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Mapping Synergies and Tradeoffs in the Sustainable Development Goals Network: A Case Study from Jordan

Jose Antonio Pedrosa-Garcia*

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* Economic Affairs Officer, Macroeconomic Policy and Financing for Development Division, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

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Abstract

Mapping relationships between Sustainable Development Goals (SDG) indicators can be useful to inform policymaking. So far, studies using Network Analysis or Graph Theory have depicted the relationships between SDG indicators based on how the SDGs were worded. With Jordan as a case study, and basing the existence of such relationships on actual data, this paper shows that previous works have overestimated the number of relationships. The results are consistent with the view that economic factors remain the central driver to achieve the SDGs: remittances, growth, household consumption or reductions in inequality show the highest number of synergies. On the other hand, unemployment (particularly of the youth), children out of school and reductions in foreign aid exhibit tradeoffs with other indicators.

1. Introduction

Adopted in September 2015 as the 'successor' of the Millennium Development Goals (MDGs), the Sustainable Development Goals (SDGs) are the global set of development goals to be achieved by 2030. The SDGs are much more comprehensive than the MDGs: compared to the MDGs' 8 goals and 50 targets, the SDGs consist of 17 goals and 169 targets. This large number has been subject of great debate, due to the risk of entailing "an overloaded agenda or no agenda at all" (Vandemoortele 2014).

To achieve the high amount of SDG targets at national level a number of ideas have been debated, of which three are worth highlighting: First, the SDG targets may be interpreted as a menu of development priorities, which countries will choose from based on their national characteristics (e.g. sea and ocean related targets do not apply to landlocked countries). Secondly, the fact that countries can tailor SDGs choosing from the menu, combined with no minimum number of SDG targets to be chosen, create room for making such tailoring of the SDGs a highly political endeavor, e.g. a given country may decide to focus on 100 targets and ignore the other 69.[1] This is in clear contrast with the MDGs, which were mostly taken as uniform for all developing countries.[2] Finally, although the relationships between targets (synergies or complementarities and tradeoffs[3]) were already present with the MDGs, the fact that SDG targets have to be tailored nationally highlights the importance of keeping such relationships into account.

The goal of this paper is to elucidate the existence of relationships between SDGs, and thus indirectly contribute to the national tailoring process. Traditionally, the research approach to analyze relationships has been 'micro' in nature. For instance, to assess the relationship between education and earnings in econometric terms, one variable would be regressed on the other while controlling for a number of relevant variables. Other research has explored the linkages between the economic and social dimension of sustainable development, failing to include the environmental (Kumawat, Bhanumurthy 2015). As an alternative approach, network analysis –also referred to as graph theory– has recently started to be used for that purpose. Being more 'macro' in nature, network analysis arguably reflects better the holistic nature of the SDG targets. Indeed, being inspired by neurology, computer science and social networks, it consists of assessing the relationships between the elements of a network (nodes

[1] Technically this would not be possible at national level, because some targets are global in scope, e.g. indicators in Goal 13 relate to the number of countries that have taken actions/policies to tackle climate change.
[2] The SDG targets are intended to be applicable to all countries, as they also reflect wealthy countries' priorities.
[3] Defined as the fact that progress in a given target can favor or hamper others, respectively.

or vertices that are connected through edges or links). Considering the network of SDGs targets, network analysis has recently been used by such authors as Cutter (2014) or Leblanc (2015) – see Figure 1. In the Arab region, Morocco has also studied the SDGs as a network, focusing for instance on the relationship between capital and the targets (Figure 2), as well as on the interactions between targets (Figure 3).

The studies on SDGs undertaken with network analysis depict the existence of relationships between targets based on how those targets were formulated (e.g. Leblanc 2015), as opposed to being grounded on actual data. This is a limitation: if the SDGs are the result of political deliberations that follow a normative approach, it is likely that the number of relations between targets has been overestimated. If this is the case, there are spurious relationships included in the picture, and therefore the validity to inform policymaking at national level is compromised.

The lack of knowledge on cross-sector relationships is even more striking given the fact that those relationships are often mentioned in policy circles, e.g. how many are there? What sectors are more prone to have them? Furthermore, as each country has its own idiosyncratic characteristics, the results of country *A* may not necessarily apply in country *B,* even if they were neighbors. Indeed the Arab region is composed of countries that differ on some important accounts. To address these caveats, this study considers the existence of relationships between SDG targets based on actual data, which should be more useful for enriching policy debates about the SDGs in a given country.

Due to its relatively good statistical system in the Arab region, the selected country for this case study is Jordan. Data is nevertheless a vital concern because, as ongoing work on SDG indicators indicates, there are great data gaps to monitor the SDGs. As more data become available in the future, similar exercises should help to better understand the relationships between SDG targets', and thereby to inform policymaking further.

The results of the analysis undertaken suggest that the relationships between SDG indicators are less common than indicated in previous similar works, and that synergies are more likely than tradeoffs. Economic factors remain the central driver to achieve the SDGs in Jordan: remittances, growth, household consumption or reductions in inequality have the highest number of synergies. On the other hand, children out of school, unemployment (particularly of the youth) and reductions in foreign aid received exhibit tradeoffs with other SDG indicators.

The paper is structured as follows. Section 2 describes the data used and limitations of the study. The methodological approach and relevant features of neural network analysis are introduced in section 3, while the results are presented in section 4 and section 5 concludes.

2. Data and Limitations

The SDGs' 169 targets have been decomposed into 240 indicators (United Nations 2016)[4], many of which still have not been clearly defined. This is likely the reason why previous analyses of SDGs as a network have not used actual data.

For the purpose of this analysis, a number of key variables with available data have been selected to reflect each of the indicators. The list of selected variables are shown in annex Table 2 (along with their corresponding SDG and indicator. The data used to monitor the SDG indicators are primarily those of the World Development Indicators (World Bank 2016), complemented by additional sources depending on the specific variables required, e.g. FAO's Agriculture Orientation Index.

The study has at least two potential limitations. First, since the final list of variables to monitor is still being defined, the list of variables adopted should be taken as tentative. However, many of the key variables adopted will probably not change. Hence, to the extent that the newly-set variables, when defined, are correlated with the ones selected here, the results should not differ.

Second, the existence of relationships between different nodes is determined by whether the different variables show a statistically significant correlation. As noted, this adds an objective criterion for determining whether a link exists, thereby solving the inconvenience of mapping the SDGs as a network based on the wording of the targets. However, this also implies that causality of the relations between nodes is not elucidated. Despite this limitation it should be kept in mind that, given such statistical issues as tremendously limited data, multicollinearity and reverse causality, a rigorous econometric analysis to establish causal relations across variables for all 240 indicators would be unfeasible.

[4] Works of the United Nations Statistical Commission are ongoing at the time of writing.

3. Methodology

The research question of the paper is: what do we know about the structure of relationships between SDG indicators in Jordan? This is decomposed in three sub-questions. First, does the SDG network indicate the existence of relationships between SDG targets? Second, are those relationships synergies or trade-offs? And finally, what are the indicators that show the highest number of synergies and trade-offs?

