calculated considering the inventory holding period of 1.6 months.

Table 20. Adjustment of miscellaneous material

	Beginning Period Raw Material*	2021 Inflation (%36,08)	2021 Opening Balance	2021 Closing Balance
Historical Cost	277.493			385.651
Time of Conversion Factor	September 2020 Purchasing Power			September 2020 Purchasing Power
Conversion Factor	1,06	0, 3608		1,20
Adjusted Value for 2020	293.546			
Adjusted Value for 2021		105.911	399.457	464.233
Difference	16.053			78.582 C

* The adjustment coefficient for miscellaneous material is calculated considering the inventory holding period of 3.2 months.

Table 21. Adjustment of cost of finished goods

	Labor and Non- Material General Production Expenses (7.5%)	Raw Material (92.38%)	Depreciation	Beginning Finished Goods
Time of	October 2020	September 2020		
Conversion Factor	Purchasing Power	Purchasing Power		
Historical Cost	39.758	489.713	636	530.107
Conversion Factor	1,04682*	1,01820**	(((1)+(2)) / 2	
Adjusted Value for 2020	1,0357626	1,0578362	1,0467994	
Adjusted Value for 2021	41.180	518.036	666	559.882
Difference	1.422	28.323	30	29.775 D

* The coefficient is the arithmetic average of the purchasing powers for the months of October and November.

** The coefficient is the arithmetic average of the purchasing powers for the months of September and October.

Table 22. Adjustment of cost of sold finished goods

	Historical Cost	Time of Conversion Factor	Conversion Factor	Adjusted Value	Difference
Beginning Finished Goods (2020)				559.882	
2021 Conversion Factor (1,3608)				202.005	
TOTAL				761.887 (3)	231.780 (6)
Total	54.732.487		1,36	74.479.968	19.747.481(7)
Production for the Period				(4)	
Less: Ending Finished Goods	773.904				
Labor and Non- Material General Production Expenses (5.86%)	45.351	End of October 2021	December 2021 CPI / October 2021 CPI 1,18 (1)	53.316	7.965
Raw Material (92.36%)	714.778	Middle of September 2021	December 2021 CPI / September 2021 CPI 1,44 (2)	1.028.932	314.154
Depreciation	13.775		1,31 ((1)+(2))/2	18.013	4.237
Ending Finished Goods	773.904			1.100.261(5)	326.357 (8) E
Cost of Sold Finished Goods	54.483.216			74.141.595 (4)-(5)+(3)	19.658.379 (7)-(8)+(6) F

Table 23. Aggregated results - inventory items

Increase in Inventory	446.688 (B+C+E)
Increase in COGS	19.658.379 (F)
Net Monetary Gain	20.105.067 (B+C+E+F)

4.3. Investments in partnerships (investments in subsidiaries, associates, joint ventures and jointly controlled entities)

ADAMETE Technology Initiatives Inc. which operates in another country for the purpose of operating in research and development, consultancy and engineering industries and investing in other businesses established and initiatives in these fields, was acquired on December 30, 2020.

Table 24. ADAMETE Technology Initiatives Inc.

Partnership Share	%25
Fair value of the purchased business	150.000
Cash Paid	150.000
Net Assets (belonging to the investor, 31/12/2020)	151.200
Shares of profit or loss of subsidiaries and joint ventures accounted for using the equity method	32.000
Exchange Difference Income	120.000
Net Assets (owned by the investor, 31/12/2021)	303.200

Table 25. IFRS/IAS compliant ADAMETE Technology Initiatives Inc. financial statements

	Historical Cost	Conversion Factor	Adjusted Value	Difference
Net assets as of December 31, 2020	151.200	1,3608	205.748	54.548
Shares of profit or loss of subsidiaries and joint ventures accounted using the Equity Method	32.000	1,2306	39.379	7.379
Exchange Difference Income	120.000		58.073	-61.927
Net assets as of December 31, 2021	303.200	1,0000	303.200	0
IAS 29 Adaptation				
Conversion Difference	61.927			
Shares of profit or loss of subsidiaries and joint ventures accounted using the Equity Method	-7.379			
Net Monetary Gain	-54.548			

Since the subsidiary is accounted for at current exchange rates at the balance sheet date, no inflation adjustment is required at this December 31, 2021 date. Shares of profit or loss of subsidiaries and joint ventures accounted for using the Equity Method have been adjusted with the conversion factor for the average purchasing power of the same year in 2021.

4.4. Financial investments (short term, accounted at fair value)

The financial assets of the business consist of shares purchased within the scope of BIST 30 Index for the purpose of utilizing idle funds. There is no need to calculate an adjusted value for this item

that will be valid as of December 31, 2021. However, since the fair value changes for the item and the monetary changes for the period must be presented in the income statement, a new adjustment was made according to inflation.

Table 26. Changes in shares during the period-1

	Inflows (cost – TL)	Outflows (cost – TL)	Balance (market value – TL)
Financial Asset Investments as of 31/12/2020			50.000
1st Quarter	99.000	(69.500)	
2nd Quarter	87.500	(57.000)	
3rd Quarter	53.000	(51.600)	
4th Quarter	60.000	(61.400)	
			60.000
Income from Financial Investments			40.000
End of Period Balance as of December 31, 2021			150.000

Table 27. Changes in shares during the period-2

	Time of Conversion Factor	Historical Cost	Conversion Factor	Adjusted Value	Difference
Market Value	31.Dec.20	50.000	1,3608	68.039	18.039
Historical Cost	1st Quarter Average	99.000	1,0164	100.627	
Historical Cost	2nd Quarter Average	87.500	1,0236	89.561	
Historical Cost	3rd Quarter Average	53.000	1,0191	54.014	
Historical Cost	4th Quarter Average	60.000	1,1370	68.219	
Cost of Sales	1st Quarter Average	69.500	1,0164	70.642	
Cost of Sales	2nd Quarter Average	57.000	1,0236	58.342	
Cost of Sales	3rd Quarter Average	51.600	1,0191	52.587	
Cost of Sales	4th Quarter Average	61.400	1,1370	69.810	
Additions for 2003		60.000	1,3120	78.723	18.723
Total		110.000		146.761	36.761
IAS adaptation	Net Monetary Gain				36.761

4.5. Share Capital

Table 28. Share Capital

Beginning Balance	300.000	15 January 2018	Half will be paid in cash on the same date and the remaining half will be paid in cash 6 months later.
Prepaid part of the commitment	150.000	15 January 2018	Paid in cash.
Fulfillment of the second part of the commitment	150.000	30 June 2018	Paid in cash.
Shared Capital (31/12/2020)	300.000		
Capital Increase	100.000	15 December 2019	Paid in cash.
Shared Capital (31/12/2021)	400.000		

Table 29. Adjustment of the opening balance as of 31 December 2020 according to purchasing power

Capital Investment Dates	Amount (TL)	Conversion Factor	Adjusted Value	Difference
15.Jan.18	150.000	1,5257	228.860	78.860
30.Jun.18	150.000	1,4120	211.796	61.796
15.Dec.19	100.000	1,1457	114.572	14.572
31 December 2020 Ending Balance	400.000		555.227	155.227
				(a)
(2) 31 December 2021 Adjustment of Opening Balance in Accordance with Purchasing Power				
15.Jan.18	150.000	2,0762	311.425	161.425
30.Jun.18	150.000	1,9214	288.205	138.205
15.Dec.19	100.000	1,5591	155.906	55.906
31 December 2021 Ending Balance	400.000		755.537	355.537
				(b)
IAS 29 Adaptation				
Deferred Revenues - Beginning Balance	155.227			
Net Monetary Gain	355.537			
Share Capital	364.213			

4.6. Dividends

The company, at its Ordinary General Assembly held on March 17, 2021, decided to distribute a total of 75,000 TL in cash dividends from its 2020 profit and made the announced dividend payment within the month of October 2021.

Table 30. Adjustment of dividends

	Historical Cost	Conversion Factor	Adjusted Value	Difference
Accruals March 2021	75.000	1,3120	98.404	23.404
Payment October 2021	75.000	1,1757	88.175	13.175
Monetary gain resulting from the difference between accrual and payment dates			10.229	10.229
IAS 29 Adaptation				
Increase in Dividend Accruals	23.404			
Increase in Net Monetary Gain	23.404			

4.7. Deferred Revenues - Government Incentives

In June 2018, the company received a government incentive totaling 150,000 TL for the installation of electric vehicle charging units in the workplace, as part of sustainability initiatives. The incentive is in the form of a grant contingent upon the fulfillment of the obligation to install the charging units. The units are expected to be completed by December 31, 2018, and be operational as of January 1, 2019. Accordingly, starting from January 2019, the depreciation of the charging units will be subject to regular amortization over their economic life of 10 years. Amortization amounts related to the charging units can be deducted from taxable income, beginning from the month in which the units start their operations, until the end of the amortization period or disposal. The received government incentive is not subject to taxation.

