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RESEARCH ARTICLE

Beyond a Reasonable Productivity

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Abstract

Productivity is a totem of economic performance; depending on the perspective one wants to capture, productivity can reflect the performance of the labor force, capital, know-how, time, financial resources etc. In this paper we have chosen to analyze the productivity of the twelve most unsustainable economies worldwide: United Arab Emirates, Qatar, Belgium, Kuwait, Singapore, Netherlands, Republic of Korea, Israel, Saudi Arabia, Macedonia, Japan and the United States of America. The research is based on statistical data provided by the World Bank, the United Nations Development Program and the Global Footprint Network. The research is based on economical, environmental and development indexes used to evaluate productivity adjusted by the ecological deficit of the nations. The fundamental research hypothesis of this paper is how productive would actually be the selected countries if their economies would be responsible enough to resume themselves to their own biocapacities. The secondary hypothesis is what global impact has the complete disregard of the planet's limited capacity to support social and economical activities. The empirical analysis will provide answers to both questions, emphasizing once more the interdependencies between the global actors and the need to incorporate the environmental perspective when analyzing the economic performance of a country.

Keywords: Economic productivity, Social fairness, Biocapacity, sustainability.

JEL Codes: F62, F63

Introduction and Literature Review

Economic productivity and its continuously growth are seen as imperatives of our modern society, but how reasonable is this growth induced by the steroids of deficit? In this paper we analyze the 12 twelve countries most *indebted* to the pool of global resources, focusing on their economic performance, but taking into account also their biological capacity, their ecological footprint of consumption and also their ecological deficit.

The idea behind the study appeared after a similar research in which we adjusted productivity by ecological deficit and GINI index, but in a completely different manner. The findings of the current research are consistent with the findings in the previous study, emphasizing the need for a more rational approach of the economy and its growth.

The rational perspective is endorsed by the use of the biocapacity concept, the ecological footprint of consumption and the relation between them reflected in the ecological deficit. The biocapacity of a country is a measure of its ability to produce and store what it produces, together with the associated wastes. The area used to support the human activity, the country's consumption and also to absorb, process or store the CO_2 emissions and any other greenhouse gases (GHG) is measured through the ecological footprint of consumption index. By deducting the ecological footprint of consumption from the biocapacity of a country, we obtain its reserve or deficit, depending on the size of the two. For this research, we have selected only countries with ecological deficits in order to prove the lack of sustainability in their productive processes.

Modern economic theories explain the differences in productivity and economic growth across countries by differences in political and economic institutions, and differences in culture, geographical position, policies and law. The success of any of these theories in explaining the gap in productivity between any two countries, depends on the countries in the sample [1].

In the twentieth century, economists defined productivity as the relationship between the output produced and the inputs necessary to produce it [2,3]. This definition is attractive in its simplicity because it stands invariable no matter the political system, social milieu or production apparatus; it captures the efficiency with which

the productive factors are used [4]. However, current economic realities (liberalized and dynamic markets, constantly changing customer preferences, new structure of production and work, etc.) are leading to a rethinking of the notion of productivity. Whereas traditionally, productivity was viewed mainly as a concept of efficiency, it is now viewed both as an efficiency and effectiveness concept, effectiveness being how the enterprise meets the dynamic needs and expectations of customers [5]. Productivity appears to be dependent on the value of the products and services (utility, uniqueness, quality, convenience, availability etc.) and the efficiency with which they are produced and delivered to the customers [6].

Productivity gaps between countries have always been an interesting problem for economists and policy makers. The literature is extensive and has several different stands. The neoclassical explanation of productivity gaps focuses on *exogenous* Total Factor Productivity shifts [7-12]. The more recent perspective focuses on the *endogenous* factors that may influence the Total Factor Productivity, as the role of input factors (capital, labor, know how, materials, energy, intermediate inputs etc.) in explaining the gap in economic performance between countries.

The discussion about the relationship between openness and economic growth is still open. The dissent is about the theoretical foundation of the relationship and about the robustness of the positive effect that is presented in the empirical arena. Among the benefits of openness are frequently mentioned the existence of technological spillovers, the exploitation of comparative advantages, scale effects, reduction of the inefficiencies and so on [13].

