Econometrics of Corruption Impact of Corruption on The Human Development of Argentina.

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Abstract

Purpose: The purpose of this document is to demonstrate the econometric calculation between corruption perception indices in Argentina and human development indices, in a period of government, you can see the impact on the different variables

Design Methodology Approach: The applied methodology is the calculation of the linear regression and its values between 30 human development indices and the Corruption Perception Index of Argentina in 2003-2015.

Research Limitations Implications: There are no limitations in the model, this research can be applied to any country in the world.

Practical Implications: The practical consequence of this work is the possibility of applying econometric theory to calculate the impact of corruption on human development variables.

Social Implications: The social implications are the possibility of seeing the impact of corruption on the variables of human development and its effect on the quality of life of society.

Originality/ Value: This theory is original; it has NOT been formulated in the study of the types of corruption in the world.

Economic Development Concept

We define the concept of economic development according to the World Bank as: The qualitative change and the restructuring of a country's economy in relation to technological progress and social progress. The main indicator of economic development is the increase in GNP per capita (or GDP per capita), which reflects the increase in economic productivity and material well-being, on average, of a country's population. Economic development is closely linked to economic growth [1].

Let's advance in this definition and go to the concept of sustainable or sustainable development:

Sustainable development [2]. According to the United Nations World Commission on Environment and Development (1987), sustainable development is one that "meets current needs without compromising the ability of future generations to meet their own needs"[3]. According to a more practical definition of the World Bank, sustainable development is "a process of managing a portfolio of assets that allows preserving and improving the opportunities that the population has". This includes economic, environmental and social viability, which can be achieved by rationally administering physical, natural and human capital.

The objective of this paper is to know if corruption impacts on sustainable development, and in what way. The literature that developed this point, is based mostly on studies of the impact of corruption on economic development, let's see and analyses below some conclusions with their characteristics and authors.

The link between corruption and economic performance -especially growth and development- has been studied in its theoretical side from various points of view and through different approaches, more or less rigorous in terms of formality and more or less satisfactory to explain intuitive knowledge and empirical evidence.

However, we can basically find two schools within which the theory of linkage has been developed, between corruption and economic growth. On the one hand, some authors have studied the issue through rent-seeking, understood as the search for profit on the part of private agents through interaction with public agents [4]. In this view, the corrupt fact originates fundamentally from the initiative of the private agent - typically, the entrepreneur - who finds in the link with the State, the possibility of obtaining a greater profit than the one reported by the execution of his productive activity.

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A pioneering work was that of Mauro (1990), (it develops the 1990 model of Barro's economy uses a production function that has two equilibria, one of "low corruption" where it impacts on two factors, especially capital and labour and another of "high corruption" colliding in all factors, especially in public spending, through deviations from unproductive spending, reaching satisfactory conclusions of positive impact of corruption on economic growth [5, 6].

Another of the pioneering works is that of Shleifer and Vishny (1993), who perform their analysis, explicitly point out the validity of the theoretical framework of principal-agent [7-9]. This acceptance of the support of the principal-agent, has some flexibility to the definition of agent, including the private sector, this framework was common to most of the literature generated since then about the link corruption-economic growth, confirming the fertile nature of that job.

A work that analyses the Asian countries is that of Shang Jin Wei (2001) in his conclusions, determines while one can think of examples in which some companies / people have progressed either paying a bribe or having the opportunity to pay a bribe, the overall effect of corruption on economic development is negative [10]. There are several channels through which corruption hinders economic development. These include the reduction of national investment, the reduction in foreign direct investment, the disproportionate increase in government spending, the distortion of the composition of government spending away from education, health and maintenance of infrastructure, towards less efficient public projects that have a greater scope for manipulation and opportunities for obtaining bribes.

While culture plays an important role in determining what is con-

sidered a bribe versus a gift, the differences generated by education itself seem small. On the other hand, Professor Jean Jaques Laffont (2002), elaborates a large number of corruption measures available, produces a regression of the measurement of corruption by transactions and GDP per capita [11].

Keith Blackburn, Niloy Bose and Emrwul Marque (2003), developed an article that discusses the incentives to be corrupt, the development process, and how corruption affects the allocation of resources. Professor Johann Graf Lambsdorff (2003), in a work of the World Bank, establishes the relationship between corruption and productivity, corruption and net inflow of capital, against Transparency International's Perception of Corruption Index, demonstrates that there is a positive correlation between High corruption and low corruption through regressions and identifies the channels of influence with two stylized models [12,13].

Taking into account basic issues, how to define corruption is developed in Svensson (2005) and how to measure it, also in Svensson (2003) explaining a precedent framework of basic definitions. The Central Bank of Peru, published a paper in 2007, which establishes a review on corruption and development indicators, is very interesting, where it reviews the measurement of corruption, its comparison with GDP per capita, Stability, Volatility of GDP, Expenditure on Education, Infant Mortality, Military Expense, Tax Revenue, Surplus / Fiscal Deficit, Indicators of Inequality, Investment, ending with the results of the estimates and their conclusions [14,15,16].

There are other jobs such as Salinas Jiménez (2007), where corruption and GDP per capita are developed, with economic and efficiency results, relating the variables with other economic costs of corruption. Aidt (2010) establishes two visions of corruption, a bureaucratic corruption and another greaser of the wheels of commerce, with micro evidence and macro evidence, the relationships between corruption and genuine investments, corruption as an obstacle to sustainable development, establishing what role institutions play in the accumulation of real wealth and sustainable development [17,18].