Table 31. Net book value of government incentives

	Historical Cost (TL)	Date Subject to Depreciation	2019	2020	2021
Charging Unit - Government Incentive	150.000	2019			
Accumulated Depreciation (150.000 / 10 = 15.000 TL/year)			(15.000)	(30.000)	(45.000)
Net Book Value			135.000	120.000	105.000
			0	0	

Table 32. Net book value of government incentives

		Conver- sion Factor	Adjusted Value	Differ- ence	Years
2020 Ending Net Book Value	120.00	1,4119	169.436	49.436	31 December
	0				2020 according to purchasing power
		1,9213	230.564	110.564	31 December
					2021 according to purchasing power
Current Depreciation	15.000	1,9213	28.821	13.821	
2021 Ending Net Book Value	105.00		201.744	96.744	2021
	0				
IAS 29 Adaptation					
Increase in Retained Earnings from Previous Years (Begin- ning Balance)	49.436				
Net Monetary Gain	-61.128				
Depreciation Increase Related to Government Incentives	13.821				
Decrease in Deferred Reve- nues - Government Incentives	96.744				

Table 33. Net book value of government incentives

	Historical Cost	Conversion Factor	Adjusted Value	Difference
Beginning Cash Balance	8.073.629	1,23058877	9.935.317	1.861.688
Cash Flows During Pe- riod				
1st Quarter	1.118.303	1,3255	1.482.331	364.028
2nd Quarter	-3.065.140	1,2746	-3.907.037	-841.896
3rd Quarter	5.455.399	1,2183	6.646.567	1.191.168
4th Quarter	6.032.611	1,1038	6.658.930	626.319
Total Inflation Effect Related to Cash				3.201.306

4.8. Revenue

Table 34. Inflation Adjustment for Revenue -1

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Revenue	16.245.000	10.532.602	18.870.745	25.452.911	71.101.258
Research and Development Expenses	(121.129)	(144.797)	(141.955)	(272.638)	(680.519)
Marketing, Sales, and Distribution Expenses	(159.382)	(232.435)	(238.918)	(692.865)	(1.323.600)
General Administrative Expenses	(113.732)	(139.213)	(164.237)	(323.247)	(740.429)
Other Income from Operating Activities	217.058	220.536	228.707	1.444.711	2.111.012
Other Expenses from Operating Activities	(100.676)	(139.715)	(215.056)	(627.434)	(1.082.881)
Foreign Exchange Gains	469.902	295.347	842.339	3.094.582	4.702.170
Foreign Exchange Losses	(612.286)	(557.382)	(937.219)	(4.112.313)	(6.219.200)
Income Tax Expense for the Period	(12.901)	(13.028)	(10.213)	(40.808)	(76.950)

Table 35. Inflation Adjustment for Revenue -2

	Sales (TL, Billed)	Conversion Factor	Adjusted Value (TL)
1st Quarter	16.254.142	1,3255	21.545.159
2nd Quarter	10.532.602	1,2747	13.425.573
3rd Quarter	18.870.745	1,2183	22.991.108
4th Quarter	25.443.769	1,1038	28.085.397

4.9. Cash and Cash Equivalents

Table 36. Cash Outflows from Operating Activities

Raw Materials (TL)		Conversion Factor	Adjusted Value
1st Quarter	12.335.849	1,3255	16.351.391
2nd Quarter	7.171.921	1,2747	9.141.820
3rd Quarter	14.344.266	1,2183	17.476.288
4th Quarter	16.696.911	1,1038	18.430.421
		TOTAL	61.399.919
Wages and Salaries (TL)		Conversion Factor	Adjusted Value
1st Quarter	108.603	1,3255	143.955
2nd Quarter	134.460	1,2747	171.392
3rd Quarter	162.696	1,2183	198.220
4th Quarter	211.365	1,1038	233.309
		TOTAL	746.877
Rent (TL)		Conversion Factor	Adjusted Value
1st Quarter	11.743	1,3255	15.566
2nd Quarter	26.707	1,2747	34.043
3rd Quarter	40.101	1,2183	48.857
4th Quarter	66.134	1,1038	73.000
		TOTAL	171.465
Tax (TL)		Conversion Factor	Adjusted Value
End of January	2.195	1,34	2.938
End of March	2.875	1,3120	3.772
End of July	15.405	1,23	18.986
End of October	13.105	1,18	15.407
		TOTAL	41.103

4.10. Allowance for Doubtful Receivables

The allowance for doubtful trade receivables is a monetary item and, as such, generates monetary gains. These monetary gains offset the monetary losses arising from the holding of the respective receivables. The inflation effect on the beginning balance of the allowance for doubtful receivables is a non-cash item that does not impact working capital; therefore, it will also be presented as a reconciling item in the cash flow statement.

Table 37. Adjustment for the Allowance for Doubtful Trade Receivables

	(TL)	Conversion Factor	Adjusted Value
Trade Receivables (Beginning Balance)	2.546.243	1,3608	3.464.927,47
Allowance for Doubtful Trade Receivables (Beginning Balance)	(229.602)	1,3608	263.124
Current Period Allowance for Doubtful Trade Receivables	(327533)		327.533
Allowance for Doubtful Trade Receivables (Ending Balance)	557.135		557.135
Difference - Inflation Effect on Allowance for Doubtful Trade Receivables			33.522

4.11. Retained Earnings

The retained earnings from previous years consist of inflation adjustment differences related to equity and extraordinary reserves. The distribution of retained earnings from previous years is provided in the table below.

Table 38. Inflation Adjustment for Retained Earnings

Retained Earnings (Unadjusted, Beginning of Period)	3.467.929
Equity Inflation Adjustment Differences	428.301
Extraordinary Reserves	3.039.628
Increases Resulting from Changes Made in Previous Years at the Beginning of the Retained Earnings	428.301
Retained Earnings (Adjusted, 2020, Beginning of Period)	3.896.230
2021 Inflation Adjustment (1.3608)	1.405.760
Retained Earnings Beginning Balance for 2021 (Adjusted)	5.301.990

4.12. Deferred Taxes

Table 39. Inflation Adjustment for Deferred Tax

Deferred Tax (31 December 2020, Net)	954.246
Adjusted Beginning Balance for the Year 2021 (1,3608)	1.298.538
Deferred Tax (31 December 2021, Net)	1.715.971
Deferred Tax During Period	417.433

5. Conclusion

IAS 29 is not a measurement standard, but a presentation standard, and one of its key elements is consistency. Therefore, within the scope of this standard, using a consistent index, in other words, an index that reflects the general purchasing power, is very important. Considering that the CPI index reflects the purchasing power of the individual who would buy the company's shares, it is possible to say that it is a consistent index to be used under IAS 29. It is thought that it would be more appropriate to make corrections according to the indexes calculated every six months in terms of eliminating the effects of inflation on comparative periods.

IAS 29 expects simultaneous implementation for all businesses operating in the country. Otherwise, the comparability of financial statements will be eliminated. When financial statements in our country are examined, it is observed that some companies, especially those traded on the stock exchange, present inflation-adjusted tables even though it is not mandatory. In this case, compliance with IFRS – IFRS is also disrupted.

Regarding IAS 29, there are no specific explanations for adjustments to be made on equity items. In practice, for ease and consistency, it seems appropriate to apply inflation adjustment to equity items that will remain within the company, while items that might leave the company should not be subject to adjustment.

It is possible to mention that there is approximately a tenfold difference between the financial statement values from 2004, the last date of inflation adjustment in Turkey, to 2022. Therefore, it is appropriate to start indexing from 2004. For the item subject to inflation adjustment, if the item is included in the financial statement at cost value, the adjustment coefficient should be calculated from the date of capitalization, or from the date of revaluation if it has been revalued.

Especially for a company with a lot of monetary liabilities, inflation accounting is not an advantage. Also, considering our country, companies are not ready for inflation adjustment. Training of teams that will apply inflation adjustment, the readiness of the business, and the preparation of data are very important and difficult processes.

References

1. Arsoy, A. P.; Gucenme, U. The development of inflation accounting in Turkey. *Critical Perspectives on Accounting*, 2009, 20(5), 568-590.
2. Bourn, M. The “gain” on borrowing. *Journal of Business Finance and Accounting*, 1976, 3(1), 167-182.
3. Callard, Madden and Associates (1982). *Expectations monitor*, 1982, p. ii.
4. IMF. *World economic outlook*, 2022
5. Keat, R., and Urry, J. Social theory as science, London, *Routledge and Kegan Paul*, 1975, p.20-22
6. Kennedy, S. Hiking time at the Fed, *Bloomberg*, 2022.
7. Marian, D. The correspondence theory of truth. *The Stanford Encyclopedia of Philosophy*, 2022, Edward N. Zalta (ed.)
8. Oner, C. Back to basics: What is inflation? *Finance and Development*, 2010, Volume 47, Number 1.
9. Riordan, D. A., and Riordan, M. P. Inflation and financial statement analysis in the international accounting classroom. *Journal of Teaching in International Business*, 2009, 20(2), 174-187.
10. Rorty, R. Transcendental arguments, self-reference, and pragmatism. *In Transcendental arguments and science: Essays in epistemology*, 1979, 77-103, Dordrecht: Springer Netherlands.
11. Rorty, R. The priority of democracy to philosophy. *Objectivity, relativism, and truth: Philosophical papers*, 1991, 1, 175-196.
12. Singh, A.; Hamid, J. Corporate financial structures in developing countries, *IFC Technical Paper 1*, 1992, Washington DC.
13. Solomons, D. The politicization of accounting. *Journal of Accountancy* (pre-1986), 1978, 146(000005), 65.
14. Solomons, D. Accounting and social change: a neutralist view. *Accounting, Organizations and Society*, 1991, 16(3), 287-295.
15. Seker, S. (1994). Son giren ilk çıkar yönteminin vergisel boyutu, Available online: <https://www.kanitymm.com.tr/wp-content/uploads/2020/02/1994-09-yaklasim-son-giren-ilk-cikaryonteminin-vergisel-boyutu.pdf> . (accessed on 26 December 2023).
16. IFRS Interpretation 7 IAS 29 The application of the correction approach within the scope of the financial reporting standard Available online: <https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2022/issued/part-a/ifric-7-applying-the-restatement-approach-under-ias-29-financial-reporting-in-hyperinflationary-economies.pdf?bypass=on> (accessed on 26 December 2023).
17. IAS 12 Income Taxes. Available online: <https://www.iasplus.com/en/standards/ias/ias12> (accessed on 27 December 2023).
18. IAS 21The Effects of Changes in Foreign Exchange Rates. Available online: <https://www.iasplus.com/en/standards/ias/ias21> (accessed on 27 December 2023).
19. IAS 29 Financial Reporting in Hyperinflationary Economies. Available online: <https://www.iasplus.com/en/standards/ias/ias29> (accessed on 27 December 2023).
20. Uman, N. Enflasyon muhasebesi, Teori ve Uygulama, 2002, İstanbul.
21. Whittington, G.; Saporta, V.; Singh, A. The effects of hyper-inflation on accounting ratios: financing corporate growth in industrial economies (No. 3). *World Bank Publications*, 1997.