Although productivity does not represent a country's economic prosperity, living standards and the only measure of competitiveness *per se*, it has been the most widely accepted measure for at least the past 20 years [14]. During the last half of century, international bodies together with national governments and several activists mainstreamed the need to approach the environment as the main casualty of the economic activity. Resource-responsible and environment-friendly, sustainable social development issues have become hot topics of general interest that resulted into a bulk of research that has been concerned about the environmental controls for the impact of conventional total factor productivity [15]. Traditional methods of measuring productivity take into account only the desired output, without considering the undesirable outputs, such as CO2 emissions. Therefore, traditional methods of measuring productivity and productivity growth are telling just one side of the story [16].

The rapidly rising level of economic integration, stimulated by advances in Information and Communication Technology (ICT), renders technology adoption, coming from foreign developed countries, a matter of great importance for economic growth and productivity improvement. As economic theory suggests, learning through international economic activity might be particularly important for all countries, especially for those lagging behind the most developed ones. Foreign Direct Investment (FDI) is considered, among others, an important channel for technology diffusion, which in turn raises the host country's productivity growth [17]. On the other hand, the new 'information economy' of the past decades is associated with increased diffusion of ICTs, which are expected to deliver higher productivity gains and enhanced growth [18].

Gaps in productivity can be explained by several theories: those considering the size of a country or of an economy, the openness to the international trade, the optimization of endogenous factors, advances in ICT, economic and fiscal policies etc., but the truth is that economic productivity is one of the most complex simple concept there is. When analyzing productivity one needs to consider all these factors, in addition, the sustainability of the economic processes that generate the respective levels of economic performance. For this scope we have developed a methodology that takes into account not only what a country produces, but also how it produces it and whether it will be able to continue that given trend. The results emphasize the need for raising awareness and for identifying more sustainable alternatives. The biocapacity of a country is given and it cannot be increased significantly, but an area where it can be intervened, is the consumption and its ecological footprint. Our economic performance needs to be captured in a wiser way, a way that incorporates also the ecological perspective and not only the financial one. The short life span of the current economic development trends is emphasized by the already exceeded biocapacity of the world. If a country exceeds its own biocapacity is a problem because that means that it can no longer rely on its own resources for the well being of its people, but it can rely on the resources of the other countries, resources incorporated in the global stock; but when the

global stock is already effete, on whose resources can one rely on?

Methodology

In order to analyze the sustainability adjusted productivity of the chosen countries, we have developed the following equation:

$$\Omega = GNI(\frac{1}{EMPC} + \frac{1}{GCF})*\alpha;\ \alpha = (1-\frac{ED}{EFC})$$

where:

Ω - Biocapacity-adjusted Economic Productivity

GNI -Gross National Income

EMPC -Compensation of Employees

GCF - Gross Capital Formation

ED -Ecological Deficit

EFC -Ecological Footprint of Consumption

The equation represents the labor and capital productivity, calculated as a GNI ratio, adjusted by the own biocapacity of each country.

Gross National Income, as defined by Eurostat, represents total primary income receivable by resident institutional units: compensation of employees, taxes on production and imports less subsidies, property income (receivable less payable), gross operating surplus and gross mixed income. It is equal to: GDP (Gross Domestic Product) + primary incomes receivable from the rest of the world - primary incomes payable to the rest of the world. Values are seasonally adjusted (SA). The ESA 95 (European System of Accounts) regulation may be referred to for more specific explanations on methodology. In order to compute the labor productivity, we have divided GNI to the compensation of employees (EMPC). The World Bank defines the compensation of employees as all payments in cash, as well as in kind (such as food and housing), to employees in return for services rendered, and government contributions to social insurance schemes such as social security and pensions that provide benefits to employees. In order to compute the capital productivity, we have divided GNI to the gross capital formation. Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation (World Bank). We have chosen to compute productivity as a ration of GNI rather than GDP because due to globalization there are often large differences between the income of a country's residents and its domestic production. Some of the income residents earn is sent abroad, some residents receive international remittances and some countries receive sizeable aid flows.

