

# The Intrafirm Complexity of Systemically Important Financial Institutions

Robin L. Lumsdaine  
Daniel N. Rockmore  
Nick Foti  
Gregory Leibon  
J. Doyne Farmer

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# Introduction

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- In November 2011, FSB/IMF published a list of 29 “SIFIs”:

“SIFIs are financial institutions whose distress or disorderly failure, because of their size, complexity and systemic interconnectedness, would cause significant disruption to the wider financial system and economic activity.”

- Regulators often rely on size-based thresholds => “too big to fail”
- Large literature using network analysis to examine interconnectedness

# SIFI designation is controversial

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- **MetLife lawsuit**

“FSOC fixated on MetLife’s size and so-called interconnections with other financial companies—factors that, considered alone, would inevitably lead to the designation of virtually any large financial company—and ignored other statutorily mandated considerations that weighed sharply against designation.”

- **FSOC motion to dismiss**

“MetLife ‘is a complex organization, with 359 subsidiaries in 50 countries’ and its operations ‘are subject to separate regulatory regimes administered by scores of state, federal, or foreign regulators”.

# Complexity of Individual Firms

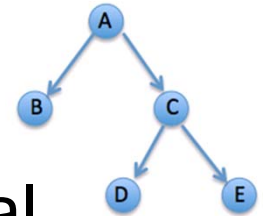
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- We approach from a lens of governance
- “High complexity” => corporate control that presents challenges for a firm’s senior management or supervisors, resulting in lack of oversight
- Allows subsidiaries to operate in relative obscurity within the organization
- Poses risk to system when coupled with high degree of interconnectivity

# This paper

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- This paper considers complexity via a firm's control hierarchy
- Control hierarchy provides natural hierarchical network representation, with nodes labeled by country of incorporation or business classification
- Proposes complexity measure related to oversight; accounts for coordination burden
- Potentially enables comparison of firms with different business models
- Can inform proposed changes in firm structure
- Useful metrics for supervisors; aligns supervisory and firm interests



# Data

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- Anonymized data set provided by Kingland Systems
- 29 large financial institutions
  - 19 of original 29 SIFIs
  - 5 non-SIFI banks
  - 5 insurance companies
- We obtain data that encodes the control hierarchy for each firm, as well as country of origin and SIC code of each entity
- Two points in time, 5/26/11 and 2/25/13

# Firms in dataset

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## SIFIs

Bank of America

Citigroup

Goldman Sachs

JP Morgan Chase

Morgan Stanley

Barclays Plc

HSBC Holdings Plc

RBS

Credit Suisse

ING Groep NV

## SIFIs (cont'd)

UBS AG

BNP Paribas SA

Société Générale

Banco Santander

Mitsubishi UFJ

Mizuho

Sumitomo Mitsui

UniCredit

Deutsche Bank

## Non-SIFI banks

RBC

Std. Chartered

BBVA

Nomura

Banca Intesa

## Insurance Cos

Allianz

Aviva

AXA

Swiss Re

Zurich

## Not included

Wells Fargo

Lloyds

Banque Populaire

Crédit Agricole

Commerzbank

Dexia

Bank of China

Nordea

# Table 1: Descriptive Statistics

(averages by group)

2011	Min	Max	SIFIs	Non-SIFI Banks	Insurance Companies
# nodes	43	16,443	4,328	1,097	921
# countries	10	89	48	27	41
# SIC groups	13	281	157	78	75
Depth	2	7	4.5	3.8	4.2

2013	Min	Max	SIFIs	Non-SIFI Banks	Insurance Companies
# nodes	330	12,752	5,398	3,906	1,648
# countries	23	86	53	34	46
# SIC groups	27	164	98	54	76
Depth	4	20	8.6	5.4	7.0