One of the most recent works in the analysis of corruption and expenditure with a fiscal deficit stands out, that of Michael Brogan (2014), which uses a regression model to demonstrate the relationship The links between corruption and economic growth should be reviewed under this new framework, much more the need to check the robustness and validity of the results.

Concluding, it is imperative that the academic and political part of society, develop new measurements, adjusting to the changes taking place around the world, on the side of economic growth and corruption [19].

On the side of methodologies for measuring corruption, and as we pointed out in a timely manner, one of the most obvious weaknesses of the indices used is their ordinal nature, which makes their use in regressions difficult [20]. However, we also highlight the efforts that economic and econometric theory has been making to provide, with diverse success, quantitative indexes of corruption. Recent empirical studies have revealed that corruption is responsible

for low economic growth, less foreign and domestic investment, high inflation, depreciation of the currency, spending on education and health, inequality between high and middle income, and education are low poverty.

Impact of Corruption
The development has many economic variables, hence it is important to study the impacts Between corruption and these economic variables, especially three, the investment rate, economic growth and the allocation of public spending.

In the case of Argentina, one of the ways to analyses the relationship between corruption and the variables of the economy is to study the impacts on the cause of the incentives of each variable and the types of basic corruption, since there are no statistics of criminal acts.

What are the types of basic corruption?
- Briberies
- Overview of goods and services.
- Outside of Public Works.

In addition to analysing the impacts on the incentives of the variables, the way to take to solve the impact of corruption and development, is to extend the concept of economic development to human development, with this analysis we will have quantitative and qualitative variables of human development. Following an interesting work by Selcuk Akcay (2006) from the University of Turkey, where it broadens the concept and the impact of corruption on development to human development [21].

In Human Development, there are more variables than basic economic development, and through how they manifest themselves, the relationship between economic growth and poverty, education and basic services, that is, quality of life, is analyzed. Let's analyse in detail these causes and consequences in this relationship, and detail the solutions between the link between corruption and poverty

Solutions to Poverty
- Increase economic growth.
- Create the most equitable income distribution.
- Strengthen government institutions and their capacity.
- Improve public services, especially in health and education.
- Increase public confidence in the government.
- Promote environmental and quality of life solutions.

Consequences of corruption on human development
- Economic growth is associated with poverty reduction.
- The burden of rapid reduction falls more heavily on the poor.
- Corruption is associated with low economic growth.
- Corruption reduces domestic investment and foreign direct investment.
- Corruption increases unproductive government expenditures.
- Corruption reduces the productivity of the public sector.
- Corruption distorts the composition of public spending.
- Corruption reduces government revenues.
- Corruption reduces the quality of public infrastructure.
- Corruption reduces spending in social sectors.

Corruption increases income inequality
- Corruption increases inequality of ownership of the capital and work factor.
- Inequality slows economic growth.
- Corruption decreases the progressivity of the tax system.
- Corruption acts as a regressive tax.
- Low-income households pay more in bribes as a percentage of income.
- Better governance is associated with lower corruption and lower poverty levels.
- High capture of the State, makes it difficult to reduce inequality.
- Trust is a component of social capital. Higher social capital is associated with lower poverty.

As a consequence, what elements we have to analyse the impact, we must choose variables that are representative of human development, but that have a correlation between the measurements of corruption Why do we look for the correlation relationship between the variables?

What happens if I study corruption in a process of economic growth, with important rates of increase? How I measure the impact if there is no correlation between the variable that I choose to represent corruption and the high rates of economic growth, the smoke of "high growth", does not let me see in reality the impact of the corruptive phenomenon, represented by a deterioration of the quality of life of the population.

Findings of Lambsdorff demonstrated, in a cross-sectional study of sixty-nine economies, that corruption significantly decreases the average productivity of capital and, consequently, GDP [22]. This evidence seems to confirm the hypothesis that all corruption is detrimental to development. Let us be careful in the analysis of the evolution of corruption and growth rates, in a process of increase [23].

How do I measure and evaluate the impact? In the difficulty of the mathematical and econometric process, he exposes a good reason to use the concept of statistical correlation for the demonstration of the relationship between corruption and human development, by this way we expand the pure economistic vision of economic development and we can focus on the impacts.

The correlation indicates the strength and direction of a linear relationship, and the proportionality between two statistical variables. It is considered that two quantitative variables are correlated. When the values of one of them vary systematically with respect to the homonymous values of the other.

In the different measures of corruption, are the indices of corruption measurement, these are several and are detailed in chapter four of this book, in this case we will choose The Corruption Perceptions Index measured by Transparency International, with some criticisms, is the index that best measures corruption, especially in the public sector [24].

The key is to work between corruption and human development, looking for variables that measure the impact of efficiency in man-

agement, which are bases of human development and opposing the Inside of Perception to Corruption of Transparency International.

In principle, let's analyse the evolution of the Corruption Perception Index for Argentina since its measurement at the beginning and its correlation:

For this characteristic, the fundamental thing when comparing indexes, is to compare government cycles, since the improvement of human development is shown through periods of government, it is logical to study it in this way, for that reason we will work with indexes belonging to the cycle of last argentine government 2003 -2015.

Years	Corruption Perception Index Transparency International
2003	2.5
2004	2.5
2005	2.8
2006	2.9
2007	2.9
2008	2.9
2009	2.9
2010	2.9
2011	3.00
2012	3.5
2013	3.4
2014	3.4
2015	3.2

If we study the descriptive statistics for the period 2003-2015 of the Corruption Perception Index of Argentina from Transparency International, we see that Argentina's bad score is accentuated, with its average falling to 2.98, with a median of 2.9, in other words in this period high corruption was accentuated and continued according to these surveys.