The second part of the equation captures how responsible the productivity of a country is. Productivity is obtained by exploiting a certain biocapacity. As the Global Footprint Network has proven, sometimes, the countries exploit a biocapacity greater than their own, either for production or for storing waste. In order to analyze how much productivity would each country obtain if they limited themselves to their own biocapacity, we calculated how much productivity is obtained via an ecological deficit and deducted it from the whole productivity of the country. *Biocapacity* or *biological capacity*, as defined in the Global Footprint Network Glossary, represents the capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies. "Useful biological materials" are defined as those demanded by the human economy. Hence what is considered "useful" can change from year to year (e.g. use of corn (maize) stover for cellulosic ethanol production would result in corn stover becoming a useful material, and thus increase the biocapacity of maize cropland). The biocapacity of an area is calculated by multiplying the actual physical area by the yield factor and the appropriate equivalence factor. Biocapacity is usually expressed in global hectares. The global hectare (gha) is a productivity weighted area used to report both the biocapacity of the earth, and the demand on biocapacity (the Ecological Footprint). The global hectare is normalized to the area-weighted average productivity of biologically productive land and water in a given year. Because different land types have different productivity, a global hectare of, for example, cropland, would occupy a smaller physical area than the much less biologically productive pasture land, as more pasture would be needed to provide the same biocapacity as one hectare of cropland. Because world bioproductivity varies slightly from year to year, the value of a gha may change slightly from

year to year. The *Ecological Footprint of consumption* is defined as the area used to support a defined population's consumption. The consumption Footprint (in gha) includes the area needed to produce the materials consumed and the area needed to absorb the carbon dioxide emissions. The consumption Footprint of a nation is calculated in the National Footprint Accounts as a nation's primary production Footprint plus the Footprint of imports minus the Footprint of exports, and is thus, strictly speaking, a Footprint of apparent consumption. The national average or per capita Consumption Footprint is equal to a country's Consumption Footprint divided by its population [19].

The difference between the *Biocapacity* and the *Ecological Footprint of consumption* can result either in ecological deficit, when the *Ecological Footprint of consumption* exceeds the *Biocapacity*, either in ecological **reserve** when the *Biocapacity* exceeds the *Ecological Footprint of consumption*. If there is a regional ecological deficit, it means that the region or the country imports biocapacity through trade or liquidating regional ecological assets, or emitting wastes into a global commons such as the atmosphere. In contrast to the national scale, the global ecological deficit cannot be compensated for through trade, and is therefore equal to overshoot by definition.

The countries we have chosen for the analysis have been selected on the basis of their per capita ecological deficit. Each one of them has an per capita ecological deficit higher than 4 gha, regardless of their population, GDP or GNI, geographical position or any other factors.

Empirical Analysis

As mentioned before, for the scope of the empirical analysis, we have chosen all the countries with a per capita ecological deficit higher than 4 gha. This resulted into a pool of twelve countries from all the continents: United Arab Emirates, Qatar, Belgium, Kuwait, Singapore, Netherlands, Republic of Korea, Israel, Saudi Arabia, Macedonia, Japan and the United States of America. Their cumulated ecological deficit is 2.42 billion gha. What does this mean? Well, it means that these twelve countries are responsible for almost a half of the world ecological deficit.

These countries differ in size, geographical position, GDP, GNI, cultural background; what they have in common is the huge per capita ecological deficit and the fact that except from Macedonia, they all belong to the High Income group of countries. Also, they all have high and very high level of development captured by the HDI.

We will begin by presenting some general information about the countries in order to establish the context for the productivity analysis. The table bellow presents the size of population in each selected country. The largest in size is the US, with a population of 308.7 million inhabitants, while Qatar is the smallest, with a population of only 1.1 million inhabitants. As we can see, most of the selected countries are small ones, with the obvious exceptions of the US, Japan, Korea and Saudi Arabia, which have a population larger than 20 million inhabitants. The population of the group represents approximately 8% of the world population.

Table 1: Population

	Belgium	Israel	Japan	Korea, Republic of	Kuwait	Macedonia	Netherlands	Qatar	Saudi Arabia	Singapore	United Arab Emira	United States of
Population (million)	10.5	6.9	127.4	48.0	2.9	2.0	16.5	1.1	24.7	4.5	6.2	308.7

Source: World Bank

Next we will introduce the economic perspective. The chart below presents the levels of GDP and GNI in the selected countries. As we can see, the levels of the economic development are consistent with the information provided by the size of population. The most rich countries are those with the largest population, respectively, the US, Japan and Korea, with the exception that the Netherlands has higher levels o both GNI and GDP than Saudi Arabia, even if it is much smaller than the last one.