If the relationships are synergies they would be reflected in statistically significant positive correlations between the variables selected, while negative correlations would indicate trade-offs. Pairwise correlations between the variables selected are calculated. To avoid spurious correlations that would merely reflect a positive evolution over time, it is ensured that all the variables used are stationary by taking differences[5] (this leads to the loss of some key variables such as poverty). The focus is not on the magnitude of the relationship so a binary approach is followed: when there is a statistically significant correlation between two variables, the adjacency matrix will show 1 between those two variables; 0 in the opposite case. To address the second and third sub-questions it is necessary to discern between synergies and trade-offs, and therefore the entire network's adjacency matrix is decomposed into two others: one that only captures positive correlations, and another with negative correlations. Thus, the analysis is done in three steps: for the entire network, for positive correlations and for negative correlations.

Two aspects are of particular interest to undertake this analysis: cohesion and centrality. In graph theory, cohesion relates to the overall structure of connections in the network, and therefore addresses the first sub-question. Centrality measures analyze specific features of the nodes, which sheds light on the second and third sub-questions: e.g. which SDG indicators have the highest number of connections (degree), which are closest nodes to others (closeness), or which nodes are connected to nodes that have many connections (eigenvector). While a full introduction to network analysis goes beyond the scope of this paper, basic descriptions of the aspects analyzed are shown in Table 1 below. The computations are undertaken using UCINET, a software for social network analysis available freely on-line (Borgatti, Everett et al. 2002).

[5] Of different order; more details in the results section.

Table 1. Key network computations of interest

Cohesion	***Overall density***. The density of a network refers to how populated it is in terms of connections, and calculates the total number of ties divided by the total number of possible ties. Density is most useful when comparing different networks (e.g. synergies vs trade-offs, across countries).
	Clustering. Refers to how connected a node's connections are among themselves (e.g. 'how many of my friends are friends themselves?'). The clustering coefficient can be calculated for any give node or for the entire network. That of a node is the density of its open neighborhood, and ranges from 0 (none of the possible connections among a node's neighbors are realized) to 1 (all of a node's contacts form a clique). For the entire network, the clustering coefficient can be the mean of all its nodes' clustering coefficients, or the overall network's coefficient (they need not coincide). The weighted overall clustering coefficient is the weighted mean of the clustering coefficient of all the actors, each one weighted by its degree (i.e. number of connections).
Centrality	***Degree***. The degree of a node consists in the number of nodes it is connected to. For an entire network, the degree refers to the average degree of all nodes.
	Closeness (Freeman). This is a measure of the ease of reaching other nodes, or the average shortest distance from each node to another node. Lower closeness indicates a more central (or important) position in the network. The reciprocal of closeness centrality is farness centrality.
	Betweenness. Betweenness measures a node's role as an intermediary, broker or connector between other nodes (i.e. 'how strategic its position is').
	Eigenvector. Eigenvector centrality takes into consideration not only how many connections a node has (i.e. its degree), but also the degree of the nodes it is connected to (a connection to a node with many connections is more important than a connection to an isolated node). This reflects 'how important my friends are'.

Sources: http://www.analytictech.com, Shneiderman, Hansen et al. (2009), Jackson (2015)

4. Results

The results on density computations are visible in Table 3. The overall density coefficient of 0.132 denotes a network with a low number of connections (the range of possible values is from 0 to 1). This result contrasts with previous analyses undertaken (see Figures 1 to 3). Decomposing the entire network into its two sub-networks, the density of synergies is higher than that of trade-offs (0.091 vs 0.041). On average, nodes have 3 positive and 1.353 negative

correlations, respectively. Clustering coefficients for the three networks considered are shown in Table 4. Overall clustering is also low for the entire network (0.200), a result driven by the tradeoffs sub-network (0.243). From Tables 3 and 4 it is worth noting that the difference in clustering between synergies and trade-offs is much more pronounced than that in density, i.e. although there are more ties in the synergies network than in the tradeoffs one, the key difference is that in the synergies' network many ties are transitive (i.e. there are 'triangles' of connections), while in the case of trade-offs there are no triangles of connections.

Clustering results for individual nodes' are shown in Table 5. For the entire network (column 1), the highest clustering coefficients appear in aspects very important for the country's economy, such as volume of remittances, government revenue relative to GDP or GDP growth. However, some social and environmental factors such as energy consumption, number of homicides, internet penetration or surface covered by forests also show relatively high clustering coefficients. When considering only synergies the picture is similar (column 2), but other social variables such as maternal mortality and access to safe drinking water come to the fore –although economic key variables (remittances, growth and government revenue) continue showing high influence. As noted, in the tradeoffs realm there are no transitive ties, so the clustering coefficients are zero (column 3).

So far the results related to cohesion, or how 'abundant' connections are –either at the network or at the node level. Next, centrality measures are analyzed to assess the relevance of specific nodes. The results relating to centrality are presented in Table 6. For the entire network, the nodes with the highest number of connections are inequality (Gini), spending on research as a share of GDP, GDP growth, output share of renewable energy in the total energy production and unemployment (column 1). In terms of closeness (column 2) growth in household consumption per capita reflects its close ties with all other indicators, while the importance of inequality and growth is reflected in their high eigenvector scores (column 3) – this means that they are connected to nodes which have many connections.

Breaking up the entire network into the two sub-networks the results are similar: improvements in Gini inequality, growth in household consumption per capita, GDP growth, remittances, renewable energies and spending on research relative to the economy are among the most important across all four criteria (columns 5-8). Nonetheless, other variables enrich the picture, e.g. having access to water gains influence in terms of closeness (column 6). Moreover, school dropouts appear as a factor restraining progress (column 9), while the share of population living in slums is close to a high other nodes (column 10), and youth unemployment is clearly a factor representing tradeoffs with other indicators (column 12).

These findings may not be that surprising, especially with regard to the economic dimension. For instance, Jordan is highly dependent on remittances; although their importance as a share of GDP has decreased in recent years (10.4 percent in 2014), they reached 25 percent in 1997 (World Bank 2016). Similarly, the country has high rates of structural unemployment, especially among the youth – unemployment has persistently hovered around 30 percent since 2000 (ibid).

Depicting the results of the computations in graphical form yields a clearer understanding. Figure 4 shows the entire network with node sizes weighted by degree; in which economic indicators are denoted by blue rounded squares, social nodes by pink circles, and those relating to environment by green triangles. Economic nodes such as growth, consumption, inequality or unemployment tend to be central, although there are some exceptions such as the cost of remittances or foreign direct investment. Social indicators tend to be on the outskirts, and environment nodes are somewhat in between: the exception is renewable energy, quite central, but the others are peripheral.

The network showing only synergies is useful to refine the interpretation (Figure 5): the core six nodes are household consumption growth, GDP growth, unemployment, volume of remittances, government revenue and Gini inequality. It must be noted that in two of these six variables (unemployment and Gini inequality), the sign of progress is reversed, i.e. more is worse. To explore the direction of the synergy, the evolution of unemployment and Gini over time is shown in Figure 7: as it has been negative, it is *the reduction* in those variables what is identified as a synergy. Figure 5 also shows expenditures on research as a strategic connector between social and economic indicators.