Corruption Perception Index	
Mean	2.98
Typical error	0.0875932864232758
Median	2.9
Mode	2.9
Standard deviation	0.315822085585525
Sample variance	0.0997435897435904
Kurtosis	-5
Asymmetry coefficient	0.166604668835469
Range	1
Minimum	2.5
Maximum	3.5
Sum	38.8
Observations	13
Confidence Level (95 %)	0.19084937625175

Conclusion for Argentina that in this period of government, political decisions, was not fought against corruption, and if it was done, the combat was very inefficient, as an interpretation of the index and its evolution.

Hypothesis

In a government cycle within a process of economic growth, the level of corruption in a country maintains a direct and substantial correlation with the results achieved by that country in terms of human development, the econometric results will be more visible

and quantifiable in the quality variables of human development.

Measurement of the Impact of Corruption on Human Development of Argentina

In the previous section we reached the conclusion that it was desirable and of greater analytical value to measure the impact of corruption on human development, according to the agenda that the United Nations established for 2030, of the goals to be a sustainable country, these goals they include economic data, to have the complete vision of the clash of variables with corruption, and the possibility of measuring their effects [25].

We enumerated the variables that I chose from human development of Argentina, measurements provided by the World Bank, detailing its scope and definitions in themeasurement period, in the last government of 2003-2015:

Economic Indices

GNI per capita, Atlas method (US $ at current prices) GNI (previously GNP) is the sum of the added value produced by all resident producers, plus taxes on products (minus subsidies) not included in the valuation of production plus net inflows of primary income (remuneration of employees and property income) from abroad. Natural Log of GNI per capita, Atlas method (US $ at current prices Foreign direct investment, net inflow of capital (balance of payments, US $ at current prices): Foreign direct investment refers to direct investment capital flows in the reporting economy. It is the sum of social capital, the reinvestment of profits, and other capital. The data is expressed in current US dollars [26].

Natural Logarithm of Foreign Direct Investment, net inflow of capital (balance of payments, US $ at current prices): GDP (US $ at current prices): GDP at buyer prices is the sum of the gross value added by all producer's resident in the economy, plus taxes on products, less subsidies not included in the value of the products. It is calculated without making deductions for depreciation of manufactured assets or for the depletion and degradation of natural resources. The data is expressed in current US dollars. Natural GDP Logarithm (US $ at current prices): Inflation, GDP deflation index (annual %): Inflation, measured by the annual growth rate of the implicit GDP deflator, shows the rate of variation of prices in the economy as a whole. The implicit GDP deflator is the ratio of GDP in current local currency and GDP in constant local currency.

Gross capital formation (as% of GDP): Gross capital formation (previously, gross domestic investment) includes disbursements for additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drainages, etc.); the acquisition of plant, machinery and equipment, and the construction of roads, railways and related works, including schools, offices, hospitals, private residential housing, and commercial and industrial buildings.

GNI growth (annual%): Increase in GNP (formerly GNP) is the sum of the value added by all resident producers, plus taxes on products (minus subsidies) not included in the valuation of production plus net inflows of primary income (remuneration of employees and property income) from abroad.

GDP growth (annual %): Percentage annual growth rate of GDP at market prices in local currency, at constant prices. Aggregates are expressed in United States dollars at constant 2005 prices. GDP is the sum of the gross added value of all producers resident in the economy plus all taxes on products, minus any subsidy not included in the value of the products. GDP growth per capita (annual %): annual percentage growth rate of GDP per capita in constant local currency. Aggregates are based on 2005 US dollar constants. GDP per capita is the gross domestic product divided by the population in the middle of the year. GDP at buyer's prices.

GNP per capita growth (annual%): GNI per capita (formerly GDP per capita) is the gross national income converted to United States dollars by the World Bank Atlas method, divided by the population halfway through the year. year. Gross capital formation (% of annual growth): Growth rate of gross capital formation (previously, gross domestic investment) includes disbursements for additions to the fixed assets of the economy plus net changes in the level of the inventories. Fixed assets include land improvements (fences, ditches, drainages, etc.); the acquisition of plant, machinery and equipment, and the construction of roads, railways and related works, including schools, offices, hospitals, private residential housing, and commercial and industrial buildings.

Education Indices

Primary level education, number of students: Evolution of primary level enrolment. Secondary school education, number of students: Evolution of secondary level enrolments. Tertiary spending as% of public spending on education (%): Expenditure on the tertiary sector of education as a percentage of public spending on education [27].

Environmental Indices

Energy use (kg of oil equivalent per capita): The use of energy refers to the consumption of primary energy before the transformation into other end-use fuels, which is equal to the production plus indigenous imports and variation of stocks, minus exports and fuels supplied to international transport vessels and aircraft. CO_2 emissions (metric tons per capita): carbon dioxide emissions are those that come from the burning of fossil fuels and the manufacture of cement. They include the carbon dioxide produced during the consumption of solid fuels, liquids and combustible gases and the burning of gas [28]. Electric power consumption (kW / hour per capita): Measures of electric power consumption of the production of power plants and cogeneration plants minus losses due to transmission, distribution and transformation and own use of heat and power plants. Renewable fuels and waste (% of total energy): Fossil fuel comprises coal, oil, petroleum and natural gas products. Production of electricity from oil (% of total): Production of electricity produced with petroleum. CO_2 emissions (metric tons per capita): Measure of CO_2 in the atmosphere per capita. Nuclear and alternative energy (% of total energy use): Clean energy is non-carbohydrate energy that does not produce carbon dioxide when it is generated. It includes hydroelectric and nuclear energy, geothermal energy and solar energy, among others. Jungle area (square kilometres): The forest area is land with natural forests or planted with trees of at least 5 meters in situ, whether or not they are productive, and excludes trees found in agricultural production systems (for example, in fruit plantations and agroforestry

systems) and trees in urban parks and gardens.