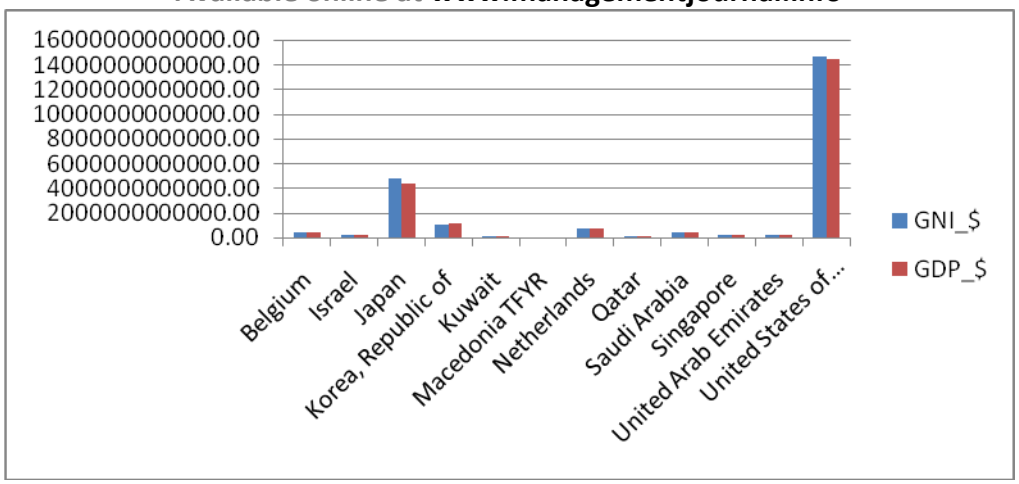

Chart 1: Levels of GDP and GNI

Source: World Bank

When we shift from analyzing the economic performance of the country as a whole, to analyzing the per capita performance, the picture changes completely. The chart below presents the levels of GNI and GDP per capita. Surprisingly, the highest values belong to Qatar, whose per capita GDP exceeds the threshold on 70.000 $, while its per capita GNI exceeds 60.000$.

Macedonia had the lowest levels, with a per capita GNI of only 3482 $ and a per capita GDP of little below 4000 $. The Netherlands and the United States present very similar levels, with Netherland having the per capita GDP higher than the one of the US, and the US having the per capita GNI higher than the Netherlands. The chart presents a much more balanced picture than the previous one did.

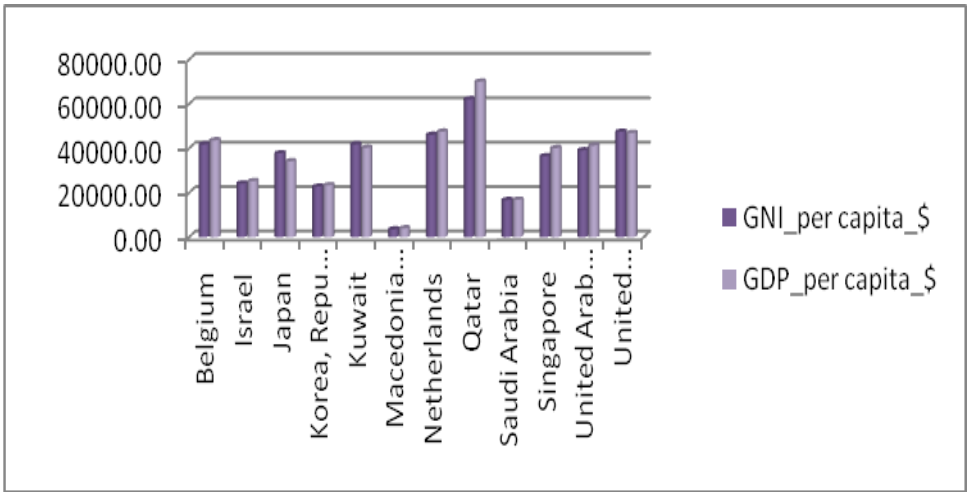

Chart 2: Levels of GNI per capita and of GDP per capita

Source: World Bank

Both charts show very similar levels of the GDP and the GNI for all the countries. In previous analyzes, we have dealt with countries that presented important differences between the levels of the two variables.