Finally, the tradeoff connections are shown in Figure 6. This network shows low density and many variables that are isolated. Of the nodes that are connected, the variables showing the most central tradeoffs relate to net official development assistance (ODA) received, the share of primary school-age children that are out of school, and youth unemployment. Again, it is intuitive that children out of school and youth unemployment show up as tradeoffs and be negatively associated with progress in other indicators. However, it is less clear that net ODA received should be classified as a tradeoff. To explore this, Figure 8 shows the evolution of aid received in Jordan over time. It becomes clear that what is identified as a tradeoff is *the reduction* of net ODA.

5. Conclusion

Based on the foregoing analysis and considering similar previous works, the relationships between SDG indicators' are less abundant than expected; nodes seem to have more reinforcing connections among them than detrimental ones; and synergizing connections tend to form transitive links in the form of triangles, whereas tradeoff connections do not.

The results are consistent with the view that progress in some SDG indicators exhibits synergies with others. According to the computations undertaken, Jordan may benefit greatly from remittances, economic growth, the reduction of inequality, ensuring access to renewable energies and safe drinking water, and promoting research. In the same vein, tackling the constraints (i.e. factors associated with tradeoffs in other indicators) may speed up progress toward the SDGs. This would involve promoting employment -especially of the youth-, avoiding school dropouts and curbing reductions in foreign aid.

Admittedly, given the paucity of the data the results should be taken cautiously. However, this argument calls for more analyses of this sort, not less –especially in the coming years when more data becomes available. In a similar vein, this is a case study on Jordan and extrapolations to other countries should be avoided –even in the Arab region. Replicating this exercise in other countries would likely help to provide a more accurate picture of the SDGs in the region, which may be useful to accelerate the policy priorities that boost progress toward the SDGs.

6. Annexes

Figure 1. Graphical reprensetation of the SDG network by Leblanc (2015)

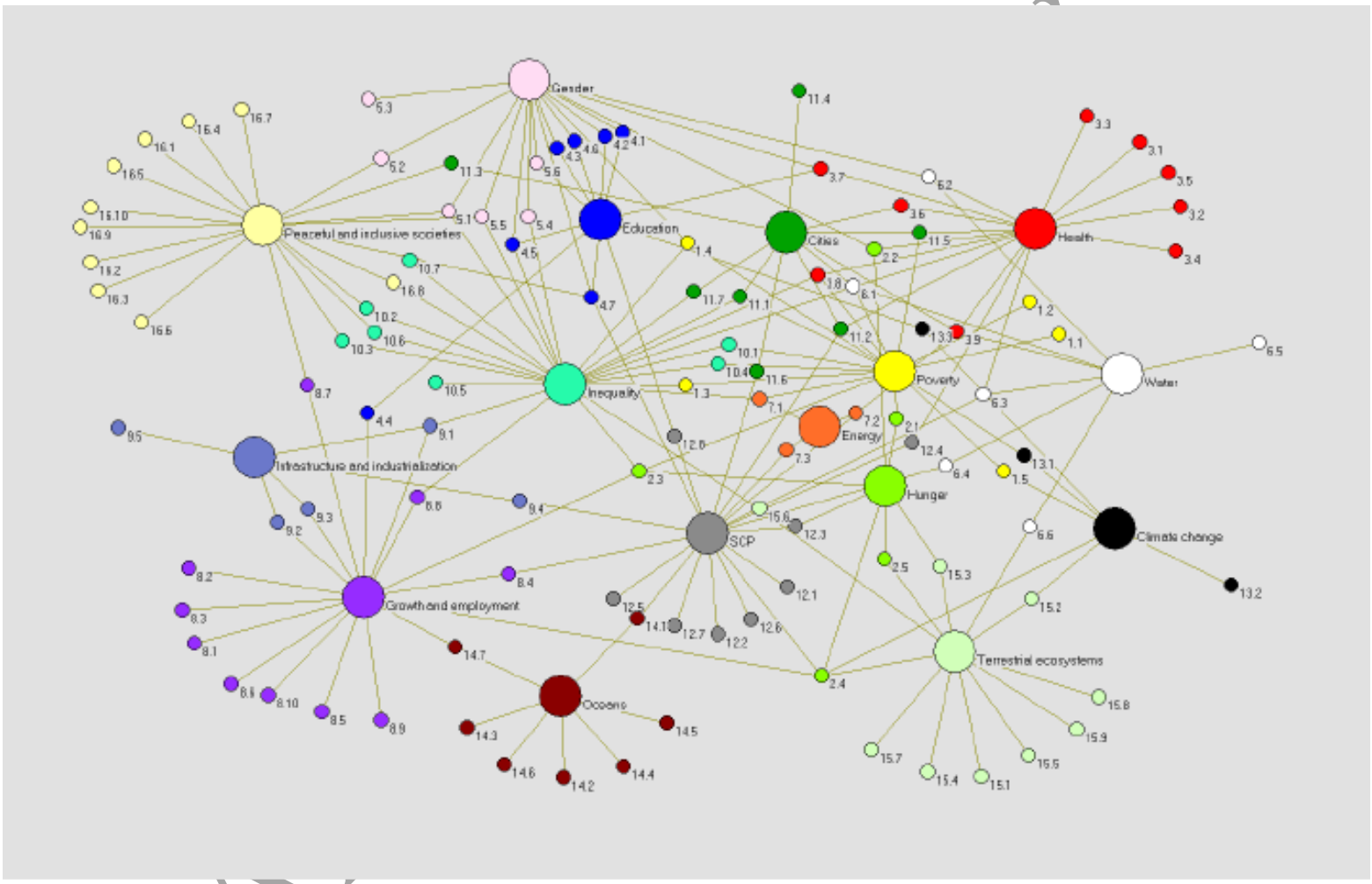


Figure 2. Graphical reprensetation of the SDG network by Morocco's Haut Commissariat au Plan (2015)