Poverty and Health Indices

Proportion of the population that uses improved sources of drinking water: Percentage of the population that uses potable water from pipes. Proportion of the population with access to improved sanitation services: Percentage of the population using water with improvements [29,30]. Population below the minimum level of food energy consumption: Percentage of population that consumes the minimum of food energy. Improvement in the water supply (% of the population with access): Percentage of the population with potable water supply or improvements of it. Improvement of sanitary facilities (% of the population with access): Percentage of the population with access to or improvement of sewage services. Life expectancy at birth, total (years): Years of life expectancy at birth.

By forming the chosen variables a significant sample of human development measures in Argentina, from here on, we will analyse the correlation of these variables, with the Corruption Preference Index for our country, and extract the conclusions.

We list the variables by group:

A-Economic indices   13 variables

B-Education Indices   3 variables

C-Environmental Indices   8 variables

D-Poverty and Health Indices.   6 variables

Model to be used: simple linear regression:

Independent variable = ordered to the origin + Slope*Explanatory variable + error

$$Yi = \alpha + \beta * Xi + \varepsilon \qquad (1)$$

Yi -Variable to explain. α -Ordered to the origin.
β – Slope (change that generates in Y each unit of X). X i -Variable to explain.
ε -Error (characteristics not explained by the proposed model).

We are going to show that corruption, through the behaviour of Argentina's Perception of Corruption Index, impacts on human development and in what way.

As we show that corruption influences and impacts human development in Argentina, it is important to analyse it by the way we described above, the example of a complete government period, allows us to correlate the observations of the variables and the Perception Index to the Corruption, from the period 2003-2015.

The idea is to work the development variables as independent variables and the Perception Index to Corruption, as a dependent variable, or explanatory, by this way, the behaviours of the variable that measures corruption, can condition the value of the development variables human. As corruption impacts on these variables, in what way, and with what intensity, the methodology used is to measure each variable and the CPI, in each regressionThe values of the human development variables of the period 2003-2015 chosen and the CPI for the same period are listed, forming regression matrices by group of indices, followed by the methodology in (1)

The methodology is followed in   (1) $Yi = \alpha + \beta * Xi + \varepsilon$

Years	Yi				X_i
	1-Gross National Income per capita (current U$$)	2- LN-Gross National Income per capita (current U$$)	3-Foreign direct investment, net capital inflow (balance of payments, US $ at current prices)	4-LN-Foreign direct investment, net capital inflow (balance of payments, US $ at current prices)	Corruption Perception Index - Transparenc y International
2003	3,631	8.19	1,652.01	7.409	2.50
2004	3,350	8.11	4,124.71	8.325	2.50
2005	4,230	8.35	5,265.25	8.569	2.80
2006	5,451	8.60	5,537.34	8.619	2.90
2007	6,471	8.77	6,473.15	8.775	2.90
2008	7,611	8.93	9,725.56	9.182	2.90
2009	7,741	8.95	4,017.16	8.298	2.90
2010	9,181	9.12	11,332.72	9.335	2.90
2011	10,611	9.26	10,839.93	9.291	3.00
2012	11,781	9.37	15,323.93	9.637	3.50
2013	12,771	9.45	9,821.67	9.192	3.40
2014	12,261	9.41	5,065.33	8.530	3.40
2015	12,511	9.43	11.759.00	9.372	3.20

Years	Yi					Xi
	5-Gross Domestic Product -(current U$$)	6-LN-Gross Domestic Product -(current U$$)	7-Inflation, GDP deflation rate (annual%)	8-Gross capital formation (% of GDP)	9-Growth of Gross National Income (% annual)	Corruption Perception Index - Transparency International
2003	127,586.97	11.756	10.50	14.15	10.20	2.50
2004	164,657.93	12.011	18.36	17.55	1.07	2.50
2005	198,737.09	12.200	10.32	18.89	8.67	2.80
2006	232,557.26	12.357	13.74	18.68	17.75	2.90
2007	287,530.50	12.569	14.94	20.10	9.74	2.90
2008	361,558.03	12.798	23.17	19.57	4.16	2.90
2009	332,976.48	12.716	15.38	16.05	(-) 6.49	2.90
2010	423,627.42	12.957	20.92	17.71	9.68	2.90
2011	530,163.28	13.181	23.70	18.40	6.54	3.00
2012	545,982.37	13.210	22.31	16.50	(-) 0.49	3.50
2013	552,025.14	13.221	23.95	17.31	2.66	3.40
2014	526,319.67	13.174	40.28	17.26	(-) 2.39	3.40
2015	594,749.28	13.296	26.58	17.07	2.93	3.20