The next step in our analysis is to measure the economic productivity of the selected countries. Unquestionably, the group consists of rich, strong countries, except from Macedonia and maybe Saudi Arabia, but how productive are their economies? The chart below presents the levels of productivity. Unfortunately, due to lack of data, we could not measure the productivity of Saudi Arabia and the United Arab Emirates; from this point forward, our analysis will continue only for the other ten countries.

The most productive country of the group is Japan, with a 95.84 score, much more productive than any other country in the group. It is seconded by the US and Korea, with 50.33, respectively 49.66 scores. The least productive countries in the group are Israel – with a score of 14.73, Macedonia – with a score of 15.48 and Qatar – with 17.26. While Macedonia doesn't come as a surprise, Qatar loses its leading position, revealing a country with a productivity level much smaller than expected.

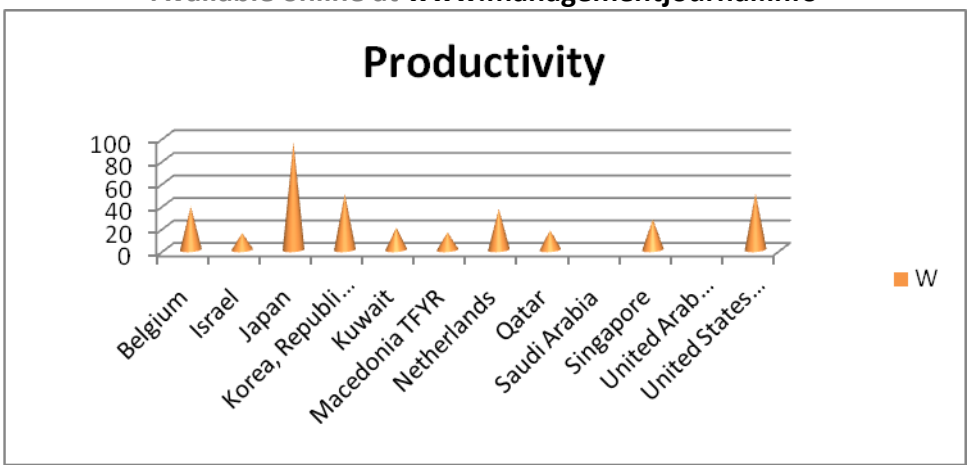

Chart 3: Levels of economic productivity

Further in our analysis we have checked if there was any correlation between productivity and the other variables measuring economic performance. The table below shows the values of the Pearson's r, together with the significance for each result. As mentioned before, the analysis includes only the ten countries for which we have all the needed data.

Table 2: Correlations between GNI, per capita GNI, GDP, per capita GDP and economic productivity

		GNI_$	GNI_per capita_$	GDP_$	GDP_per capita_$	W
W	Pearson Correlation	.482	.121	.461	.008	1
	Sig. (2-tailed)	.159	.740	.180	.982	
	N	10	10	10	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

As we can see, there is no significant correlation between economic productivity and the other economic performance variables. This reads that an economy can have a high or low productivity, regardless of its size. We wanted to make sure that this was true also for the size of population, so we have checked whether there is any correlation between productivity and population. SPSS retrieved the following values: 0.556 for Pearson's r and 0.095 for the significance. Neither result is relevant. This reinforces the former result: productivity is not size sensitive. This is a first important finding of the paper.

Further we will introduce the ecological perspective. Table 3 presents the population of the selected countries, their per capita ecological footprint of consumption, per capita biocapacity and their per capita deficit, The countries are arranged by size of the ecological deficit, from largest to smallest.