Empowering Green Sukuk Through IoE Towards SDGs Attainment

Adlin Masood¹ and Norfhadzilahwati Rahim^{2,*}

¹ Faculty of Economics and Muamalat, Universiti Sains Islam Malaysia; adlin.masood@usim.edu.my

² Faculty of Economics and Muamalat, Universiti Sains Islam Malaysia; norfhadzilahwati@usim.edu.my

* Correspondence: norfhadzilahwati@usim.edu.my

Abstract: The 17 SDGs introduced by the United Nations aimed at sustainability, faced setbacks due to COVID-19 reversing 25 years of poverty reduction. Global crises, climate change, and rising prices pushed 95 million into extreme poverty. Green Sukuk, Islamic bonds for eco-friendly projects, has substantial fundraising potential. Adoption requires supportive legal, regulatory, social, and tech environments. Technical advances, including the Internet of Everything, make finance cheaper, aligning with Shari'ah laws and enabling intelligent decision-making. Thus, this study evaluates if Green Sukuk empowered by IoE can achieve SDGS and provide a new paradigm. The research methodology utilized a qualitative approach, extensively examining current literature to gain insights into the Islamic finance ecosystem, specifically focusing on Green Sukuk and the possible integration of the Internet of Everything (IoE). The findings reveal that the proposed model of integrating IoE into Islamic finance, particularly Green Sukuk, holds great potential where the integration of IoE addresses issues of integrity and communication within the Islamic finance ecosystem, providing timely data and information sharing among stakeholders. Analysis from the study points out that mobilising private resources and using new technology can accelerate SDG attainment and make the future more sustainable and equitable.

Keywords: Green Sukuk; Internet of Everything (IoE); Sustainable Development Goals (SDGs); Islamic Finance

1. Introduction

The difficulties of extreme climate change, global health crises, wars, poverty, and inequality are formidable issues of unprecedented magnitude that persistently elude global resolution. The progress made by the United Nations in implementing the 17 Sustainable Development Goals (SDGs), which seek to promote sustainability and equity in the future, has been impeded by the revelation that the COVID-19 pandemic had reversed a significant portion of the poverty reduction achievements made over the past twenty-five years. The confluence of escalating prices attributed to climate change and the persistent geopolitical tensions surrounding the Ukraine issue and Gaza incursion is anticipated to yield a concerning upsurge in the population residing in conditions of extreme poverty. Based on the findings of the United Nations Statistical Division (UN Report 2022), it is projected that around 95 million individuals will be residing in conditions of extreme poverty by the year 2022.

The integration of Islamic finance with advanced technological advancements holds considerable potential for enhancing the worldwide endeavor to attain sustainable development [2]. The Islamic finance industry has increasingly acknowledged the significance of integrating environmental, social, and governance (ESG) concepts into its operations [2]. The Green Sukuk, a groundbreaking financial instrument grounded in Shariah principles, has emerged as a significant entity within the realm of sustainable finance [6]. The establishment of a vehicle for Islamic bonds aimed at supporting projects that foster environmental sustainability demonstrates a resolute dedication to this objective. The Green Sukuk market is seeing tremendous growth and holds the potential to generate substantial capital for the advancement of sustainable development. According to the principles of Shariah law, green sukuk development will result in a favorable and advantageous influence on society at large. Nonetheless, the successful integration of this initiative in nations endeavoring to achieve Sustainable Development Goals (SDGs) necessitates an appropriate and progressive structure encompassing legal, regulatory, social, and technological aspects [47]. Furthermore,

Citation: Masood, A.; & Rahim, N., (2024) Empowering Green Sukuk Through IoE Towards SDGs Attainment. *Journal Of Economic and Business Issues*, 4(1), 113-125.

Received: 29/12/2023

Accepted: 17/02/2024

Published: 29/02/2024

due to technological developments and the implementation of Green Sukuk, the financial burden related to acquiring capital can be significantly alleviated [39]. However, the untapped potential of Green Sukuk in allowing substantial transformation has yet to be fully attained.

Simultaneously, the Internet of Everything (IoE) is a highly advanced network that intimately links diverse devices, humans, and data to deliver fast and correct information to the relevant decision-makers, making it a very effective enabler in the future. The Internet of Things (IoT) possesses the capacity to enhance the efficacy and transparency of sustainable initiatives [32]. Although the Internet of Things (IoT) solely facilitates the connection known as machine-to-machine (M2M) communication, it should be noted that IoT is just one component of the broader concept of the Internet of Everything (IoE), which encompasses a wider range of interconnected entities [26]. The Internet of Everything (IoE) enables individuals to gain a deeper comprehension of the environmental and social consequences of sponsored initiatives by collecting and analysing real-time data [26], that is then fed to the various pillars of IoE. Consequently, this fosters a financial ecosystem characterised by openness and accountability. The integration of the Internet of Everything (IoE) into the Green Sukuk ecosystem signifies a significant change in perspective, introducing a versatile framework that can effectively monitor, evaluate, and enhance the effectiveness of environmentally sustainable initiatives.

Central to this inquiry is the careful utilization of private resources and the adept application of emerging technologies, serving as pivotal catalysts for fostering a future characterized by both sustainability and social equality. The principal aim of this paper is to elucidate the considerable transformative capacity inherent in the model under consideration. It seeks to unravel how the symbiotic relationship between Green Sukuk and IoE can act as a formidable force in accelerating progress towards the SDGs. The crux of this argument lies in the cultivation of innovation, inclusion, and sustainability, positioning the combination of Islamic finance and cutting-edge technology as a pivotal driver for societal progress. By intricately interweaving private sector dynamism with technological prowess, this research contends that a profound and positive impact can be achieved, transcending the conventional boundaries of financial instruments and sustainability initiatives.

Furthermore, the research contends that the Internet of Everything (IoE) emerges as a linchpin in enhancing the efficiency, transparency, and accountability of Green Sukuk issuance, management, and investment. By leveraging IoE, the financial ecosystem of Green Sukuk can be fortified with real-time data analytics, offering stakeholders deeper insights into the environmental and social impact of financed projects. The paper posits that IoE is not merely a technological tool but a transformative enabler, capable of addressing a spectrum of challenges associated with SDGs. Beyond streamlining existing processes, IoE's integration is envisioned to spark innovation, leading to the development of novel Green Sukuk goods and services that have the potential to tackle a broader array of SDG-related concerns.

The 17 Sustainable Development Goals (SDGs) set forth by the UN offer a thorough road map for tackling world issues and creating a sustainable future. Several of these objectives are met by the combination of Green Sukuk and IoE, providing a comprehensive strategy for sustainable development. For example, the global shift to sustainable energy sources is aided by the promotion of renewable energy projects through Green Sukuk, which is in line with SDG 7 (Affordable and Clean Energy). In a similar vein, SDG 9 (Industry, Innovation, and Infrastructure) is aligned with the intelligent monitoring and management enabled by IoE, which fosters innovation in sustainable projects and technical breakthroughs. SDG 17 (Partnerships for the Goals) is further supported by the interconnected IoE structure, which encourages cooperation and communication between the various parties involved in Green Sukuk projects. This alignment highlights Green Sukuk's potential for empowerment.

Even though incorporating IoE into Green Sukuk has many potential advantages, adopting and putting such a model into practice will require careful consideration of several aspects. The legal and regulatory frameworks are essential in determining how the IoE is integrated and how Green Sukuk is issued. Governments that want to implement Green Sukuk must set up legal and regulatory frameworks that encourage innovative and moral finance.

In conclusion, this research presents a compelling argument for the synergy between Green Sukuk and IoE, underscoring their collective potential to drive societal progress towards the ambitious goals outlined by the United Nations. Through careful examination, the proposal of a novel framework, and an emphasis on the transformative capacity of this consolidation, the paper contributes to the discourse on the intersection of finance, technology, and sustainability, advocating for a future that is not only economically viable but also socially and environmentally equitable. Thereby achieving *Maqasid al-Shariah* as decreed in the Quran.

In light of the global complexities posed by climate change, poverty, and inequality, the convergence of Green Sukuk and the Internet of Everything (IoE) presents a potentially viable avenue for tackling these multifaceted concerns. The objective of this study is to evaluate if Green Sukuk

empowered by IoE can achieve SDGS and provide a new paradigm. This study can demonstrate the potential of Islamic financing, namely through the utilisation of Green Sukuk, in mitigating the decline of severe poverty and facilitating the attainment of the Sustainable Development Goals (SDGs).

Furthermore, the technological and social preparedness of the nation's implementing Green Sukuk is essential. Key factors for effective adoption include technological infrastructure that can support Internet of Everything applications, as well as societal acceptance and comprehension of Islamic financial principles.