Years	Yi				Xi
	10-Growth of the Gross Domestic Product (annual%)	11-Growth of the Gross Domestic Product per capita (annual%)	12-Per capita growth of Gross National Income (annual%)	13-Gross capital formation (% of annual growth)	Corruption Perception Index - Transparency International
2003	8.84	7.68	9,03	40.19	2.50
2004	9.03	7.88	0.01	29.61	2.50
2005	8.85	7.73	7.55	14.80	2.80
2006	8.05	6.96	16.53	6.87	2.90
2007	9.01	7.92	8.66	20.33	2.90
2008	4.06	3.03	3.13	6.68	2.90
2009	(-) 5.92	(-) 6.85	(-) 7.43	(-) 23.07	2.90
2010	10.13	9.30	8.86	32.54	2.90
2011	6.00	4.79	5.37	16.09	3.00
2012	(-) 1.03	(-) 2.14	(-) 1.80	(-) 11.18	3.50
2013	2.40	1.26	1.43	4.67	3.40
2014	(-) 2.51	(-)3.58	(-)3.37	(-) 6.22	3.40
2015	2.73	1.63	1.82	4.56	3.20

B-Education Indices   3 variables

The methodology is followed in   (1) $Y_i = \alpha + \beta * X_i + \varepsilon$:

Years	Yi			X_i
	14-Primary level education, students	15-Secondary education, students	16-Expenditure on tertiary education as% of public expenditure on education (% GDP)	Corruption Perception Index - Transparency International
2003	4,885,664	3,902,011	3.54	2.50
2004	4,923,075	3,919,748	3.49	2.50
2005	4,872,889	3,884,317	3.86	2.80
2006	4,928,319	3,872,929	4.13	2.90
2007	4,951,505	3,897,005	4.46	2.90
2008	4,975,520	3,963,715	4.84	2.90
2009	4,961,821	4,106,048	5.53	2.90
2010	4,947,105	4,213,136	5.02	2.90
2011	4,911,776	4,279,426	5.29	3.00
2012	4,871,157	4,346,391	5.34	3.50
2013	4,791,544	4,406,046	5.44	3.40
2014	4,780,105	4,450,741	5.36	3.40
2015	4,784,446	4,501,734	5.78	3.20

C-Environmental Indices   8 variables

The methodology is followed in   (1) $Y_i = \alpha + \beta * X_i + \varepsilon$:

Years	Yi				X_i
	17-Energy use (kg of oil equivalent per capita)	18-CO2 emissions (metric tons per capita)	19-Electric energy consumption (kWh per capita)	20-Renewable fuels and waste (% of total energy)	Corruption Perception Index - Transparency International
2003	1,598.79	3.55	2,180.33	4.54	2.50
2004	1,728.21	4.09	2,293.31	2.26	2.50
2005	1,720.67	4.17	2,408.43	2.42	2.80
2006	1,853.04	4.47	2,374.10	2.88	2.90
2007	1,858.39	4.41	2,455.66	2.81	2.90
2008	1,937.64	4.72	2,772.84	2.19	2.90
2009	1,865.34	4.44	2,730.12	2.31	2.90
2010	1,928.65	4.61	2,877.65	2.63	2.90
2011	1,952.05	4.64	2,929.08	2.95	3.00
2012	1,936.80	4.63	3,000.60	3.15	3.50
2013	1,967.02	4.59	2.967.38	2.97	3.40
2014	2,029.92	4.59	3,074.70	3.25	3.40
2015	2,029.92	4.66	3,074.70	3.24	3.20

Years	Yi				X_i
	21-Production of electricity from oil (% of total)	22-CO2 emissions (metric tons per capita)	23-Nuclear and alternative energy (% of total energy use)	24-Jungle area (square kilometers)	Corruption Perception Index - Transparency International
2003	1.10	3.54	7.42	324,288	2.50
2004	4.03	4.09	6.44	321,124	2.50
2005	5.45	4.17	6.42	317,960	2.80
2006	7.51	4.46	6.77	314,796	2.90
2007	10.21	4.41	5.77	311,632	2.90
2008	11.82	4.72	5.43	308,468	2.90
2009	11.71	4.44	6.18	305,304	2.90
2010	13.30	4.61	5.68	302,141	2.90
2011	15.12	4.64	5.86	299,906	3.00
2012	14.79	4.62	5.57	297,672	3.50
2013	14.27	4.59	5.67	295,438	3.40
2014	13.84	4.59	5.50	293,204	3.40
2015	15.42	4.66	5.50	290,971	3.20

D-Poverty and Health Indices................................ 6 variables

The methodology is followed in   (1) $Y_i = \alpha + \beta * X_i + \varepsilon$:

Years	Yi						X_i
	25-Proportion of the population that uses improved drinking water sources	26-Proportion of the population with access to improved sanitation services	27-Population below the minimum level of food energy consumption %	28-Improvement in the water supply (% of the population with access)	29-Improvement of sanitary facilities (% of the population with access)	30-Life expectancy at birth, total (years)	Corruption Perception Index - Transparency International
2003	97	93	5	96.9	92.5	78	2.50
2004	97	93	5	97.1	92.8	78	2.50
2005	97	93	5	97.3	93.2	78	2.80
2006	98	94	5	97.5	93.5	78	2.90
2007	98	94	5	97.7	93.9	78	2.90
2008	98	94	5	97.9	94.2	78	2.90
2009	98	95	5	98.1	94.5	78	2.90
2010	98	95	5	98.2	94.9	79	2.90
2011	98	95	5	98.4	95.2	79	3.00
2012	99	96	5	98.6	95.5	79	3.50
2013	99	96	5	98.8	95.8	79	3.40
2014	99	96	5	98.9	96.1	79	3.40
2015	99	96	5	99.1	96.4	79	3.20

We use this methodology because it is novel, since the calculations are made by country, by government period and by variable.