Table 3: Population, ecological footprint of consumption, total biocapacity and ecological deficit or Reserve of the selected countries

	Population (million)	Ecological Footprint of Consumption	Total Biocapacity	Ecological Deficit
United Arab Emirates	6.2	10.7	0.8	(9.8)
Qatar	1.1	10.5	2.5	(8.0)
Belgium	10.5	8.0	1.3	(6.7)
Kuwait	2.9	6.3	0.4	(5.9)
Singapore	4.5	5.3	0.0	(5.3)
Netherlands	16.5	6.2	1.0	(5.2)
Korea, Republic of	48.0	4.9	0.3	(4.5)
Israel	6.9	4.8	0.3	(4.5)
Saudi Arabia	24.7	5.1	0.8	(4.3)
Macedonia TFYR	2.0	5.7	1.4	(4.2)
Japan	127.4	4.7	0.6	(4.1)
United States of America	308.7	8.0	3.9	(4.1)

The most important ecological deficit belongs to the United Arab Emirates, of 9.8 gha for the per capita deficit and 61.42 millions gha, the total ecological deficit. The deficit of the UAE is caused by its very limited capacity of only 0.8 gha (per capita), its population rather large compared to its deficit, but most importantly by its huge ecological foot print of consumption, of 10.7 gha, the highest in the world. The UAE is seconded by Qatar, another Arab country, whose per capita ecological deficit is 8 gha, while its total deficit is of 9.1 million gha. The global impact of the Qatar deficit is much smaller than the one of UAE because: (i) its population is much smaller, (ii) it has an own biocapacity three times larger and (iii) its per capita ecological footprint is smaller, even if not much smaller – Qatar has the second largest per capita footprint of consumption in the world.

Further, we will test how do economy and sustainability relate. Table below presents the results for Pearson's r and the significance of the relations.

Table 4: Correlations between ecological footprint of consumption, total biocapacity, ecological deficit, gross national income, gross domestic product and productivity

		Ecological Footprint of Consumption	Total Biocapacity	Ecological (Deficit) or Reserve	GNI_$	GDP_$	W
Ecological Footprint of Consumption	Pearson Correlation	1	.545	-.861**	.080	.089	-.268
	Sig. (2-tailed)		.067	.000	.804	.784	.455
	N	12	12	12	12	12	10
Total Biocapacity	Pearson Correlation	.545	1	-.042	.716**	.724**	.015
	Sig. (2-tailed)	.067		.896	.009	.008	.967
	N	12	12	12	12	12	10
Ecological (Deficit) or Reserve	Pearson Correlation	-.861**	-.042	1	.339	.334	.406
	Sig. (2-tailed)	.000	.896		.281	.288	.245
	N	12	12	12	12	12	10
W	Pearson Correlation	-.268	.015	.406	.482	.461	1
	Sig. (2-tailed)	.455	.967	.245	.159	.180	
	N	10	10	10	10	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

The first thing we notice is that productivity doesn't correlate with any other variable, it seems to be independent of both income and domestic product, as well as any of the ecological variables: biocapacity, ecological deficit and ecological footprint of consumption.

The strongest correlation identified is between the ecological deficit and the ecological footprint of consumption; we find that there is a strong negative correlation (r = -0.861, sig. 0.000) which means that the higher the ecological footprint of consumption, the lower the ecological reserve. There is a significant correlation also between the biocapacity and the ecological footprint of consumption, but positive and lower in intensity (r = 0.545, sig. 0.067). We observe also that both GNI and GDP are strongly correlated with the biocapacity of the countries, r = 0.716 (sig. 0.009), respectively r = 0.724 (sig. 0.008).

Up to this point in our analysis we have discussed the economic performance of the selected countries, their productivity and their biological capacity, together with their ecological footprint of consumption and their ecological deficits. Further we will analyze the economic performance of the selected countries in regard to their biocapacities; we will test to what extent would manage these countries to remain productive and keep their current levels of income and domestic product if they had to live within their means.

The table below presents the gross national income of the countries, its value adjusted by α when α = $(1-\frac{ED}{EFC})$ and the difference between the two. As we can see there are huge differences between GNI and its value adjusted by α. The US is the country that benefits the most of the world openness, 7564.4 billions of its GNI being obtained by valorizing resources and markets other than its own.