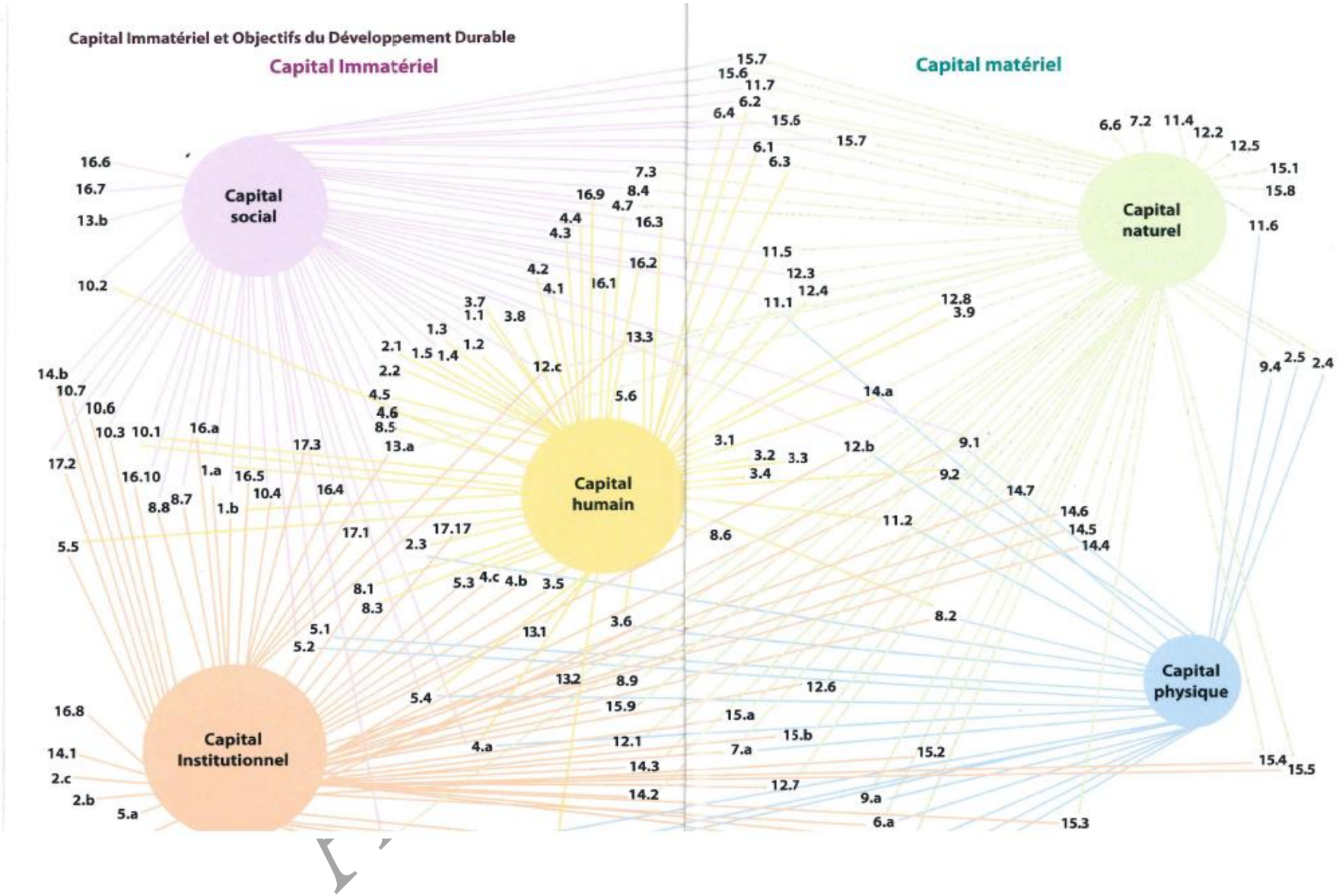


Figure 3. Graphical reprensetation of the SDG network by Morocco's Haut Commissariat au Plan (2015)

