

Network Analysis of the Sardex Community Currency

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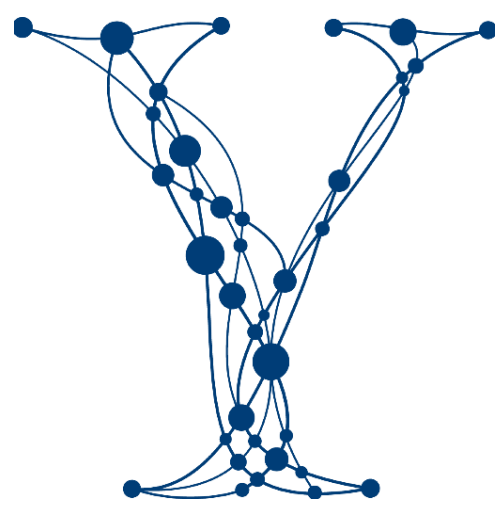


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Georgios Iosifidis, Yanick Charette, Giuseppe Littera, Leandros Tassioulas, and Nicholas Christakis, "Network Analysis of the Sardex Community Currency" (September 23, 2015). *Yale Day of Data*. Paper 4.

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Abstract

We present a transaction dataset and preliminary analysis results about Sardex, a complementary currency (CC) in Sardinia, Italy. Sardex is currently considered one of the most successful CCs in Europe, as it grows continuously in terms of transactions' volume and membership, and has been already replicated in 8 other regions in Italy. We model Sardex as a transaction network and study its basic properties.

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References

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- G. Littera, L. Sartori, D. Paolo, P. Antoniadis, "From an Idea to a Scalable Working Model: Merging Economic Benefits with Social Values in Sardex", in *Inaugural WINIR Conference*, 2014, Greenwich, UK.