Table 5: Values of gross national income, adjusted gross national income and the difference between the two

	GNI	GNI_adjusted	Difference
Belgium	440,283,225,823.81	73,911,877,438.33	366,371,348,385.48
Israel	167,275,363,782.99	11,032,190,641.94	156,243,173,141.04
Japan	4,812,118,504,650.81	609,654,587,609.20	4,202,463,917,041.61
Korea, Republic of	1,091,724,432,505.02	75,067,976,623.78	1,016,656,455,881.24
Kuwait	119,171,302,572.80	7,451,562,623.27	111,719,739,949.54
Macedonia TFYR	7,104,059,800.29	1,799,230,146.60	5,304,829,653.68
Netherlands	758,663,878,173.47	125,965,336,136.90	632,698,542,036.57
Qatar	70,704,948,706.42	16,884,837,701.84	53,820,111,004.58
Saudi Arabia	412,762,521,417.80	67,407,931,524.25	345,354,589,893.55
Singapore	163,610,302,253.11	568,568,876.72	163,041,733,376.39
United Arab Emirates	244,417,704,106.41	19,398,825,984.36	225,018,878,122.05
United States of America	14,652,712,112,200.20	7,088,305,584,815.64	7,564,406,527,384.54

The second exploiter of the world resources is Japan whose GNI owes 4202.4 billion to the world resources, followed by Korea with 1016.6 billion. Though the value of the difference between the GNI and the adjusted GNI is higher for the US, the difference for Japan is much more important if considered as percentage of GNI – about 87%, compared to 51% in the case of US.

We have performed the same operations with the GDPs of the countries and the results were very similar, with the US owing 7475.4 of its GDP to the world biocapacity, followed by Japan and Korea, with 3804.4 billion, respectively 1045.4 billion. This was an expected outcome due to the very similar levels of the GDP and GNI observed earlier in the section dedicated to the analysis of the economic performance.

As far as productivity is concerned, we observe again very important differences between productivity and adjusted productivity. If in the case of GNI and GDP, the differences were self-explanatory, in the case of productivity we felt the need to calculate also the share represented by the difference between the two variables, in the productivity index. The last column in the table below includes these shares.

Table 6: Values for the economic productivity, the adjusted economic productivity, the difference between the two and the share of the difference in relation to productivity

	Productivity	Productivity_ adjusted	Difference	Percentage of difference
Belgium	38.60	6.48	32.12	0.83
Israel	14.73	0.97	13.76	0.93
Japan	95.84	12.14	83.70	0.87
Korea, Republic of	49.67	3.42	46.25	0.93
Kuwait	19.61	1.23	18.38	0.94
Macedonia TFYR	15.48	3.92	11.56	0.75
Netherlands	36.25	6.02	30.23	0.83
Qatar	17.27	4.12	13.15	0.76
Saudi Arabia	Missing values	Missing values	Missing values	Missing values
Singapore	27.09	0.09	27.00	0.99
United Arab Emirates	Missing values	Missing values	Missing values	Missing values
United States of America	50.33	24.35	25.98	0.52

They highlight the dependence of these countries on the world biocapacity more obvious than any other variable before in the analysis. The most striking difference is in the case of Singapore,

whose economic productivity is obtained almost entirely by valorizing a foreign biocapacity. For Kuwait 94% of its productivity is explained by foreign resources, for Korea and Israel, 93% of their productivity is reliant on the world resources. The US appears to be the least dependent country in the list, counting for half of its productivity on its own biocapacity and for the other half on the biological capacity of the world.

The analysis was focused on the world most irresponsible countries when it comes to living within their own means. But equally true and accurate is the fact that these are the most skillful countries when it comes to valorizing available resources, either their own or belonging to others.

Conclusions

The complexity of the productivity concept emphasizes a research area with unlimited potential for development. Researchers from all over the world have exploited the concept from the most diverse perspectives and yet it continues to be an area that we know little about and that we can control even less.

In this paper we have analyzed how productive are the most unsustainable countries, based on their ecological deficit, and also how productive would be their economies if, in fact, they would be responsible enough to resume themselves to their own biocapacities. In our attempt to answer this research hypothesis, we have tried to answer a secondary question as well: what global impact has the complete disregard of the planet's limited capacity to support social and economical activities.