Ypothesis
In a government cycle within a process of economic growth, the level of corruption in a country maintains a direct and substantial correlation with the results achieved by that country in terms of human development, the econometric results will be more visible and quantifiable in the quality variables of human development.

Demonstration and Verification of Hypotheses
The methodology of the econometric exercise is to calculate the economic, education, environmental, poverty and health indices as independent variables with the impact of the corruption perception index in its econometric measures in model (1)

$$Y_i = \alpha + \beta * X_i + \varepsilon$$

Where the indices receive the impact of the country's corruption perception index in a full government period 2003-2015. According to this methodology, it shows us how the corruption perception index impacts each of the 30 chosen indices, and within their groups where we can see its impact more clearly, since corruption is not neutral.

The Methodology Based on 4 measures That Are
Multiple Correlation Coefficient
Measures the Intensity between the dependent variable and the In-

dependent variable.

Determination Coefficient R 2
To what extent the regression line fits the data, and indicates the proportion of the variation of Y that can be attributed to the variations of X.

Covariance
Measures the degree of linear association that exists between two random variables and their respective dispersions.

Correlation Coefficient
Measures the degree of observations between the observations of the two variables regardless of the unit of measurement used. These 4 measures give us the degree of impact of the corruption perception index in each group of economic, education, environmental, poverty and health indices. Where the impact of corruption is clearly seen through these 4 measures.

Summary of the arithmetic means of the thirty regressions that measure the relationship of the Corruption Perception Index (of Transparency International) and the Human Development variables of Argentina, period 2003-2015:

A-Economic indices   13 variables.

REGRESSION ANALYSIS Independent Variable = α + β *Corruption Perception Index + ε	1-Gross National Income per capita (current US$)	2- LN-Gross National Income per capita (current US$)	3-Foreign direct investment, net capital inflow (balance of payments, US $ at current prices)	4-LN-Foreign direct investment, net capital inflow (balance of payments, US $ at current prices)	5-Gross Domestic Product - (current US$)	6-LN-Gross Domestic Product - (current US$)	7-Inflation , GDP deflation rate (annual %)	8-Gross capital formation (% of GDP)	9-Growth of Gross National Income (% annual)	10-Growth of the Gross Domestic Product (annual%)	11-Growth of the Gross Domestic Product per capita (annual%)	12-Per capita growth of Gross National Income (annual%)	13-Gross capital formation (% of annual growth)	ARITHMETIC MEAN-regressions
MULTIPLE CORRELATION COEFFICIENT	62.90%	87.64 %	65.77%	67.01%	88.02%	87.64%	68.84%	3.05%	67.01%	62.90%	63.09%	39.51%	66.87%	63.86 %
COEFFICIENT OF DETERMINATION R 2	39.56 %	76.80 %	43.26%	44.90%	77.47%	76.80%	47.38%	0.09%	44.90%	39.56%	39.80%	15.61%	44.71%	45.45%
COVARIANCE	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	NEGATIVE	POSITIVE
LINEAR CORRELATION COEFFICIENT	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG	WEAK	WEAK	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
Multiple correlation coefficient	0.629	0.876	0.6578	0.670	0.880	0.877	0.688	0.030	0.670	0.629	0.631	0.395	0.669	
Coefficient of determination R ^ 2	0.396	0.768	0.433	0.449	0.775	0.768	0.474	0.001	0.449	0.396	0.398	0.156	0.447	
R ^ 2 adjusted	0.341	0.747	0.381	0.399	0.754	0.747	0.426	(-) 0.09	0.399	0.341	0.343	0.079	0.397	

Typical error	4.199	0.258	3,1154.82	0.471	81,537.46	0.258	6.08	1.640	0.471	4.199	4.180	6.119	13.92
Observations	13	13	13	13	13	13	13	13	13	13	13	13
Interception	35.328	8.478	(-)16,850.74	4.965	(-) 992,800	8.478	(-) 31.85	17,1812	4.965	35.328	34.260	27.644	123.68
Corruption Perception Iindex	(-)10.299	1.424	8,247.35	1.288	458,373.26	1.424	17.48	0,1516	1.288	(-) 10.300	(-) 10.303	(-) 7.979	(-) 37.94

Analysis of the regression measures of the corruption perception index with the economic indices are:

Multiple Correlation Coefficient: The intensity of the Corruption Perception Index and the economic indices is 63.86 % Determination Coefficient R 2: The fit of the regression line is 45.45 % the proportion of variation of the economic indices of the variation of corruption Covariance The degree of linear association between the corruption perception index and the economic indices is positive Correlation Coefficient: There is a positive and strong association between the corruption perception index and the economic indices To better observe the conclusions, let's observe the values of the regression lines for each variable based on (1)

The methodology is followed in (1) $Yi = \alpha + \beta * Xi + \varepsilon$

Values of Regression Straights:

Yi	=	α	+	β*	Xi	+	ε
1-Gross National Income per capita (current US$)	=	(-) 21841.799	+	100910.66	Corruption Perception Index	+	ε
2- LN-Gross National Income per capita (current US$)	=	4.834	+	1.370	Corruption Perception Index	+	ε
3-Foreign direct investment, net capital inflow (balance of payments, US $ at current prices)	=	(-) 16850.742	+	8.247.355	Corruption Perception Index	+	ε
4-LN-Foreign direct investment, net capital inflow (balance of payments, US $ at current prices)	=	4.965	+	1.288	Corruption Perception Index	+	ε
5-Gross Domestic Product -(current US$)	=	(-) 992800.854	+	4583732.62	Corruption Perception Index	+	ε
6-LN-Gross Domestic Product -(current US$)	=	8.477	+	1.423	Corruption Perception Index	+	ε
7-Inflation, GDP deflation rate (annual%)	=	(-) 31.852	+	17.480	Corruption Perception Index	+	ε
8-Gross capital formation (% of GDP)	=	17.181	+	0.1516	Corruption Perception Index	+	ε
9-Growth of Gross National Income (% annual)	=	4.965	+	1.288	Corruption Perception Index	+	ε
10-Growth of the Gross Domestic Product (annual%)	=	35.328	+	(-) 10.299	Corruption Perception Index	+	ε
11-Growth of the Gross Domestic Product per capita (annual%)	=	34.259	+	(-) 10.303	Corruption Perception Index	+	ε
12-Per capita growth of Gross National Income (annual%)	=	27.643	+	(-) 7.979	Corruption Perception Index	+	ε
13-Gross capital formation (% of annual growth)	=	123.683	+	(-) 37.938	Corruption Perception Index	+	ε

B-Education Indices.................................3 variables

REGRESSION ANALYSIS Independent Variable = α + β* Corruption Perception Index + ε	14-Primary level education, students	15-Secondary education, students	16-Expenditure on tertiary education as% of public expenditure on education (% GDP)	ARITHMETIC MEAN-regressions
MULTIPLE CORRELATION COEFFICIENT	60.20%	82.05%	80.47%	74.24 %
COEFFICIENT OF DETERMINATION R 2	36.24%	67.31%	64.75%	56.10 %
COVARIANCE	POSITIVE	POSITIVE	POSITIVE	POSITIVE
LINEAR CORRELATION COEFFICIENT	STRONG	STRONG	STRONG	STRONG
Multiple correlation coefficient	0.60201114586	0.82044878134	0.80468763747	
Coefficient of determination R ^ 2	0.36241741975	0.67313620281	0.64752219390	
R ^ 2 adjusted	0.30445536700	0.64342131215	0.61547875698	
Typical error	57030.49	144043.19	0.49227487455	
Observations	13	13	13	
Interception	5280188.89	2263791.08	(-) 1.26	
Corruption Perception Iindex	-130348	626648.52	2.022	

Analysis of the regression measures of the corruption perception index with the education indices are: Multiple Correlation Coefficient: The intensity of the Corruption Perception Index and the education indices is 74.24 % Determination Coefficient R 2: The fit of the regression line is 56.10 % the proportion of variation of the education indices of the variation of corruption Covariance: The degree of linear association between the corruption perception index and the education indices is positive Correlation Coefficient: There is a positive and strong association between the corruption perception index and the education indices To better observe the conclusions, let's observe the values of the regression lines for each variable based on (1)

The methodology is followed in (1) Yi = α + β*Xi + ε

VALUES OF REGRESSION STRAIGHTS:

Yi	=	α	+	β*	Xi	+	ε
14-Primary level education, students	=	5280188.89	+	(-) 130348.7017	Corruption Perception Index	+	ε
15-Secondary education, students	=	2263791.08	+	626648.52	Corruption Perception Index	+	ε
16-Expenditure on tertiary education as% of public expenditure on education (% GDP)	=	(-) 1.26	+	2.022	Corruption Perception Index	+	ε

C-Environmental Indices   8 variables

REGRESSION ANALYSIS Independent Variable = α + β*Corruption Perception Index + ε	17-Energy use (kg of oil equivalent per capita)	18-CO2 emissions (metric tons per capita)	19-Electric energy consumption (kWh per capita)	20-Renewable fuels and waste (% of total energy)	21-Production of electricity from oil (% of total)	22-CO2 emissions (metric tons per capita)	23-Nuclear and alternative energy (% of total energy use)	24-Jungle area (square kilometers)	ARITHMETIC MEAN-regressions
MULTIPLE CORRELATION COEFFICIENT	82.01%	71,72%	85,52%	5,16%	82.81%	71.72%	72.3%	88.24%	69.93%
COEFFICIENT OF DETERMINATION R 2	67.26%	51,44%	73,14%	0,26%	68.58%	51.44%	52.38%	77.86%	55.30%
COVARIANCE	POSITIVE	POSITIVE	POSITIVE	NEGATIVE	POSITIVE	POSITIVE	NEGATIVE	NEGATIVE	POSITIVE
LINEAR CORRELATION COEFFICIENT	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG	STRONG
Multiple correlation coefficient	0.820	0.7172459805	0.8552420608	0.051688388626	0.8281770882	0.71724598050	0.72307921309	0.882395403583	
Coefficient of determination R^2	0.672	0.5144417965	0.7314389826	0.002671689518	0.6858772895	0.51444179655	0.52284354841	0.77862164826	
R^2 adjusted	0.642	0.4703001416	0.7070243447	(-) 0.087994520	0.6573206795	0.47030014169	0.47946568918	0.758496343562	
Typical error	762.629.426.842	0.2365863803	172.527	0.643520978357	2.749	0.23658638037	0.43267568551	5,819.711	
Observations	13	13	13	13	13	13	13	13	
Interception	888.206	2.225	126.806	2.590	(-) 26.104	2.225	10.116	388,404.329	
Corruption Perception Iindex	331.437	0.7382448694	863.155	0.10097174255	12.317	0.73824486946	(-) 1.373	(-) 33,087.223	

Analysis of the regression measures of the corruption perception index with the environmental indices are: Multiple Correlation Coefficient: The intensity of the Corruption Perception Index and the environmental indices is 68,21 % Determination Coefficient R 2:The fit of the regression line is 55,30 % the proportion of variation of the environmental indices of the variation of corruption Covariance: The degree of linear association between the corruption perception index and the environmental indices is positive.