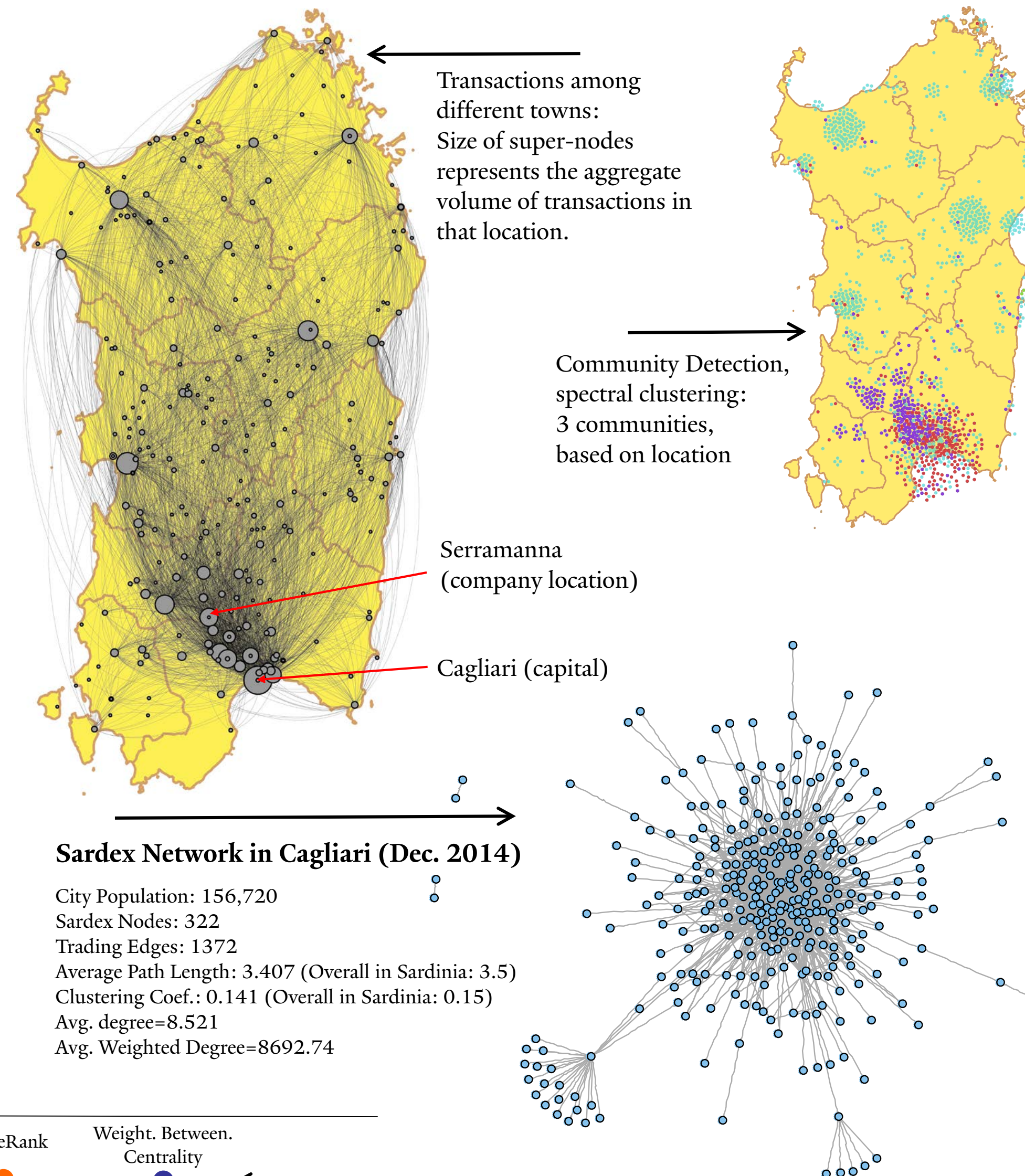
Background

Sardex is a very successful B2B/E local currency system that was established in Sardinia, Italy, in 2010 by a social innovation startup as a response to the economic recession. Its design principles draw both from typical LETS platforms and the Swiss WIR system. It is an electronic-only payment system, there is no bank, and Sardex is not exchangeable with the Euro nor it can be used outside Sardinia. By December 2014, Sardex had 2500 members, businesses and employees, that conducted 66000 transactions since January 2012, with an annual turnaround of 39 Millions of Euros.

We model Sardex as a trading network and study its properties. The 2-years transaction dataset includes additional information such as geographic location of its members, the offered products/services, and their membership duration.

Analysis

Modeling Approach: Sardex is modeled as a directed weighted graph. The nodes represent the traders and the edges the aggregate currency flow (from buyer to seller) during the time interval of interest. We study the properties of the Sardex network at December 2014, as well as the evolution of their values during this 2-year time period. We consider both the node-level properties such as the degree distribution and transaction rates, as well as the network-level properties such as the diameter of the system and its structure. Also, we explore the impact of the geography on the operation of Sardex.



Sardinia Demographics

9197 sq mi, 1.6 million population
GDP/capita: 20,071
Unempl.: 8.6% (08), 14.6% (12)

Sardex Demographics

690 individuals, 1432 companies
9 Categories, 250 Subcategories
10 Provinces, 150 Cities/Towns

Sardex Properties

Network:

- 1 component, 2122 nodes, 17197 trading relationships (66000 transactions). Values increase linearly with time.
- Directed diameter is 10 and average path length is 3.66 (constant).
- Network density 0.0038 (slightly decreasing).
- Transitivity is 0.096 (approx. constant)

Nodes:

- Mean degree increases from 5.09 to 16.2
- Mean transaction rate: 1 new transaction every 7.8 days, 1 new partner every 25 days.
- Mean number of transactions per node increases from 5.9 to 33.3

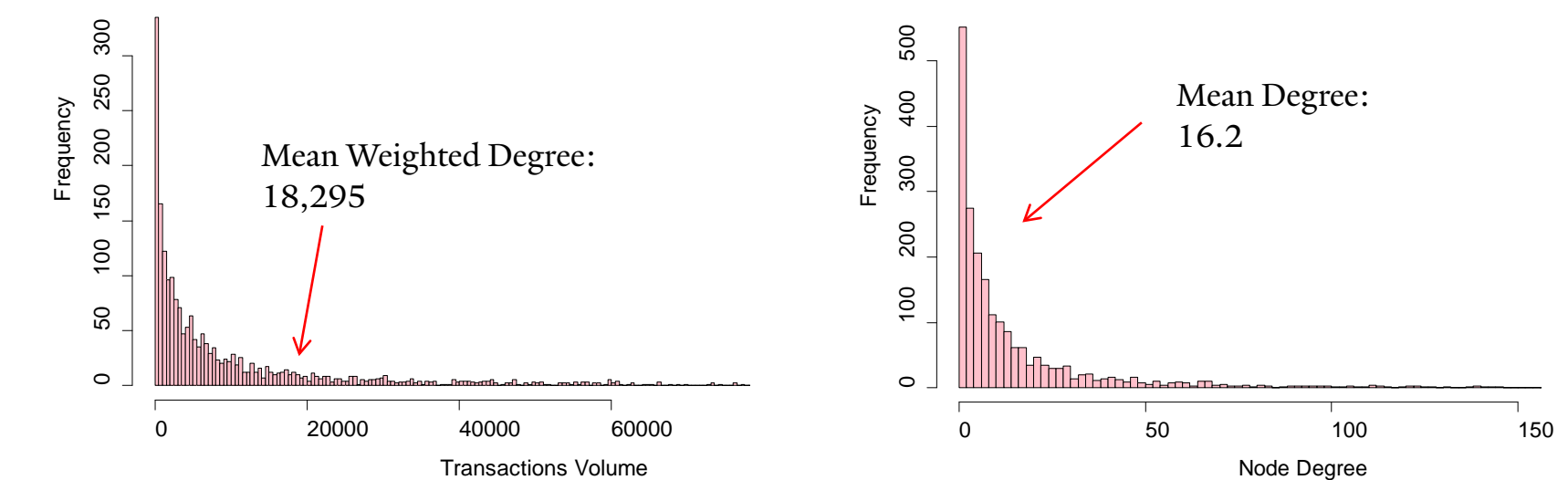
Edges

- New transactions per month: 5223 (increasing linearly)
- Average amount per transaction: 296.18 Sardex (constant)
- Average number of transactions per node increases from 5.9 to 33.3
- Average number of transactions per pair of nodes: 3.8 (incr. from 1.7)