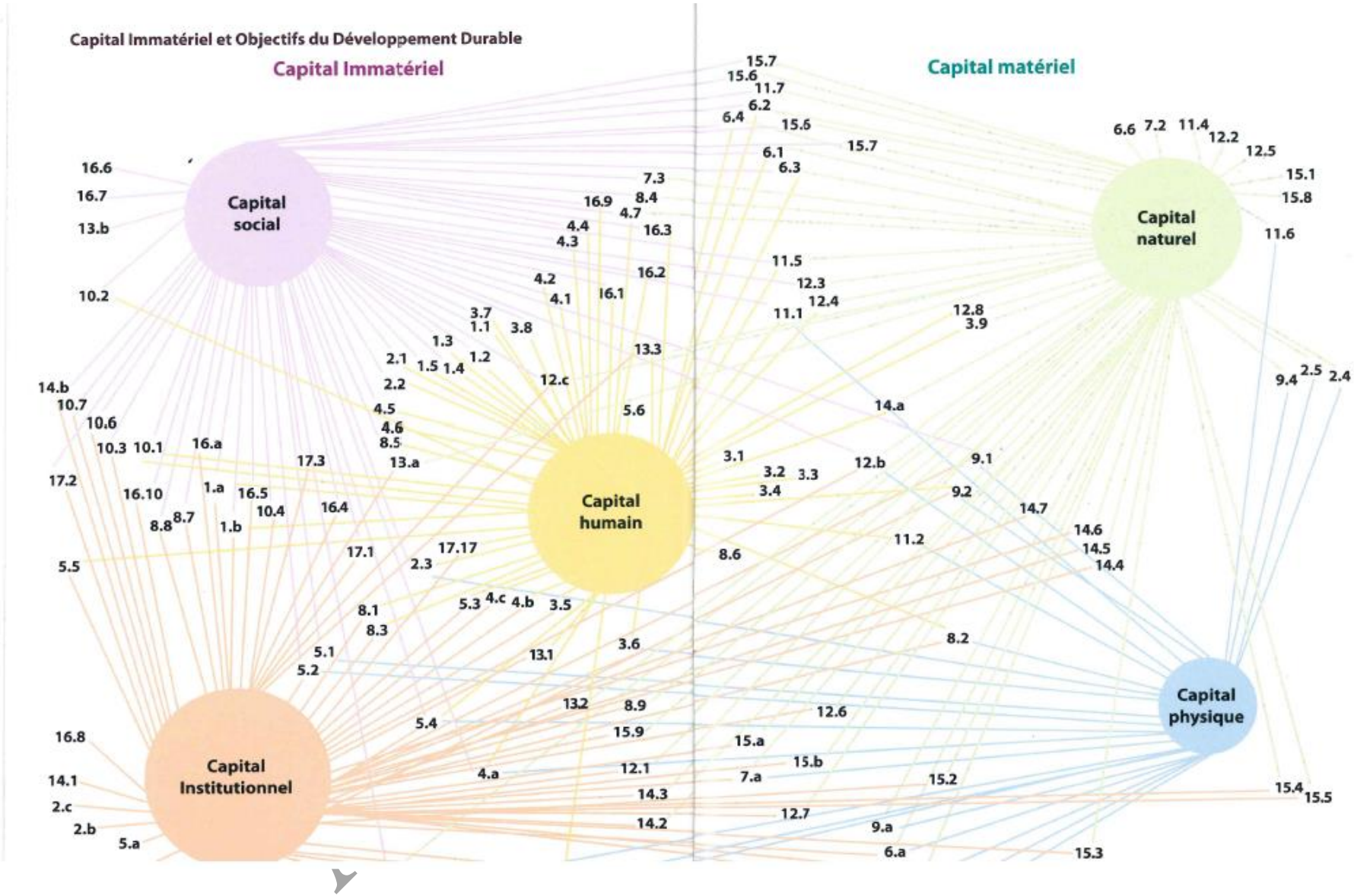


Table 2. Variables selected from the proposed final list of SDG Indicators

Goal	Indicator	Variable used	Code
1. End poverty in all its forms everywhere	N/A	The available variables are non-stationary and have few observations. When differences are taken to make them stationary, there are not enough data to be included.	N/A
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.1.1. Prevalence of undernourishment 2.3.1. Volume of production per labour unit by classes of farming / pastoral / forestry enterprise size 2.a.1. The agriculture orientation index for government expenditures	- Prevalence of undernourishment - Crop Production Index - Agriculture Orientation Index (% budget Government)	undern croppi agricoi
3. Ensure healthy lives and promote well-being for all at all ages	3.1.1. Maternal mortality ratio 3.2.1. Under-five mortality rate 3.2.2. Neonatal mortality rate	- Maternal mortality ratio - Under-five mortality rate - Neonatal mortality rate	mater u5mor neomor
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	4.1.1. Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex	- Children out of school (% of primary school age)	school
5. Achieve gender equality and empower all women and girls	5.5.1. Proportion of seats held by women in national parliaments and local governments	- Proportion of seats held by women in national parliaments (%)	women
6. Ensure availability and sustainable management of water and sanitation for all	6.1.1. Proportion of population using safely managed drinking water services 6.2.1. Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water	- Improved water source (% of population with access) - Improved sanitation facilities (% of population with access)	water sanit
7. Ensure access to affordable, reliable, sustainable and modern energy for all	7.2.1. Renewable energy share in the total final energy consumption 7.3.1. Energy intensity measured in terms of primary energy and gross domestic product (GDP)	- Renewable energy output share in the total final energy production - Energy intensity level of primary energy (MJ/$2011 PPP GDP)	renew energy
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.1.1. Annual growth rate of real GDP per capita 8.5.2. Unemployment rate, by sex, age and persons with disabilities 8.10.1. Number of commercial bank branches and automated teller machines (ATMs) per 100,000 adults	- Annual growth rate of real GDP per capita - Unemployment, total (% of total labor force) - Unemployment, youth total (% of total labor force ages 15-24) (national estimate) - Number of ATMs per 100,000 adults	growth unemp unempy atms
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.2.1. Manufacturing value added as a proportion of GDP and per capita 9.4.1. CO2 emission per unit of value added 9.5.1. Research and development (R&D) expenditure as a proportion of GDP 9.c.1. Proportion of population covered by a mobile network, by technology	- Manufacturing value added as a proportion of GDP - CO_2 emissions (Kg per 2011 PPP$ of GDP) - Research and development (R&D) expenditure as a proportion of GDP - Mobile cellular subscriptions by 100 people	manuf co2 research cells
10. Reduce inequality within and among countries	10.1.1. Growth rates of household expenditure or income per capita among the bottom 40 per cent of the population and the total population 10c1. Remittance costs as a proportion of the amount remitted Added	- Household final consumption expenditure per capita growth (annual %) - Average transaction of remittances - Gini Index (World Bank estimate)	consum costrem gini
11. Make cities and human settlements inclusive, safe, resilient and sustainable	11.1.1. Proportion of urban population living in slums, informal settlements or inadequate housing	- Population living in slums (% of urban population)	slums
12. Ensure sustainable consumption and production patterns	Added	- Fossil fuel energy consumption (% of total)	fossil

13. Take urgent action to combat climate change and its impacts	N/A	N/A [Targets are defined at global level]	N/A
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	N/A	The available variables are non-stationary and have few observations. When differences are taken to make them stationary, there are not enough data to be included.	N/A
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	15.1.1. Forest area as a proportion of total land area	- Forest area (% of land area)	forest
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	16.1.1. Number of victims of intentional homicide per 100,000 population, by sex and age Added	- Intentional homicides (per 100,000 people) - Arms import (SIPRI trend indicator values)	kills arms
17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	17.1.1. Total government revenue as a proportion of GDP, by source 17.2.1. Net official development assistance, total and to least developed countries, as a proportion of OECD/Development Assistance Committee donors' gross national income 17.3.1. Foreign direct investments (FDI), official development assistance and South-South Cooperation as a proportion of total domestic budget 17.3.2. Volume of remittances (in United States dollars) as a proportion of total GDP 17.4.1. Debt service as a proportion of exports of goods and services 17.6.2. Fixed Internet broadband subscriptions per 100 inhabitants, by speed 17.8.1. Proportion of individuals using the Internet 17.10.1. Worldwide weighted tariff-average	- Revenue, excluding grants (% of GDP) - Net ODA received (% of GNI) - Foreign Direct Investments, net inflows (% of GDP) - Personal remittances received (% of GDP) - Debt service (PPG and IMF only, % of exports of goods, services and primary income) - Fixed broadband subscriptions - Internet users per 100 people - Tariff rate, applied, weighted mean, all products (%)	revenue oda fdi remit debt bb internet tariff

Table 3. Cohesion Results: Density

	Density	No. of Ties	Std. Dev.	Average Degree
Entire Network	0.132	148	0.338	4.353
Synergies only	0.091	102	0.287	3
Trade-offs only	0.041	46	0. 198	1.353

Table 4. Cohesion Results: Overall Clustering

	Unweighted	Weighted
Entire Network	0.200	0.211
Synergies only	0.243	0.213

Trade-offs only	0.000	0.000

Table 5. Cohesion Results: Individual Nodes' Clustering Coefficient[6]

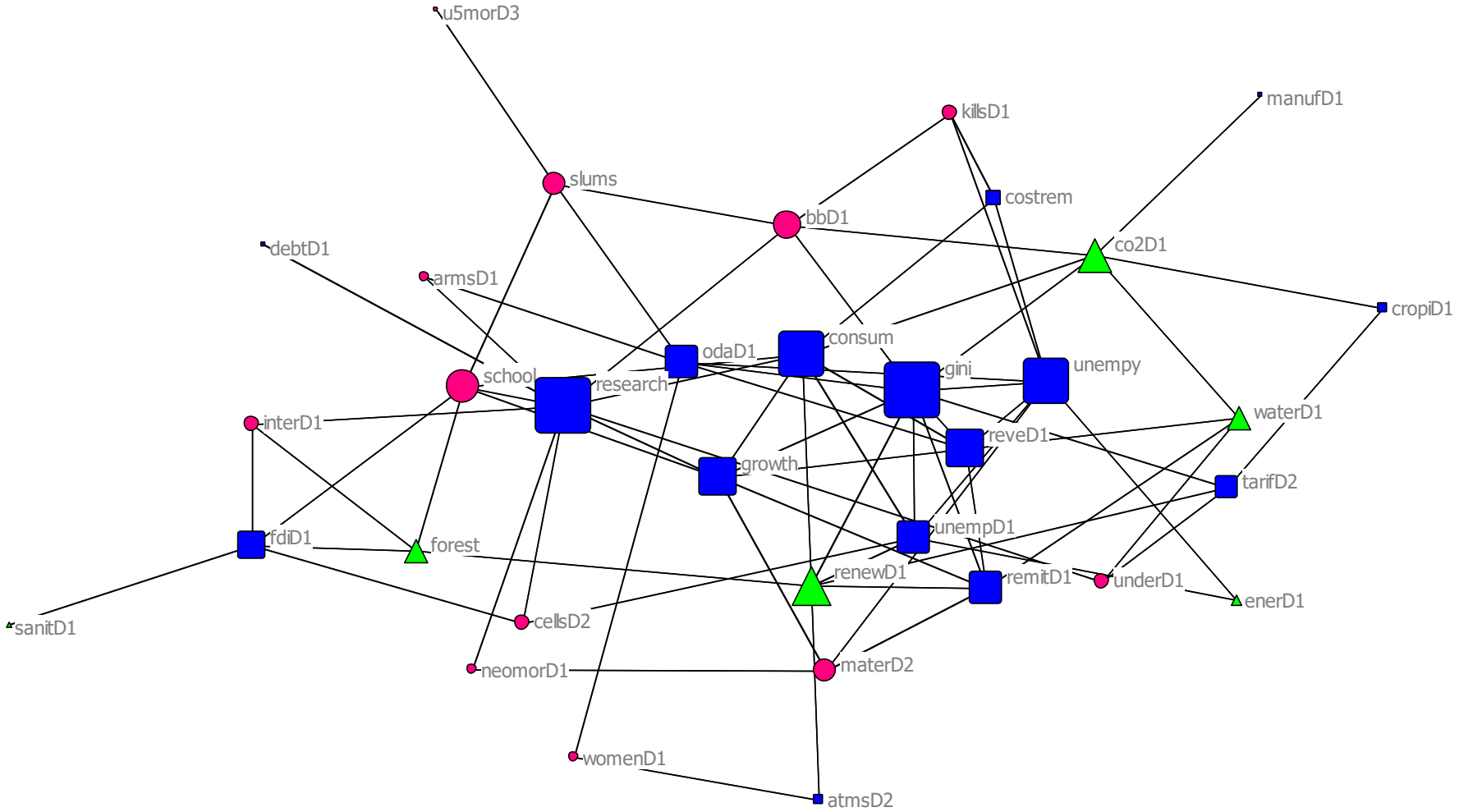
Variable	Entire Network	Synergies only	Trade-offs only
	(1)	(2)	(3)
consum	0.179	0.200	0.000
costrem	0.333	1.000	
gini	0.244	0.250	0.000
reveD1	0.381	0.400	
tarifD2	0.167	0.333	
odaD1	0.200		0.000
fdiD1	0.200	0.000	0.000
remitD1	0.400	0.400	
debtD1			
cropiD1	0.000	0.000	
growth	0.381	0.400	
atmsD2	0.000	0.000	
unempD1	0.267	0.333	0.000
unempy	0.214	0.200	0.000
manufD1			
research	0.067	0.022	
slums	0.000	0.000	0.000
killsD1	0.333	1.000	
armsD1	0.000		
bbD1	0.100	0.000	0.000
interD1	0.333		0.000
underD1	0.000	0.000	
materD2	0.167	1.000	0.000
u5morD3			
neomorD1	0.000		
school	0.267	0.000	0.000
womenD1	0.000	0.000	
cellsD2	0.000	0.000	
forest	0.333	0.000	0.000
waterD1	0.167	0.333	
sanitD1			
renewD1	0.190	0.190	
enerD1	1.000		
co2D1	0.067	0.000	0.000