The research begins with a brief review of Green Sukuk and IoE before delving into the potential benefits of IoE towards empowering the Green Sukuk ecosystem. It presents earlier research papers on how digitalisation and the Internet of Things (IoT), which is a component of IoE, are already being utilised to improve the Green Sukuk market. In doing so, it contributes significantly to continuing research on the critical role of Green Sukuk in achieving global sustainability goals. The sections that follow examine the theoretical underpinnings, methodology, and literature findings that underline the need to imbue Green Sukuk with the Internet of Everything (IoE) to effectively fulfil the Sustainable Development Goals (SDGs). Finally, the study discusses the policy consequences and future research objectives.

2. Conceptual Framework

The incorporation of the Internet of Everything (IoE) into the Green Sukuk ecosystem presents a promising opportunity, as it introduces a flexible structure that can effectively monitor, analyse, and improve the efficacy of environmentally sustainable initiatives. This academic study aims to enhance the effectiveness of Green Sukuk in contributing to the attainment of the United Nations' Sustainable Development Goals (SDGs). It explores a transformative approach by integrating the Internet of Everything (IoE) into the existing ecosystem. The primary objective of this paper is to elucidate the considerable potential of the paradigm for facilitating transformative outcomes. By undertaking this endeavour, the intention is to illustrate the potential synergy between the objectives of innovation, inclusivity, and sustainability in accelerating the advancement towards the achievement of Sustainable Development Goals (SDGs).

3. Theoretical Framework

The integration field of using the Internet of Everything (IoE) to enable Green Sukuk in the pursuit of Sustainable Development Goals (SDGs) is informed by several theoretical frameworks. The theoretical foundations for our knowledge of how Islamic finance, environmental sustainability, and technology innovation intersect to support global sustainable development are examined in this section.

3.1. Islamic Finance Principles

The theoretical framework is based on the fundamental ideas of Islamic finance. As an Islamic financial product, Green Sukuk follows Sharia law and prioritises morally and socially conscious investing. A framework for sustainable and fair financial transactions is provided by the tenets of Islamic finance, which include risk-sharing, asset backing, and the avoidance of excessive uncertainty (gharar) and speculation (maisir) [21].

According to the philosophy of Islamic finance, financial transactions ought to uphold moral principles and promote the welfare of society. By its very nature, green sukuk invests money in green projects, supporting the goals of sustainable development, clean energy, and sustainable infrastructure while also conforming to the larger ideals of climate action.

3.2. The Internet of Everything (IoE)

The transformative force of technological innovation is the foundation for the adoption of IoE within the theoretical framework. According to the thesis of technological determinism, society structures and behaviours are shaped by technical progress [38]. IoE, an advancement of the Internet of Things (IoT), conforms to this notion by establishing a networked framework that connects people, things, information, and processes. IoE becomes a facilitator of communication, real-time monitoring, and intelligent decision-making in the context of Green Sukuk.

Moreover, [45] the theory of diffusion of innovations holds relevance in comprehending the possible integration of the Internet of Everything (IoE) in the Islamic finance sector. Because IoE provides real-time data, transparency, and efficiency improvements, it is in line with the characteristics that promote the spread of innovations. The IoE's adoption in the context of Green Sukuk is likely to be influenced by factors such as relative advantage, compatibility with existing practices, complexity, trialability, and observability.

3.3. Sustainable Development Goals (SDGs)

The idea of the SDGs is also incorporated into the theoretical framework as a guiding principle. The SDGs offer a thorough and internationally acknowledged road plan for tackling urgent issues including inequality, poverty, and climate change. According to Locke and Latham's (2002) goal-setting and goal-alignment theory, performance and motivation are improved by well-defined goals [35]. The linkage of Green Sukuk and IoE with certain Sustainable Development Goals (SDGs) offers a well-defined direction and purpose, inspiring stakeholders to work together for sustainable development.

In conclusion, the theoretical framework that guides the integration of IoE to support Green Sukuk in achieving the SDGs is based on the broad principles of sustainable development, Islamic financing, environmental finance, and technological innovation. With the support of IoE, Green Sukuk takes on the characteristics of these theories ethical finance, environmental stewardship, technical innovation, and the pursuit of global sustainability objectives.

4. Research Methodology

This research is conceptual and takes a multidisciplinary approach to investigating the phenomenon of endowing things with smartness, and its consequences. Owing to the diverse, recency and transcendental nature of the topic, a critical literature review on the Green Sukuk ecosystem and previously related innovation, gleaning research information about IoE is a challenge; this is compounded by the scarcity of relevant papers published in scientific management journals.

The current investigation is a qualitative research study, which entailed doing a comprehensive analysis of existing literature. This study included qualitative descriptive analysis and content analysis approaches. The research will utilise a methodological framework that involves undertaking a thorough examination of pertinent bibliographic sources to solve the research problem and achieve the stated objectives. This study combines a deductive with an inductive approach. This research follows an inductive approach through a vignette description of real examples, to both interrogate and expand on the theoretical foundations, as well as develop the researcher's understanding of smart things in the IoE. The primary aim of this study is to augment the existing knowledge base and comprehend the issues encountered by the Green Sukuk market. The potential application of the Internet of Everything (IoE) as an intermediary holds the potential for facilitating the continuous functioning of the Islamic Finance sector, guaranteeing the preservation of its ethical tenets, and promoting sustainable development goals thereby achieving Maqasid al-Shariah. This study presents a comprehensive overview of the current body of literature about the potential augmentation of the Green Sukuk ecosystem by using IoE to ensure adherence to the principles of Syariah Law. The main aim of integrating IoE into the Green Sukuk ecosystem is to support the achievement of the Sustainable Development Goals (SDGs) while also ensuring the implementation of risk mitigation measures.

The initial step of this study involves doing a comprehensive assessment of existing literature to gain a thorough understanding of the various aspects of the Islamic Finance ecosystem, with a specific emphasis on Green Sukuk. Additionally, the study aims to investigate the methods of communication and information dissemination among the diverse stakeholders within the Islamic Finance ecosystem. The study will also examine the existing system and explore the feasibility of incorporating IoE framework into the system. The focus of previous research on Green Sukuk and the application of IoE in an Islamic Finance context will be determined by retrieving information from bibliographic databases. Finally, the study will analyse the results and propose suggestions and strategies for governments, financial institutions, and producers to achieve, sustain, and enhance their Environmental and Sustainable (ESG) programs. It will also outline potential areas for future research investigations.

4.1. Literature Review

Malaysia has taken the lead in the implementation of cutting-edge instruments and solutions within the realm of Islamic finance. The nation's implementation of Islamic banking exemplifies its commitment to constructing a forward-thinking and contemporary financial system through the seamless incorporation of Islamic tenets into routine banking operations. To attain the SDGs and ESG-related objectives, Malaysia has developed a robust Islamic finance ecosystem that employs an array of technologies, procedures, and tools [46]. Fintech, value-based intermediation, zakat, sukuk, waqf, and charity crowdfunding are some examples. Moreover, Innovative financial products have arisen from the nexus of Islamic finance and sustainable development, with Green Sukuk emerging as a major player. The Internet of Everything (IoE) has been more and more integrated

into Green Sukuk initiatives in recent years, which has transformed sustainable finance. The empowerment of Green Sukuk through IoE and its role in assisting in the achievement of the Sustainable Development Goals (SDGs) are examined in this literature study.

4.1.1. Environmental Degradation

The post-industrial society is confronted with significant environmental concerns of immense magnitude. Throughout human life within the ecosystem, the post-industrial era has presented significant challenges to the planetary boundaries, resulting in an unparalleled decline in biodiversity [29]. The word 'Anthropocene' was coined by Paul Crutzen in the mid-1970s, and it is employed to describe the pollutant emissions generated as a consequence of human activity. The current state of affairs can be attributed to several contributing factors, namely individual self-interested behaviour, the prevalence of money-based usurious financial intermediation, and the separation of moral ideals in the post-industrial human relationship with the ecosystem and environment. Approximately three centuries following the advent of the Industrial Revolution, this research has successfully attained unparalleled economic expansion. Throughout the twentieth century, there was a significant increase in global population by a factor of four, while industrial output had a substantial growth of forty-fold. Conversely, there has been a significant rise in the magnitude at which environmental resources are depleted throughout production operations. In the twentieth century, the past two generations witnessed a notable surge in energy consumption, resulting in a sixteen-fold rise [29].

As per the World Health Organisation, air pollution stands as the foremost environmental health concern on a global scale at present. Global Health Organisation estimates that the combined impacts of household and ambient air pollution cause 6.7 million premature deaths annually. Globally, annual waste production is projected to increase by 73% from 2020 levels to 3.88 billion tonnes in 2050 due to urbanisation and rapid population growth; this could result in soil and waterway contamination, plant mortality, and damage to animals and humans (World Bank).

According to research published in 2020, the rate of warming in the oceans has escalated significantly over the past few decades and increased by 450% between 1987 and 2019 compared to the preceding era. In the past quarter-century, global society has deposited enough heat into the world's oceans to equal the output of 3.6 billion Hiroshima atom-bomb explosions which is equivalent to dropping approximately four Hiroshima weapons into the oceans per second [17]. Based on data released annually by the Internal Displacement Monitoring Centre, the global average annual displacement caused by natural disasters such as droughts, floods, windstorms, or earthquakes has been 26.4 million individuals since 2008.