Network Assessment

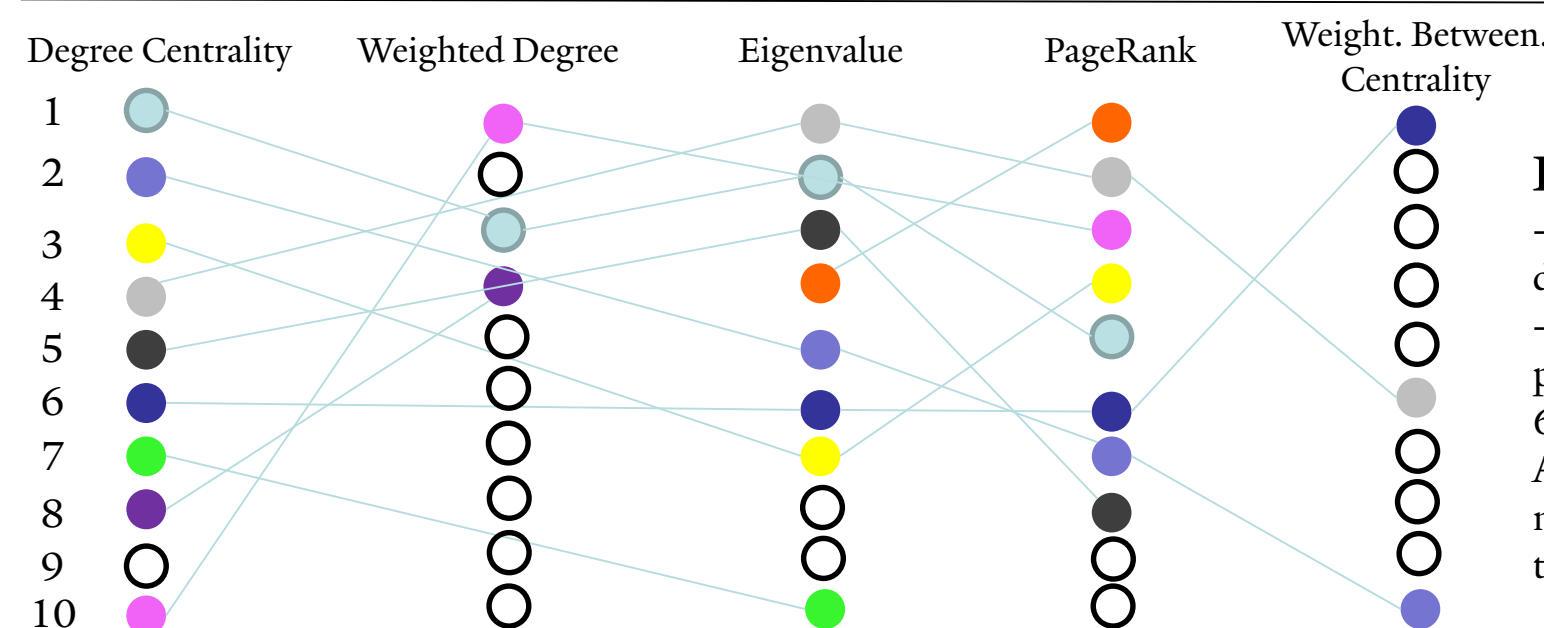
- Sardex has low average path length, similar to Random, Small-World and Scale-free networks.
- Sardex has 12 times higher clustering coefficient than random networks, and 5 times smaller than small world graphs.

Weighted Degree (Volume of Transactions), and Degree Distributions have a long tail



Conclusion & Ongoing Work

We presented the basic properties of a detailed network dataset from a complementary currency economy in Sardinia, Italy. We showed that the network is asymmetric, as it has a skewed degree and weighed degree distribution. Location plays also an important role as the community detection revealed. Our current work focuses on identifying why some nodes perform better than others, in terms of trading volumes and/or number of partnerships.



Prominent Nodes

--10 most central nodes in Sardex based on different centrality criteria.
-- top 20% of the nodes with the largest number of partners (highest degree) were responsible for the 67.9% of the overall trading ties (partnerships). Also, top 20% of the nodes with the highest number of transactions made the 98.38% of all transactions.