[6] Dickey-Fuller tests for unit root and graphical representations were undertaken to assess stationarity of each of the variables. The endings D# in the name of some variables denote the number of differences that was taken to render the series stationary.

Table 6. Centrality Results: Degree (1), Closeness (2), Eigenvector (3), Betweenness (4)

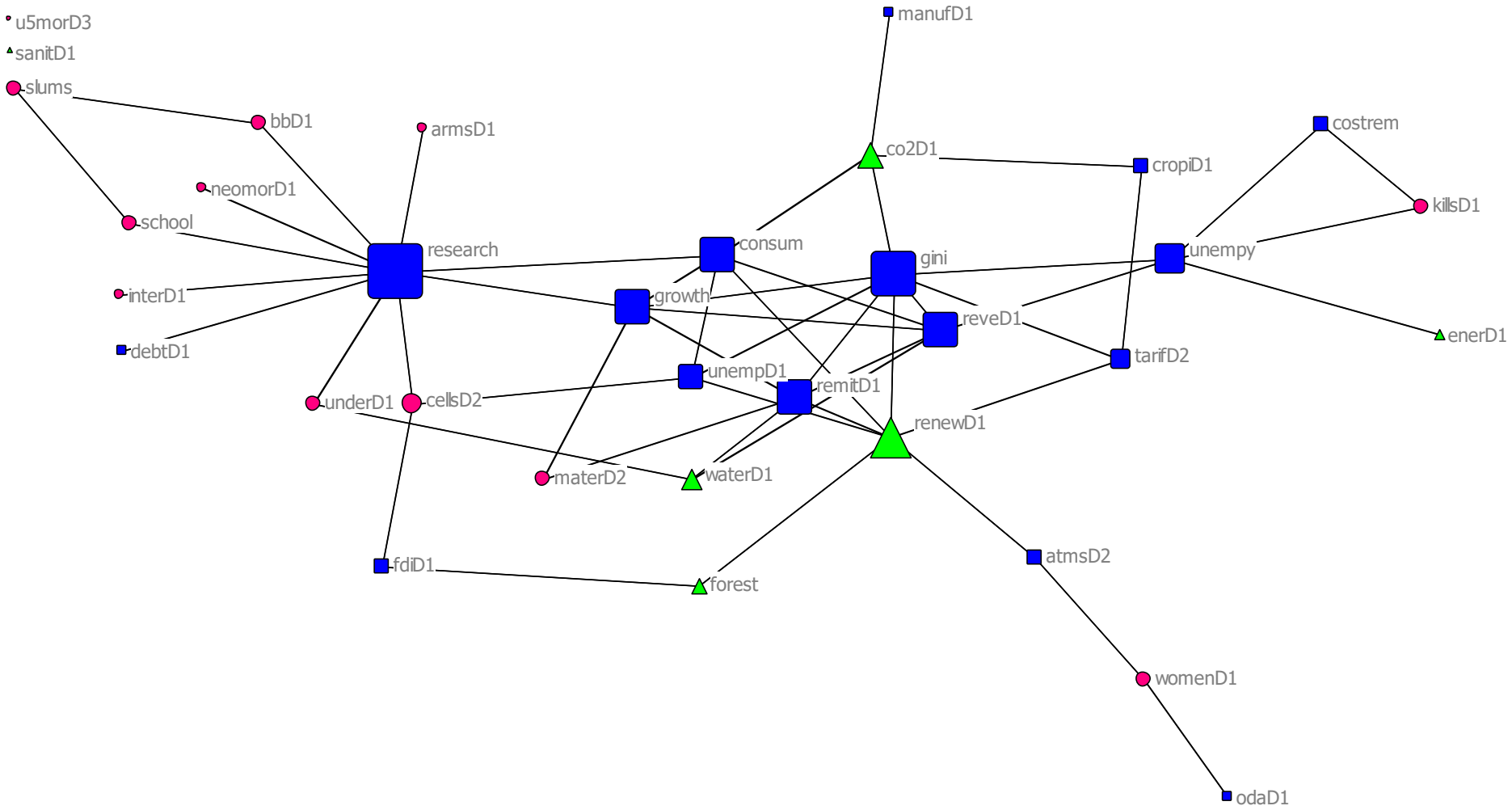
	Entire Network				Synergies only				Trade-offs only			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
consum	0.242	0.541	0.426	0.125	0.182	0.412	0.455	0.205	0.061	0.149	0.000	0.011
costrem	0.091	0.398	0.155	0.006	0.061	0.250	0.061	0.000	0.030	0.145	0.000	0.000
gini	0.303	0.524	0.539	0.123	0.242	0.398	0.581	0.190	0.061	0.177	0.463	0.076
reveD1	0.212	0.465	0.437	0.035	0.182	0.359	0.490	0.085	0.030	0.170	0.346	0.000
tarifD2	0.121	0.412	0.181	0.034	0.091	0.317	0.221	0.022	0.030	0.128	0.000	0.000
odaD1	0.182	0.465	0.275	0.101	0.030	0.195	0.004	0.000	0.152	0.182	0.859	0.133
fdiD1	0.152	0.375	0.108	0.068	0.061	0.275	0.046	0.010	0.091	0.150	0.000	0.015
remitD1	0.182	0.434	0.363	0.028	0.182	0.367	0.480	0.052	0.000	0.125	0.000	0.000
debtD1	0.030	0.344	0.055	0.000	0.030	0.287	0.062	0.000	0.000	0.125	0.000	0.000
cropiD1	0.061	0.330	0.073	0.002	0.061	0.275	0.090	0.002	0.000	0.125	0.000	0.000
growth	0.212	0.493	0.431	0.050	0.182	0.384	0.498	0.121	0.030	0.147	0.000	0.000
atmsD2	0.061	0.351	0.067	0.011	0.061	0.297	0.092	0.110	0.000	0.125	0.000	0.000
unempD1	0.182	0.452	0.323	0.063	0.121	0.355	0.320	0.034	0.061	0.168	0.272	0.025
unempy	0.242	0.452	0.367	0.086	0.152	0.320	0.246	0.163	0.091	0.177	0.565	0.083
manufD1	0.030	0.311	0.043	0.000	0.030	0.258	0.046	0.000	0.000	0.125	0.000	0.000
research	0.303	0.516	0.326	0.224	0.303	0.388	0.312	0.391	0.000	0.125	0.000	0.000
slums	0.121	0.418	0.133	0.077	0.061	0.234	0.027	0.001	0.061	0.172	0.413	0.025
killsD1	0.091	0.375	0.127	0.006	0.061	0.250	0.061	0.000	0.030	0.160	0.117	0.000
armsD1	0.061	0.393	0.101	0.015	0.030	0.287	0.062	0.000	0.030	0.170	0.346	0.000
bbD1	0.152	0.478	0.232	0.077	0.061	0.292	0.067	0.027	0.091	0.171	0.289	0.066
interD1	0.091	0.375	0.096	0.013	0.030	0.287	0.062	0.000	0.061	0.147	0.000	0.002
underD1	0.091	0.402	0.118	0.025	0.061	0.308	0.104	0.018	0.030	0.128	0.000	0.000
materD2	0.121	0.398	0.211	0.021	0.061	0.303	0.194	0.000	0.061	0.168	0.272	0.025
u5morD3	0.030	0.297	0.022	0.000	0.000	0.125	0.000	0.000	0.030	0.161	0.166	0.000
neomorD1	0.061	0.367	0.090	0.006	0.030	0.287	0.062	0.000	0.030	0.157	0.109	0.000
school	0.182	0.478	0.262	0.102	0.061	0.292	0.067	0.027	0.121	0.151	0.000	0.028
womenD1	0.061	0.333	0.058	0.009	0.061	0.237	0.019	0.057	0.000	0.125	0.000	0.000
cellsD2	0.091	0.402	0.127	0.030	0.091	0.333	0.134	0.049	0.000	0.125	0.000	0.000
forest	0.121	0.402	0.136	0.033	0.061	0.295	0.097	0.023	0.061	0.149	0.000	0.004
waterD1	0.121	0.398	0.197	0.016	0.091	0.320	0.213	0.019	0.030	0.152	0.056	0.000
sanitD1	0.030	0.275	0.018	0.000	0.000	0.125	0.000	0.000	0.030	0.146	0.000	0.000
renewD1	0.212	0.485	0.342	0.111	0.212	0.388	0.445	0.233	0.000	0.125	0.000	0.000
enerD1	0.061	0.355	0.116	0.000	0.030	0.248	0.049	0.000	0.030	0.157	0.109	0.000
co2D1	0.182	0.446	0.254	0.104	0.121	0.337	0.232	0.088	0.061	0.162	0.139	0.025