Land degradation escalated throughout the 20th century because of escalating and interconnected pressures associated with livestock and agricultural production (overgrazing and forest conversion), urbanisation, deforestation, and extreme weather phenomena ([18];[30]), which contribute to soil salinity ([18];[30]). As 20 million hectares of arable land degenerate annually, the deterioration and desertification of the earth pose a threat to people's livelihoods on a worldwide scale. Degradation over the past four decades has turned around a third of the world's arable land into Bora [3]. All these disconcerting figures underscore the criticality of adopting proactive measures to revolutionise production, consumption, and lifestyle. Modifications to food production, business processes, and technical capabilities are required. For society to develop a more conscientious attitude towards the environment, there must be a corresponding shift in the value system. The study will examine how an Islamic worldview fortified with IoE could assist in improving the relationship with the environment.

4.1.2. Sukuk

Sukuk, derived from the Arabic term "صكوك" which represents the plural form of "صك" (sakk), meaning a legal instrument, deed, or cheque, serves as a financial certificate in the Islamic financial system, functioning as a counterpart to conventional bonds. The fundamental underpinning of Islamic finance resides in the imperative to eradicate the presence of both interests, commonly referred to as *riba*, and uncertainty, known as *gharar*, within the realm of financial transactions. To address this requirement, sukuk was introduced as a viable means of securing funding that aligns with the principles of Shari'a law. According to Islamic jurisprudence, the practice of charging or receiving interest, as well as engaging in trade characterised by excessive uncertainty and ambiguous outcomes, commonly referred to as "gharar" or gambling, is strictly prohibited [22].

Sukuk, by the principles and concepts sanctioned by the esteemed Shariah Advisory Council Malaysia (SAC), as per the authoritative Securities Commission Malaysia (SC), are certificates of equal value that serve as a testament to undivided ownership or investment in assets. Sukuk, as per the definition provided by the Accounting and Auditing Organisation for Islamic Financial Institutions (AAOIFI), refers to securities of uniform value that represent individual ownership interests

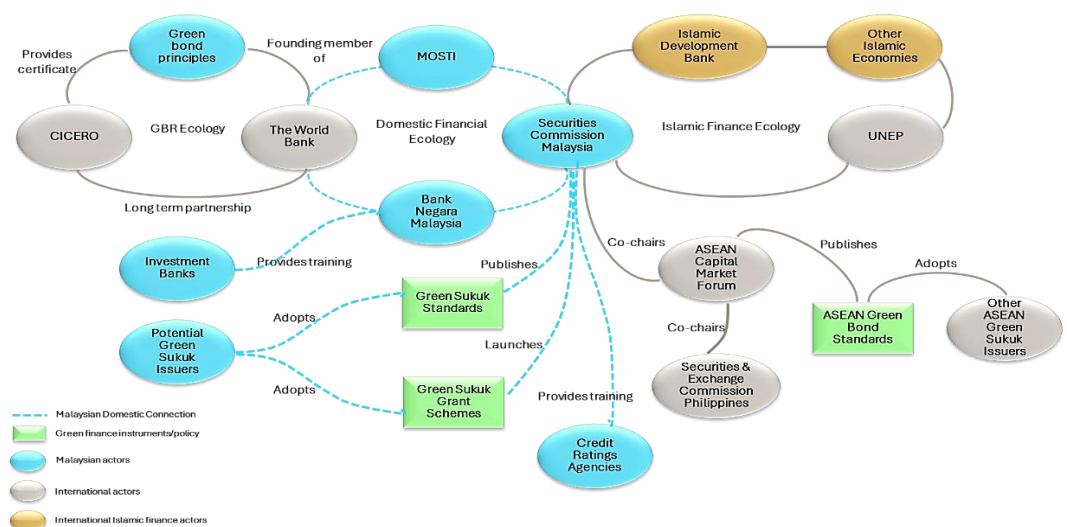
in a collection of present or future assets that fulfil the specified eligibility requirements [1]. The aforementioned definition garners substantial support within the scholarly literature, as evidenced by the works of Hassan et al. (2018), Ahmed and Elsayed (2018), and Asutay and Hakim (2017).

Sukuk, subsequently, is an Islamic financial product that allows investors to generate returns on their investments in a manner consistent with the principles of Islamic Shariah. It functions similarly to asset-backed securities. It can be designed with a structured framework that provides a predetermined return, much to the interest received from a traditional bond. However, unlike bondholders, Sukuk holders are granted an ownership stake in the assets or business that is being funded. The return on Sukuk is contingent upon the performance of the underlying assets, rather than being interest-based.

Fitch Ratings has projected that Islamic banks will maintain a growth advantage over conventional banks due to the adoption of Sharia-compliant services, the supportive regulatory environment, and the presence of an Islamic finance ecosystem within the country. In the year 2022, Islamic financing experienced a notable increase, reaching its highest level in five years at 13%. This growth may be attributed to a strong economic recovery, primarily fueled by an extended rise in working capital loans and a stable household sector. The aforementioned development has reinforced Malaysia's standing as the third-largest global market for Islamic banking. The proportion of Islamic financing in the whole portfolio of banking system loans increased from 38%, after 2021, to 41% by the conclusion of 2022. Malaysia's sukuk market is recognised globally for its established status and significant contribution, with sukuk accounting for around 64% of the total local outstanding issue as of November 2022.

4.1.3. Green Sukuk

Emerging economies have seen significant expansion in green bond markets, which finance green infrastructure like renewable energy, green housing, and low-carbon transportation [15]. Islamic scholars, financial practitioners, and environmental think tanks argue that Islamic finance is inherently compatible with green finance, which seeks to channel investments for environmental benefit. Wasatiyyah demands avoiding waste, luxury, and corruption to sustain mizan (the natural state of the world). Fasad (promoting disorder) and unethical transactions including interest/usury (riba), uncertainty or deceitful contracts (gharar), and gambling (maysir) are forbidden in Islam [41]. This framework requires enterprises to provide people's demands within a sustainable and efficient economy. Thus, financial operations that cause disorder, particularly environmental degradation, are illegal ([38] and [41]). Islamic scholars say that Sharia and environmental sustainability need Islamic finance to contribute to environmental conservation and climate action in the face of climate change, environmental degradation, and humanitarian disaster [38]. Green sukuk, with its structural requirements and concept of expressing economic, environmental, and Islamic principles, may solve some challenges confronting green finance.



Source: Adapted from Liu, F. H., & Lai, K. P. (2021)

Figure 1. The financial ecologies of green sukuk in Malaysia

Through the development of green Islamic finance markets, the World Bank Group Knowledge and Research Hub, Bank Negara Malaysia, and the Securities Commission have been working together to promote the Malaysia Green Finance Programme since 2016. This program's overarching goal is to increase financing for environmentally friendly projects. In 2017, with help from the programme, the first Green Sukuk was issued, raising USD 59 million to fund a solar power plant in Malaysia. With its initiative to launch novel Green Sukuk projects, Malaysia became the pioneer in Green Sukuk issuance [33]. These efforts serve as a conduit for sukuk to be invested in ways that prioritise addressing societal and environmental concerns. Therefore, Green Sukuk play a vital role in bridging the gap between infrastructure development and the field of economically viable practices that give top priority to environmental concerns by Shariah Law. Figure 1 demonstrates the Green Sukuk ecosystem in Malaysia.

According to the World Bank, whilst acting as a bridge between conventional and Islamic finance, the adoption of Green Sukuk can make substantial progress towards the achievement of diverse Sustainable Development Goals including SDG3 pertains to the promotion of good health and well-being, SDG4 focuses on the provision of quality education, SDG6 emphasises the importance of clean water and infrastructure, SDG7 underscores the need for affordable and clean energy, SDG8 centres around fostering decent work and economic growth, SDG9 highlights the significance of industry, innovation and infrastructure, SDG11 addresses the creation of sustainable cities and communities, SDG12 advocates for responsible consumption and production, and finally, SDG13 underscores the imperative of climate action [7].

Furthermore, Bank Negara Malaysia Assistant Governor, in a Bloomberg report (March 2022) reiterated, *"We see Islamic finance with the potential to play a significant part in supporting the sustainable development goal (SDG) commitments. A large financing gap needs to be filled to realize the SDGs in developing nations, which is estimated to be between US\$2.5 trillion to US\$3 trillion annually. OIC countries alone need about US\$1 trillion annually to implement the SDGs. In Malaysia, green and SRI sukuk issuances have served as a bridge between Islamic finance and sustainable investment. As of February 2021, a total of US\$2 billion green and SRI sukuk has been issued since its launch in 2014."*

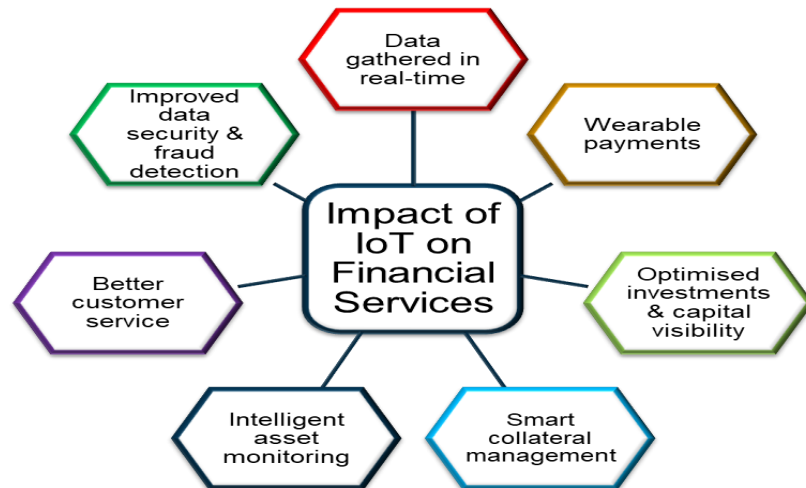
The Global Green Bond Market: Size & Forecast with Impact Analysis of COVID-19 (2021-2025) report highlights the global trend of increasing demand for green, social, and sustainability bonds. This surge in demand can be attributed to various factors such as the growing need for renewable energy, clean drinking water, and sanitation ([19] and [4]). Additionally, there is a rising concern over CO₂ emissions, an increased awareness about forest conservation, and the rapid growth of the urban population worldwide [40]. Islamic green financing is experiencing a notable increase as a growing number of investors are redirecting their capital towards business models that prioritise sustainability. According to Fitch Ratings, Environmental, Social, and Governance (ESG), sukuk had robust expansion during the second quarter of 2023, with a total outstanding value of USD 30.5 billion. Being part of ESG Sukuk, Green Sukuk is also seen to be rising. This represents a quarter-on-quarter increase of 22%. It is projected that the proportion of ESG sukuk will surpass 7.5% of the total outstanding sukuk globally within the following five years, with a recorded percentage of 3.8% in the first half of 2023 [24]. The observed growth aligns with the constant pattern observed during the previous five-year period. It is worth mentioning that Malaysia has emerged as one of the leading countries in sukuk issuance, ranking among the top three globally.