Correlation Coefficient: There is a positive and strong association between the corruption perception index and the environmental indices. To better observe the conclusions, let's observe the values of the regression lines for each variable based on (1)

The methodology is followed in (1) Yi = α + β*Xi + ε

Values of Regression Straights

Yi	=	α	+	β*	Xi	+	ε
17-Energy use (kg of oil equivalent per capita)	=	888.206	+	331.437	Corruption Perception Index	+	ε
18-CO2 emissions (metric tons per capita)	=	2.225	+	0.73824486946	Corruption Perception Index	+	ε
19-Electric energy consumption (kWh per capita)	=	126.806	+	863.155	Corruption Perception Index	+	ε
20-Renewable fuels and waste (% of total energy)	=	2.590	+	0.100	Corruption Perception Index	+	ε
21-Production of electricity from oil (% of total)	=	(-) 26.104	+	12.317	Corruption Perception Index	+	ε
22-CO2 emissions (metric tons per capita)	=	2.225	+	0.73824486946	Corruption Perception Index	+	ε
23-Nuclear and alternative energy (% of total energy use)	=	10.116	+	(-) 1.37303367	Corruption Perception Index	+	ε
24-Jungle area (square kilometers)	=	388.404	+	(-) 33.087	Corruption Perception Index	+	ε

D-Poverty and Health Indices.................6 variables

Analysis of the regression measures of the corruption perception index with the Poverty and Health indices are: Multiple Correlation Coefficient: The intensity of the Corruption Perception Index and the Poverty and Health indices is 89.94 % Determination Coefficient R 2 The fit of the regression line is 81.43 % the proportion of variation of the Poverty and Health indices of the variation of corruption Covariance: The degree of linear association between the corruption perception index and the Poverty and Health indices is positive Correlation Coefficient There is a positive and strong association between the corruption perception index and the Poverty and Health indices To better observe the conclusions, let's observe the values of the regression lines for each variable based on (1)

The methodology is followed in (1) $Yi = \alpha + \beta*Xi + \varepsilon$

Values of Regression Straights

Yi	=	α	+	β*	Xi	+	ε
25-Proportion of the population that uses improved drinking water sources	=	91.305	+	2.268	Corruption Perception Index	+	ε
26-Proportion of the population with access to improved sanitation services	=	84.334	+	3.444	Corruption Perception Index	+	ε
27-Population below the minimum level of food energy consumption%	=	5	+	0	Corruption Perception Index	+	ε
28-Improvement in the water supply (% of the population with access)	=	92.034	+	2.011	Corruption Perception Index	+	ε
29-Improvement of sanitary facilities (% of the population with access)	=	83.777	+	3.592	Corruption Perception Index	+	ε
30-Life expectancy at birth, total (years)	=	74.740	+	1.246	Corruption Perception Index	+	ε

Conclusions

To conclude, we will analyse the four variables of the regressions in the different indices to draw the conclusions and verify the hypothesis:

REGRESSION ANALYSIS Independent Variable = α + β *Corruption Perception Index + ε	A-Economic indices ... 13 variables-arithmetic mean	B-Education Indices. 3 variables-arithmetic mean	C-Environmental Indices..8 variables-arithmetic mean	D-Poverty and Health Indices ... 6 variables-arithmetic mean	Arithmetic mean of human development regressions in Argentina 2003-2015
MULTIPLE CORRELATION COEFFICIENT	63.86%	74.24%	69.93%	89.94%	74,49%
COEFFICIENT OF DETERMINATION R 2	45.45%	56.10 %	55.30%	81.43%	59,57%
COVARIANCE	POSITIVE	POSITIVE	POSITIVE	POSITIVE	POSITIVE
LINEAR CORRELATION COEFFICIENT	STRONG	STRONG	STRONG	STRONG	STRONG

Now Let's Analyse the Four Measures and Draw the Conclusion Multiple Correlation Coefficient: The intensity of corruption is 74.49 %, the intensity is the average of the measured indices, with the greatest impact on the Poverty and Health indices being 89.94% and then 74.24% on the Education indices, therefore corruption impacts more directly on the indices. In the qualitative variables not so much in quantitative variables, in the variables qualitative it is easier to see their impact Determination Coefficient R 2: The fit of the regression line is 59.57 % the proportion of variation of the Poverty and Health indices of the variation of corruption This adjustment is more evident in the Poverty and Health indexes is 81.43 % on the Education indices is 56.10 % , therefore corruption impacts more directly on the indices In the qualitative variables not so much in quantitative variables, in the variables qualitative it is easier to see their impact. Covariance The degree of linear association between the Corruption Perception Index measured by Transparency International, and the regressed indices is positive with the human development indices of Argentina in the period 2003-2015, measured by the World Bank, Correlation Coefficient It is strong between the Corruption Perceptions Index measured by

Transparency International, and the regressed indices is positive with the human development indices of Argentina in the period 2003-2015, measured by the World Bank, Therefore the hypothesis is fulfilled In a government cycle within a process of economic growth, the level of corruption in a country maintains a direct and substantial correlation with the results achieved by that country in terms of human development, the econometric results will be more visible and quantifiable in the quality variables of human development. "In conclusion, the level of corruption in Argentina in the period 2003-2015 has a negative impact on the evolution of its human development indexes and maintains a direct and substantial correlation with adverse results, published"

Acknowledgements

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