Figure 4. Entire network[7]



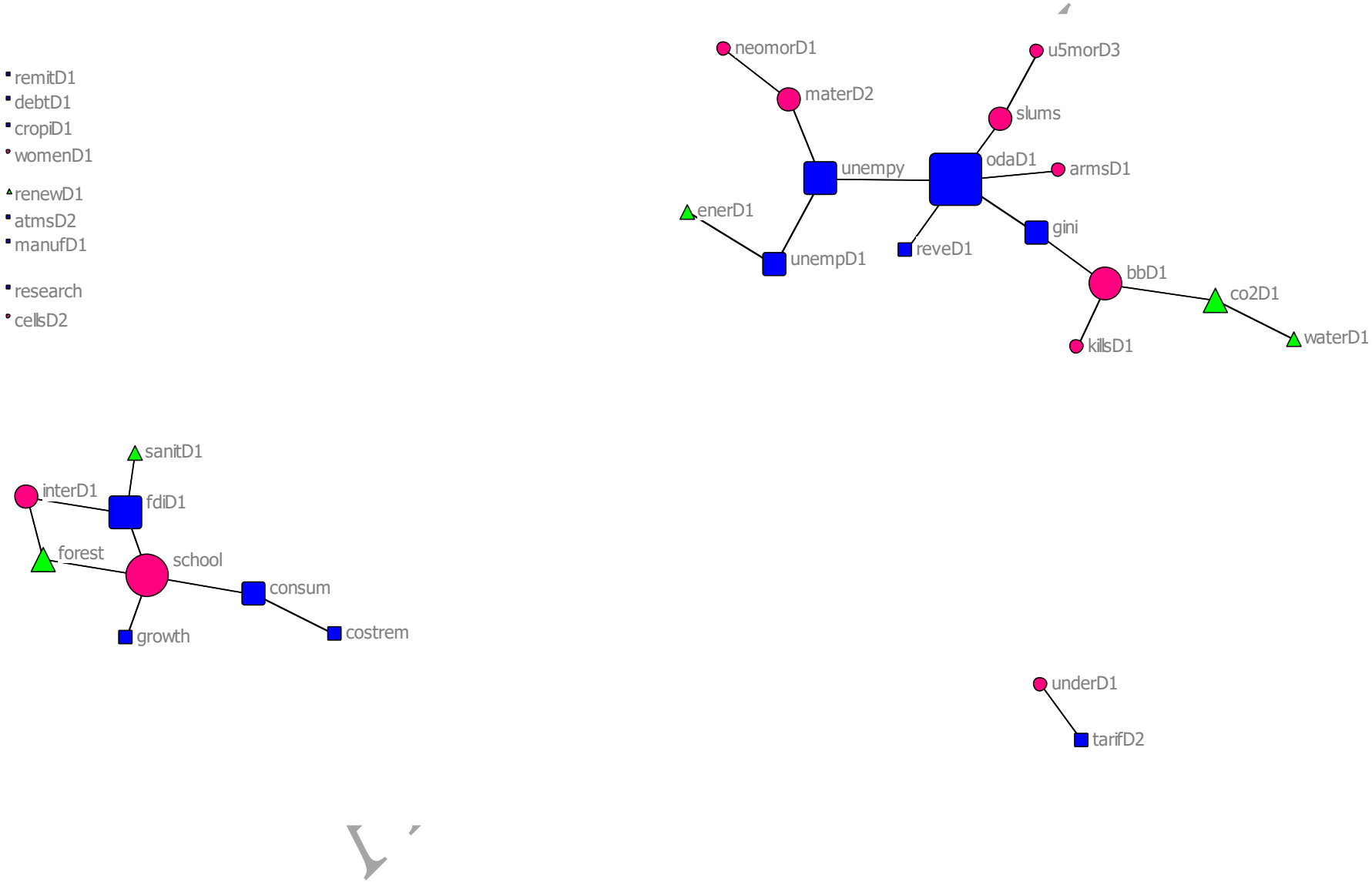
[7] The colors (blue, pink and green) are for economic, social and environmental indicators. The size of the nodes is weighted according to the degree of connections. The layout criteria are: distance, node repulsion and equal edge length.