4.1.4. Overview of Internet of Things (IoT)

The acronym IoT was coined in 2013 to describe the proliferation of contemporary technologies such as embedded systems, microelectromechanical systems, Web connectivity, and cordless interaction [39]. The advent of wireless networks has enabled the integration of sensors into any object, irrespective of its dimensions, enabling it to become connected to the IoT and undergo autonomous learning and response. IoT has the potential to bring about significant changes in numerous industries, including manufacturing, healthcare, retail, ecology, finance, and more.

As per the Internet Architecture Board, the term "IoT" denotes a technological framework comprising a multitude of embedded devices that communicate via Internet Protocol Communication Services and are not under direct human control. In contrast to its previous emphasis on Internet infrastructure, there has been a shift in focus towards addressing the physical realm. This includes an expanded range of technologies such as smart factory equipment, wearable health monitors, smart home security systems, and autonomous agricultural equipment [44]. More recently, the term IoT has been used to describe the connectivity of things as "a system of uniquely identifiable and connected constituents (termed as Internet-connected constituents) capable of virtual representation and virtual accessibility leading to an Internet-like structure for remote locating, sensing, and/or operating the constituents with real-time data/information flows between them" [37]. The explosion of connectivity is subtle and often not noticeable to many people [31].

In modern financial institutions, the impact of technology transcends a single layer and affects a multitude of operational facets, including information transfer, processing, and management across multiple layers (Figure 2). The integration of devices via the Internet of Things enables smooth functioning and the exchange of data [34].



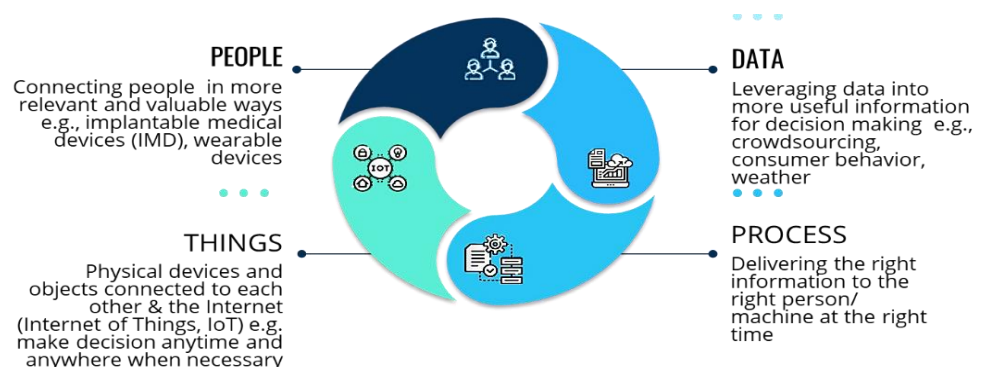
Source: Adapted from Mazlan Abbas (2023)

Figure 2. Top applications of IoT in the Financial Service Industry

4.1.5. Overview of Internet of Things (IoT) Transcending Nature

As a consequence of the worldwide health crisis precipitated by the COVID-19 pandemic, the advancement of pioneering technology has experienced a notable surge and amplification, leading to its widespread adoption by society for the facilitation of daily activities. The proliferation of connectivity is inconspicuous and frequently goes unnoticed by a significant portion of the population. According to [26], hyperconnectivity refers to a wide range of communication and interaction methods that are always available, easily accessible, filled with information, and interactive. This phenomenon facilitates connections between nearly all entities, leading to the expansion of the Internet of Things (IoT) concept into the Internet of Everything.

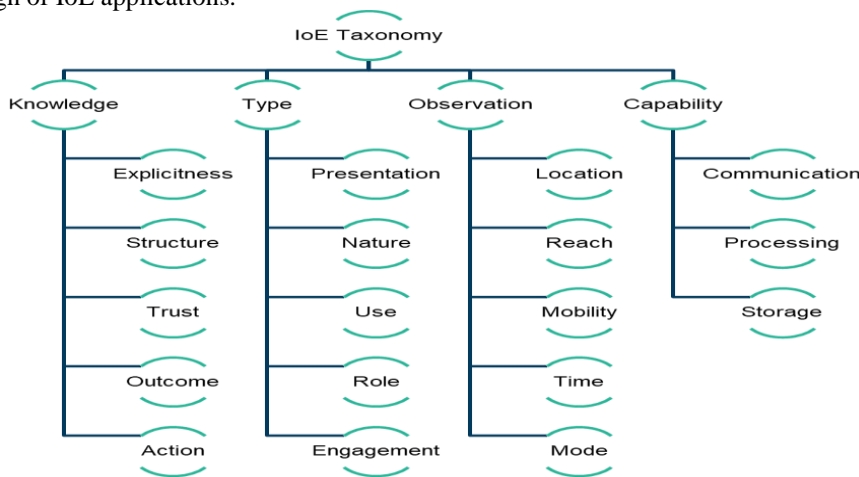
The notion of the Internet of Everything (IoE) is a broadened iteration of the Internet of Things (IoT) that encompasses linkages to data, humans, and business processes [16] that act as IoE pillars. As a result, it includes additional frameworks that are based on connectivity, such as the Internet of Things (IoT), the Internet of People (IoP), and the Industrial Internet (II) [21]. Within the context of this concept, the Internet of Everything (IoE) is understood as a complex network consisting of interconnected intelligent entities, persons, operational processes, and data, where rapid exchanges of data and information occur (Figure 3).



Source: Adapted from Bandara & Ioras (2016)

Figure 3. Pillars of IoE

In 2021, Farias da Costa et al. diagrammatically depicted the entire taxonomy of the Internet of Everything (IoE) (Figure 4). The taxonomy of the Internet of Everything (IoE) is composed of four distinct groups, each encompassing properties that are mutually exclusive and typically comprehensive. The knowledge category examines the attributes of knowledge and the value generated by applications of the Internet of Everything (IoE). It also explores the various types of sensors used in IoE applications and their associated characteristics. The observation category focuses on the methods employed to sense and collect data in IoE observations. Additionally, the capabilities of sensors are categorised into several dimensions that pertain to the technological considerations in the design of IoE applications.



Source: Adapted from Farias da Costa VC (Figure. 2)

Figure 4. Taxonomy of IoE

According to a report from Bloomberg (March 2022), Bank Negara Malaysia Assistant Governor, Adnan Zaylani Mohamad Zahid was quoted as saying, “Islamic financial institutions should step up the adoption of emerging technologies such as artificial intelligence and big data to tap into new opportunities in under-served markets. Bank Negara Malaysia will strengthen key infrastructures to ensure the ecosystem remains vibrant for digitalization, including enhancements to the regulatory sandbox to accelerate time to market for digital innovation.”

In the field of Technology and Innovation Management, a key direction has been the new opportunities for creating value offered by digital technologies, such as those incorporated in the IoE [30]. Indeed, digital technology offers opportunities throughout the entire process of value creation and appropriation whereby it influences not only the functional level of business operations but also the strategic level of business purpose and ability to generate new value propositions [11]. Already the finance institutions understand the importance of taking care of the macro, meso and micro ecosystems however in the case of Green Sukuk it involves many institutions both domestic and international including regulators thus making it more imperative to use technology innovatively (Figure 1). It must be highlighted that implementing IoE also poses considerable challenges to firms, including the development of interoperability between systems, coping with entrenched industry partners that do not collaborate with the new developments, path-dependent legacy processes and transactions, contractual and liability issues, security challenges, loss of control, as well as privacy concerns related to the explosion of data collected and used by businesses and their smart things. For businesses, it is therefore important to understand the extent to which smart things will transform existing business models, and as a part of this, how value creation in such service ecosystems will be affected by the rise of the IoE [32]. This would critically depend on the configuration of the smart things and their capabilities.