For the empirical analysis we have chosen all the countries with a per capita ecological deficit higher than 4 gha. This resulted into a pool of twelve countries from all the continents: United Arab Emirates, Qatar, Belgium, Kuwait, Singapore, Netherlands, Republic of Korea, Israel, Saudi Arabia, Macedonia, Japan and the United States of America. Their cumulated ecological deficit is 2.42 billion gha, which means that these twelve countries are responsible for almost a half of the world ecological deficit. The countries differ in size (from Qatar with a population of 1.1 million inhabitants to the US with a population of 308.7 million inhabitants), geographical position (each continent being represented), political system (republic – parliamentary representative democratic; presidential representative democratic; federal constitutional-, monarchy – absolute; federal presidential absolute; federal parliamentary representative democratic constitutional; hereditary; constitutional; or multiparty parliamentary representative democratic constitutional-, or parliamentary democracy), cultural background, GDP (from 8.1 billion $ for Macedonia to 14480.3 billion $ for US) etc. Their two common areas being the lack of sustainability of their economical processes considered in regard to their ecological deficit and the fact that they are all, except from Macedonia, strong economies, included in the High Income Group of countries according to the World Bank classification.

The most productive country of the group proved to be Japan, with a 95.84 score, much more productive than any other country in the group. It is seconded by the US and Korea, with 50.33, respectively 49.66 scores. The least productive countries in the group are Israel – with a score of 14.73, Macedonia – with a score of 15.48 and Qatar – with 17.26. Further in our analysis we have checked if there was any correlation between economic productivity and the other economic performance variables. The test showed no significant correlation, which means that an economy can have a high or low productivity, regardless of its size.

The sustainability perspective was captured in the paper via three indexes: total biocapacity, ecological footprint of consumption and ecological deficit. The countries vary significantly across each index. The most important ecological deficit belongs to the United Arab Emirates, of 9.8 gha for the per capita deficit and 61.42 millions gha, the total ecological deficit. The deficit of the UAE is caused by its very limited capacity of only 0.8 gha (per capita), its population rather large compared to its deficit, but most importantly by its huge ecological foot print of consumption, of 10.7 gha, the highest in the world. The UAE is seconded by Qatar, another Arab country, whose per capita ecological deficit is 8 gha, while its total deficit is of 9.1 million gha. The global impact of the Qatar deficit is much smaller than the one of UAE because: (i) its population is much smaller, (ii) it has an own biocapacity three times larger and (iii) its per capita ecological footprint is smaller, even if not much smaller – Qatar has the second largest per capita footprint of consumption in the world.

Furthermore we have adjusted the economic performance variables by $\alpha = (1-\frac{ED}{EFC})$, in order to reveal how much of the economic result is obtained via a sustainable use of the biocapacity and how much is obtained through exploitation of the global stock of the resources. The values

obtained are significantly different from the official records of each country, the differences counting for up to 99.65% in the case of Singapore. As far as absolute values are concerned, the US has the highest differences between the economic performance indexes and their adjusted values, while Singapore has the highest shares.

The cumulated difference of the GDP and its adjusted value of the 12 countries equals the GDP of the US, respectively 14.4 thousand billion $. This means that these twelve countries manage to exploit/valorize the stock of the global resources in such an extensive manner that can obtain the economic performance of the US, the strongest economy in the world, without having any of its resources.

The results brought to light several important findings, but most importantly it proved the validity of the Ω equation developed with the purpose of testing the sustainability of the economic productivity. The results still leave room for a lot of interpretation. The productivity levels of the 12 countries are way beyond reasonable, reflecting a lack of common global initiatives able to protect the common stock of resources and able to protect the smaller national players. The current pattern of economic development is one tailored by the big players for the big players with a complete and utter disregard of the wellbeing of mankind.

Scope for Future Research

Future works will extend the pool of countries selected for the empirical analysis in order to identify the differences in productivity intensity for the bulk of cross-country variations. Furthermore, we hope to identify some thresholds to divide the countries in categories according to their level of productivity (high, medium or low) and their responsibility (social and environmental). Both inter- and intra- categories analyses are required in order to ensure the robustness of the partitioning. Moreover, we want to identify alternative measurements for labor and capital compensation to make possible the analysis over a longer period of time, to identify trends and to be able to predict future developments.

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