Figure 5. Network with positive relationships only[8]



[8] The colors (blue, pink and green) are for economic, social and environmental indicators. The size of the nodes is weighted according to the degree of connections. The layout criteria are: distance, node repulsion and equal edge length.

Figure 6. Network with negative relationships only[9]



[9] The colors (blue, pink and green) are for economic, social and environmental indicators. The size of the nodes is weighted according to the degree of connections. The layout criteria are: distance, node repulsion and equal edge length.

Figure 7. Evolution of unemployment rate and Gini coefficient (with linear fits)

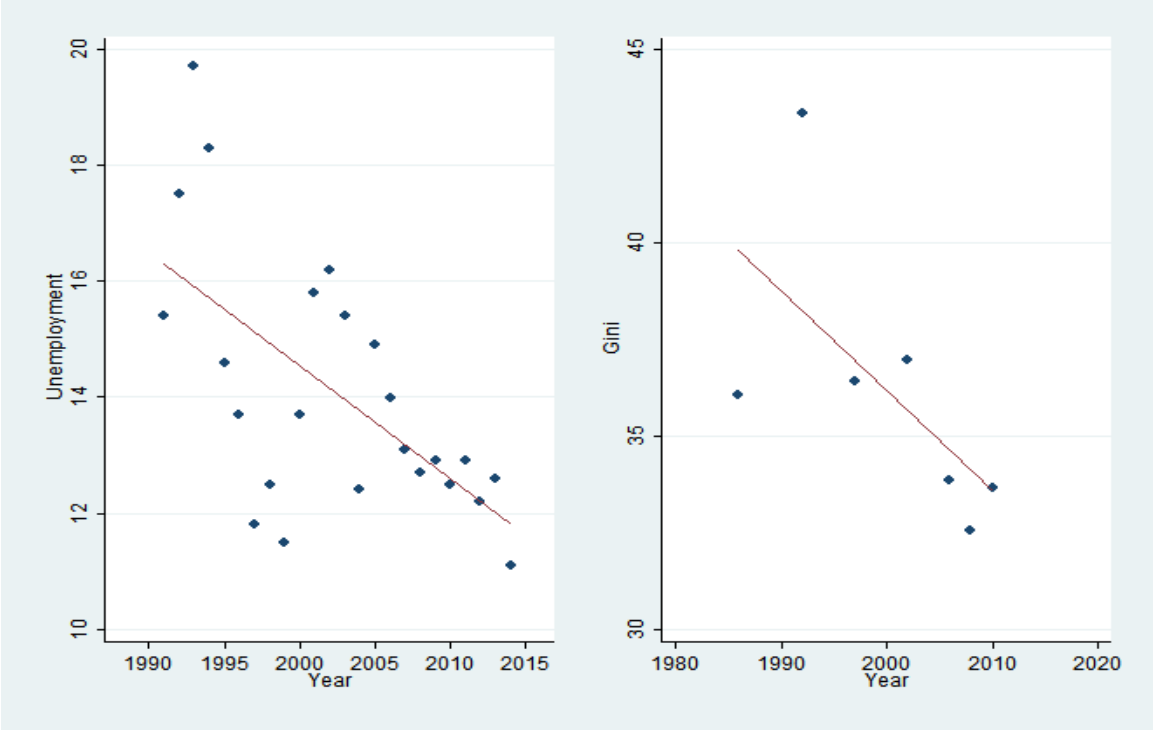
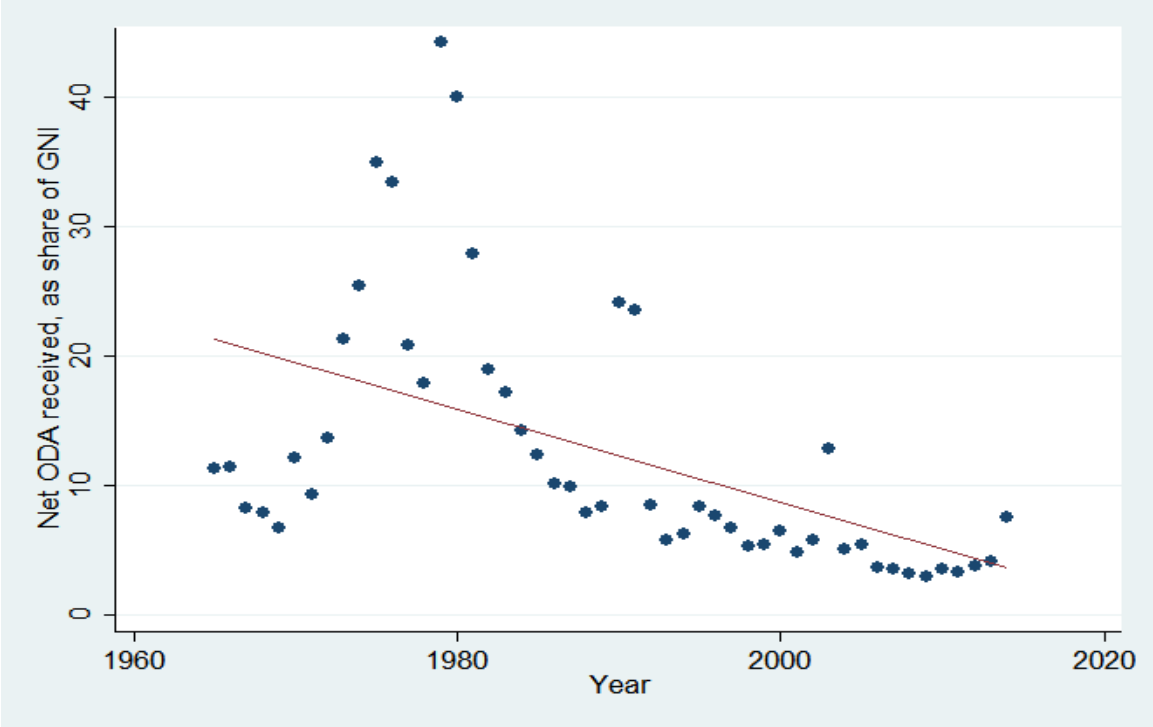


Figure 8. Evolution of net ODA as share of Gross National Income (with linear fit)



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