The advent of digital platforms has facilitated remote labour and communication, as seen by the recent pandemic. According to Statistics Malaysia, firms recorded a total e-commerce income of RM279 billion in the third quarter of 2021, representing a year-on-year growth of 17.1%. Murali Raman (2022), in his study, anticipated that the metaverse, if well incorporated into corporate strategies and societal principles, will exhibit longevity akin to the rise and fall of the e-commerce “dotcom to dot-gone” phenomenon. According to [32], the Internet of Everything (IoE) serves as a means of connecting individuals, objects, data, and processes to enhance user experiences and facilitate intelligent decision-making. The integration of diverse components within the Islamic Finance ecosystem, such as the green Sukuk ecosystem, necessitates the implementation of the Internet of Everything (IoE) to achieve comprehensive connection, enhanced intelligence, and advanced

cognition. The strategy outlined in this study encompasses a multifaceted system that incorporates individuals and their behaviours [26]. The concept of the Internet of Everything comprises a diverse array of user-generated communications and activities occurring within the global network of interconnected devices. The utilisation of the Internet of Everything (IoE) technology, which is characterised by its interactive and interconnected nature, has promise in addressing various worldwide limitations. Consequently, it is seen as highly suitable for ensuring the integrity of Green Sukuk initiatives.

5. Findings and Discussion

Although efforts were made to glean more information on previous research conducted on Green Sukuk, IoT and SDGs there is currently no research published using this search string in SCOPUS. However, there is little research on Green Sukuk, digitalisation and SDGs on Google Scholar. Authors thus concluded that IoE is a relatively new framework that has not been tested in the realm of Islamic Finance and Green Sukuk. The ASEAN green standards, SRI Sukuk and sustainable investment in addition face several challenges such as messy green taxonomy, trouble in identifying green assets of projects, time consuming and costly, no compelling benefit and exposure to higher risk profiles [47].

The possible resolution of several integrity and communication challenges in Islamic Finance, particularly the timely sharing of data and information among diverse stakeholders, can be facilitated through the seamless integration of the Internet of Everything (IoE) inside the Green Sukuk ecosystem. The Internet of Things (IoT) refers to a network of physical objects equipped with sensors, software, and other technological components, enabling them to establish connections and autonomously exchange data without the need for human intervention (Shafiq, 2022). The utilisation of real-time data from the Internet of Things (IoT) facilitates the facilitation of remote office operations. The exchange of information among Internet of Things (IoT) devices, known as Machine-to-Machine (M2M) communication, offers the advantage of efficient data packet exchange via a network, resulting in time and cost savings. While the Internet of Things (IoT) primarily focuses on the interaction between individuals and objects (People-to-Things or P2T) as well as the communication between objects themselves (Things-to-Things or T2T), the concept of the Internet of Everything (IoE) encompasses the interconnection of people, objects, data, and processes. Figure 5 depicts the simplified connection paradigm proposed by the author for the Internet of Everything (IoE), which undoubtedly can potentially enhance individual experiences and decision-making by establishing uninterrupted connections among the four pillars of the Internet of Everything (IoE).

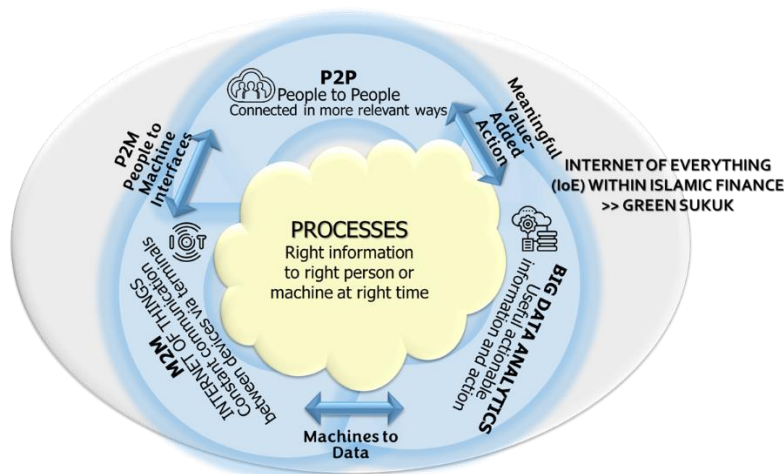


Figure 5. Proposed Model of Internet of Everything Incorporated into Islamic Finance

The Islamic Finance ecosystem, including Green Sukuk, is characterised by its broad scope, involving both domestic and international entities. Additionally, it operates within a regulatory framework overseen by relevant agencies, ensuring that transactions and communications adhere to the policies and standards prescribed by Shariah Law. Nevertheless, the incorporation of the Internet of Everything (IoE) into the Islamic Finance ecosystem would guarantee the smooth and trustworthy execution of these procedures, hence enhancing the Green Sukuk ecosystem and facilitating the achievement of Sustainable Development Goals (SDGs).

Although the incorporation of IoE in Green Sukuk exhibits great potential, it is imperative to consider certain obstacles and limitations. To effectively utilise the benefits of IoE in the context of Green Sukuk, several difficulties need to be resolved, including privacy concerns, data security, and the requirement for standardised protocols [26]. Strong cybersecurity measures are necessary to guard against any intrusions due to the sensitivity of financial transactions and environmental data.

6. Conclusions and Recommendations

In conclusion, this research searches into the transformative potential of integrating the Internet of Everything (IoE) into the realm of Green Sukuk to enhance its impact on achieving the Sustainable Development Goals (SDGs). The research recognizes the formidable global challenges posed by extreme climate change, the health crisis, wars, poverty, and inequality. The United Nations' 17 SDGs were designed to address these challenges, but the COVID-19 epidemic has set back poverty reduction progress significantly. The research posits that the combination of Islamic finance, particularly Green Sukuk, and cutting-edge technologies like IoE can offer a promising solution. Green Sukuk, based on Shariah principles, has emerged as a significant player in sustainable finance, yet its full potential remains untapped. The integration of IoE introduces a flexible and efficient framework capable of monitoring, evaluating, and enhancing the effectiveness of environmentally conscious projects, thereby accelerating progress toward SDGs.

The research methodology employed a qualitative approach, thoroughly analyzing existing literature to understand the Islamic finance ecosystem, with a focus on Green Sukuk and the potential application of IoE. The research emphasizes the importance of communication and information dissemination among stakeholders and explores the feasibility of incorporating the IoE framework. The literature review highlights Malaysia's leadership in Islamic finance, particularly in Sukuk issuance, and the global trend of increasing demand for green, social, and sustainability bonds. The observed growth in Islamic green financing aligns with the rising awareness of environmental and social issues. The findings and discussion reveal that while there is limited research on the specific intersection of Green Sukuk, IoT, and SDGs, the proposed model of integrating IoE into Islamic finance, particularly Green Sukuk, holds great potential. The seamless integration of IoE addresses issues of integrity and communication within the Islamic finance ecosystem, providing timely data and information sharing among stakeholders.

In essence, this research suggests that the wise use of private resources, combined with the application of emerging technologies like Green Sukuk and IoE, can contribute significantly to a future marked by sustainability and equity. By bridging the gap between Islamic finance and technology, this integrated approach aims to play a vital role in slowing the progression of extreme poverty and expediting the achievement of the SDGs. The proposed model presents a paradigm shift, emphasizing innovation, inclusion, and sustainability as key drivers for progress toward global sustainability goals.

Acknowledgements: The authors would like to acknowledge the financial support of this research by Universiti Sains Islam Malaysia under the Matching Grant Scheme (USIM/UNIDA/FEM/SEPA-DAN/72923).

References

1. AAOIFI. *Accounting and Auditing Organization for Islamic Financial Institutions's Shari'ah Standards*. (Accessed from: <http://www.aaofi.com>).
2. Aassouli, D.; Shah, M. E. Aligning sustainability integration, digitalization and inclusivity for green, sustainable recovery. *Journal of Infrastructure Policy and Management* 2022, 5(1), pp. 39-47.
3. AbdelRahman, M.A.E. An overview of land degradation, desertification and sustainable land management using GIS and remote sensing applications. *Rendiconti Lincei. Scienze Fisiche e Naturali* 2023, 34, pp. 767-808. <https://doi.org/10.1007/s12210-023-01155-3>
4. Abdullah, M. S.; Keshminder, J. S. What drives green sukuk? A leader's perspective. *Journal of Sustainable Finance & Investment* 2022, 12(3), pp. 985-1005.
5. Ahmed, H.; Elsayed, A. H. Are Islamic and conventional capital markets decoupled? Evidence from stock and bonds/sukuk markets in Malaysia. *The Quarterly Review of Economics and Finance* 2019, Volume 74, pp. 56-66.
6. Alam, N., Duygun, M.; Ariss, R. T. Green sukuk: an innovation in islamic capital markets. In A. B. -Dorsman, Ö. Arslan-Ayaydin, & M. B. Karan (Eds.), *Energy and finance*. Springer International Publishing 2016, pp. 167-186.
7. Araminta, D. V.; Timur, Y. P. The Role of Green Sukuk in Realizing the Sustainable Development Goals 2030 Agenda. *Jurnal Ekonomi & Bisnis Islam* 2022, Volume 8, Issue 2.
8. Asutay, M., & Hakim, A. Exploring international economic integration through sukuk market connectivity: A network perspective. *Research in International Business and Finance* 2018, Volume 46, pp. 77-94.
9. Bandara, I., & Ioras, F. The evolving challenges of internet of everything: enhancing student performance and employability in higher education. In *INTED2016 Proceedings* 2016, pp. 652-658
10. Bansal, N. *IoT Applications in Financial Services*. In: *Designing Internet of Things Solutions with Microsoft Azure*. Apress, Berkeley, CA, , 2020. https://doi.org/10.1007/978-1-4842-6041-8_10

11. Barrett, M.; Davidson, E.; Prabhu, J.; Vargo, S. L. Service innovation in the digital age. *MIS Quarterly* 2015, Volume 39, Issue 1, pp. 135-154.
12. Belmontes, M.; Kramarz, B. *H1* populated by ESG Sukuk featuring offshore centers Islamic Finance News, 2023, Volume 20, Issue 30 (Accessed from: <https://www.mondaq.com/islamic-finance/1358358/h1-2023-populated-by-esg-sukuk-featuring-offshore-centers#:~:text=During%20H1%202023%2C%20Fitch%20Ratings,quarter%20Don%2Dquarter%20increase.>)
13. BIXMalaysia. *What is Sukuk?* (Retrieved from: <https://www.bixmalaysia.com/learning-center/articles-tutorials/what-is-sukuk>)
14. Bloomberg. Malaysia Seeks Sustainable Lead to Drive Islamic Finance Growth, 2022. (Retrieved from: <https://www.bloomberg.com/news/articles/2022-03-24/malaysia-seeks-sustainable-lead-to-drive-islamic-finance-growth?embedded-checkout=true>)
15. Climate Bond Initiative (CBI). *Bonds and Climate Change: State of the Market*, 2018. Available at: <https://www.climatebonds.net/resources/reports/green-bonds-state-market-2018>.
16. Charmonman, S.; Mongkhonvanit, P. Special consideration for big data in IoE or Internet of Everything. In 2015 13th International Conference on ICT and Knowledge Engineering (ICT & Knowledge Engineering 2015), *IEEE* 2015, pp. 147-150.
17. Cheng, L.; Abraham, J.; Zhu, J. Record-setting Ocean Warmth Continued in 2019. *Advances in Atmospheric Sciences* 2020. 37, pp. 137-142. <https://doi.org/10.1007/s00376-020-9283-7>
18. Delang CO. The consequences of soil degradation in China: a review. *GeoScope* 2018, Volume 12, Issue 2, pp. 92-103. <https://doi.org/10.2478/geosc-2018-0010>
19. Delle Foglie, A.; Keshminder, J. S. Challenges and opportunities of SRI sukuk toward financial system sustainability: a bibliometric and systematic literature review. *International Journal of Emerging Markets* 2022.
20. Di Martino, B.; Li, KResearchL.T.; Esposito, A. *Trends and Strategic Researches in Internet of Everything*. In: Di Martino, B., Li, KC., Yang, L., Esposito, A. (eds) *Internet of Everything. Internet of Things*. Springer, Singapore, 2018. (Retrieved from: https://doi.org/10.1007/978-981-10-5861-5_1)
21. El-Hawary, D., Grais, W., & Iqbal, Z. Diversity in the regulation of Islamic financial institutions. *The Quarterly Review of Economics and Finance* 2007, Volume 46, Issue 5, pp. 778-800.
22. El Shazly, M. R.; Tripathy, P. Sukuk structures, profiles and risks. Paper of Columbia College, 2013, pp. 1-18.
23. Farias da Costa VC; Oliveira L; de Souza J. Internet of Everything (IoE) Taxonomies: A Survey and a Novel Knowledge-Based Taxonomy. *Sensors*. 2021, Volume 21, Issue 2, pp. 568. <https://doi.org/10.3390/s21020568>
24. Fitch Rating ESG-Sukuk Strengthening as Pivot Towards Sustainability Grows (Accessed from: <https://www.fitchratings.com/research/non-bank-financial-institutions/esg-sukuk-strengthening-as-pivot-towards-sustainability-grows-08-08-2023>)
25. Fredette, J.; Marom, R.; Steinert, K.; Witters, L. The promise and peril of hyperconnectivity for organizations and societies. *The Global Information Technology Report. World Economic Forum*, 2012. https://www3.weforum.org/docs/GITR/2012/GITR_Chapter1.10_2012.pdf
26. Hamid, F. A., Ali, M. J., & Abdul Hamid, A. Internet of Everything (IoE) and its potential application in Islamic finance: A conceptual framework. In *Advances in Human Factors, Business Management and Society 2022*, pp. 147-155. Springer.
27. Hassan, M. K., Aliyu, S., Paltrinieri, A., & Khan, A. A review of Islamic investment literature. *Economic Papers: A journal of applied economics and policy* 2019, Volume 38, Issue 4, pp. 345-380.
28. Internal Displacement Monitoring Centre (website: <https://www.internal-displacement.org/>)
29. Ismail, A. G.; Shaikh, S. Role of Islamic Economics and Finance in Sustainable Development Goals, 2017. DOI: 10.13140/RG.2.2.14806.09288. (Retrieved from: https://www.researchgate.net/publication/333103001_Role_of_Islamic_Economics_and_Finance_in_Sustainable_Development_Goals)
30. Janečková M. K.; Sklenička P.; Bohnet I. C.; Lowther-Harris F.; van den Brink A.; Movahhed Moghaddam S.; Fanta V.; Zástěra V.; Azadi H. Impacts of land consolidation on land degradation: a systematic review. *J Environ Manage*, 2023, 329:117026. (Retrieved from: <https://doi.org/10.1016/j.jenvman.2022.117026>. (PMID: 36608617))
31. Keen, P.; Williams, R. Value architectures for digital business: beyond the business model. *MIS quarterly*, 2013, Volume 37, Issue 2, 643-647.
32. Langley, DJ.; Doorn, JV; Ng, ICL.; Stieglitz, S.; Lazovik, A.; Boonstra, A. The Internet of Everything: Smart things and their impact on business models, *Journal of Business Research* 2021, Volume 122, Pp 853-863, ISSN 0148-2963, (Retrieved from: <https://doi.org/10.1016/j.jbusres.2019.12.035>.)
33. Lim, A., Jensen, D., and Rahman, ZA. Facilitating SDGs with Islamic Finance (Part1) Malaysia's Leadership in Sukuk An INFAC Content Series Internation Federation of Accountants 2022.
34. Liu, F. H., & Lai, K. P. Ecologies of green finance: Green sukuk and development of green Islamic finance in Malaysia. *Environment and Planning A: Economy and Space* 2021, Volume 53, Issue 8, pp. 1896-1914.
35. Locke, E. A., & Latham, G. P. Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist* 2002, Volume 57, Issue 9, pp. 705-717.
36. Maiti M, Ghosh U. Next generation Internet of Things in fintech ecosystem. *IEEE Internet Things Journal* 2021. doi: 10.1109/JIOT.2021.3063494.
37. Mazlan Abbas. Empowering Financial Services with IoT: Top Applications 2023. (Available at: <https://iotworld.co/2023/10/empowering-financial-services-with-iot-top-applications/>)
38. McLuhan, M. *Understanding media: The extensions of man*. New York: McGraw-Hill 1964.
39. Musari, K., Hidayat, S.E. The Role of Green Sukuk in Maqasid Al-Shariah and SDGs: Evidence from Indonesia. In: Jumat, Z.r., Hafiz Khateeb, S., Nazim Ali, S. (eds) *Islamic Finance, FinTech, and the Road to Sustainability*. Palgrave CIBFR Studies in Islamic Finance. Palgrave Macmillan, Cham 2023. https://doi.org/10.1007/978-3-031-13302-2_9
40. Ng, I.C.L. and Wakenshaw, S.Y.L. The Internet-of-Things: Review and Research Directions. *International Journal of Research in Marketing* 2017, Volume 34, Issue 1, pp. 3-21 (Retrieved from: <https://doi.org/10.1016/j.ijresmar.2016.11.003>)
41. Obaidullah, M. Managing climate change: The role of Islamic finance. *IES journal Article* 2018, Volume 26, Issue 1.
42. Prasanthi, D., & Kumar, B. Design And Implementation Of High Security Banking System By Using Iot Technology, *International Journal of Innovative Technology and Research* 2019, Volume 7, Issue 5.
43. Rahman, A., Hanife, M. A., Ab Halim, A. H., & Markom, R. The Challenges of Green Sukuk Policy Implementation for Achieving Sustainable Environment. *Malaysian Journal of Social Sciences and Humanities* 2022, 7(11), e001987-e001987.
44. Responsible Finance Institute (RFI). *Environmental Impact in Islamic Finance*, 2018. Available at: <http://report.rfi-foundation.org/download.html>.
45. Rogers, E. M. *Diffusion of innovations*. New York: Free Press 1962.

46. Rosman, R.; Redzuan, NH; Mokhtar, NZN.; Alid, ERAE; Mohammed, MO. Islamic Social Finance and Sustainable Development Goals: Issues and Challenges. *Journal of Islamic Finance* 2022, Volume 11, Issue 2; pp56-67 ISSN 2289-2117 (O) / 2289-2109 (P) (Retrieved from: <https://journals.iium.edu.my/iiibf-journal/index.php/jif/article/download/690/295>)
47. Saba, I., Khan, A., Jawed, H. Islamic Finance and SDGs: connecting dots. In: Hassan, M.K., Saraç, M., Khan, A. (eds) *Islamic Finance and Sustainable Development*. Palgrave Macmillan, Cham, 2021. https://doi.org/10.1007/978-3-030-76016-8_4
48. Sadiq, A. S., Dehkordi, A. A., Mirjalili, S., Too, J., & Pillai, P. Trustworthy and efficient routing algorithm for IoT-FinTech applications using non-linear Lévy Brownian generalized normal distribution optimization, 2021.
49. Tahmoures, A. A. Compare and contrast Sukuk (Islamic Bonds) with conventional bonds, Are they compatible? *The Journal of Global Business Management* 2013, Volume 9, Issue 1, pp. 44–52. (Retrieved from: <http://www.jgbm.org/page/5%20Tahmoures%20A%20%20Afshar.pdf>)
50. World Bank (Retrieved from: <https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management>)