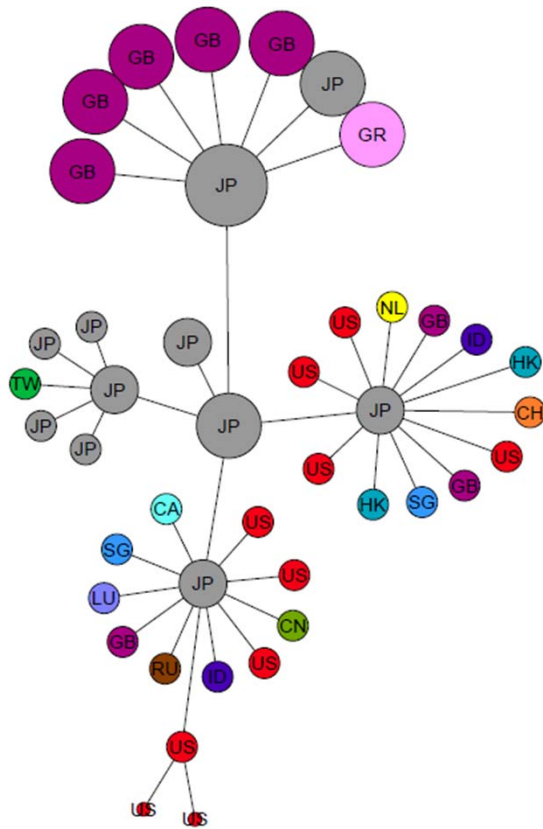


# Are SIFIs in our sample more complex?

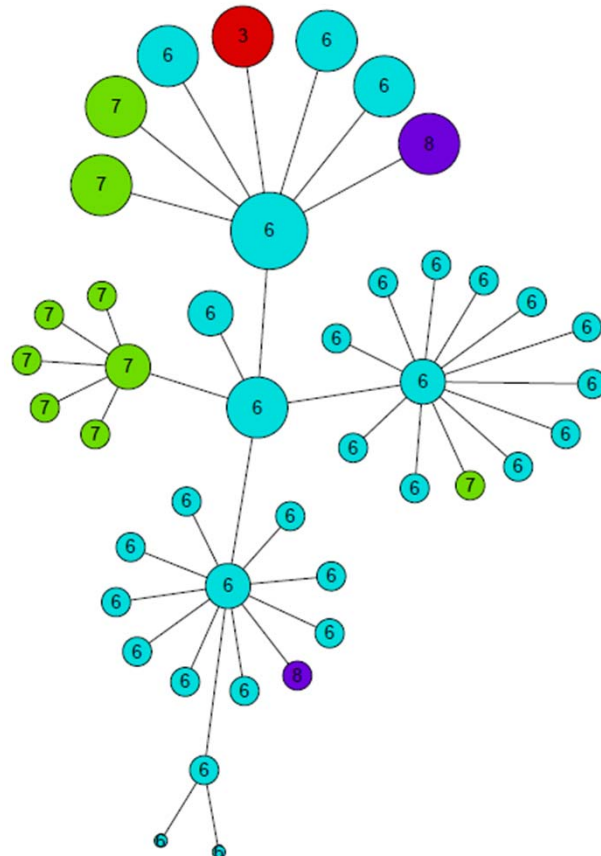
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- At first glance, yes
  - Based on #nodes, depth, #countries, #SIC
  - Averaged \$1.82tr in total consolidated assets (vs \$0.72tr for non-SIFI banks and \$0.62tr for insurance companies)
- Do network measures tell us more than size?
- Consider complexity from a supervisory perspective
  - How difficult is it to supervise/assess?
  - How likely can problems be identified?
  - How easily can problem be mitigated/remedied?
  - We assume ease of supervision is related to proximity of control hierarchy to a perfect tree (less coordination necessary)

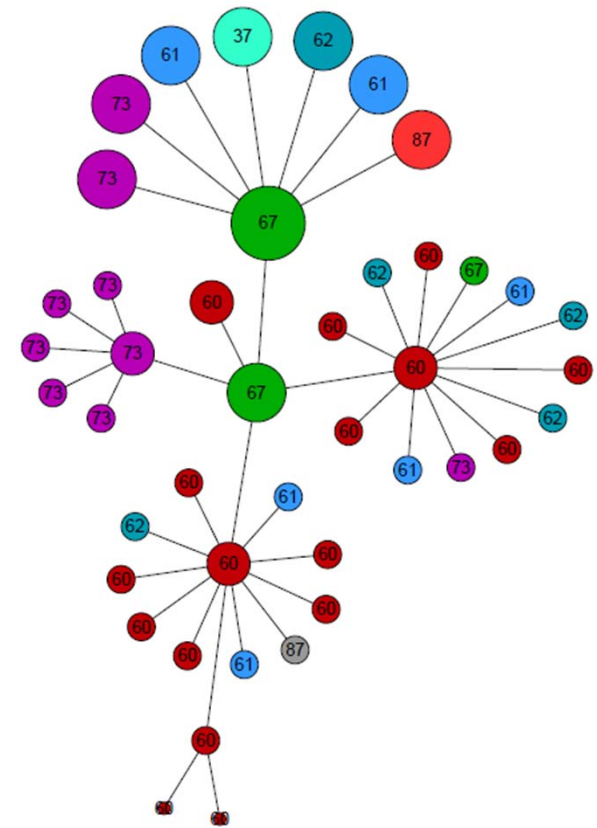
# Example 1: SIFI S11 (43 nodes, depth = 4)



Country (n=14)



1-digit SIC (n=4)

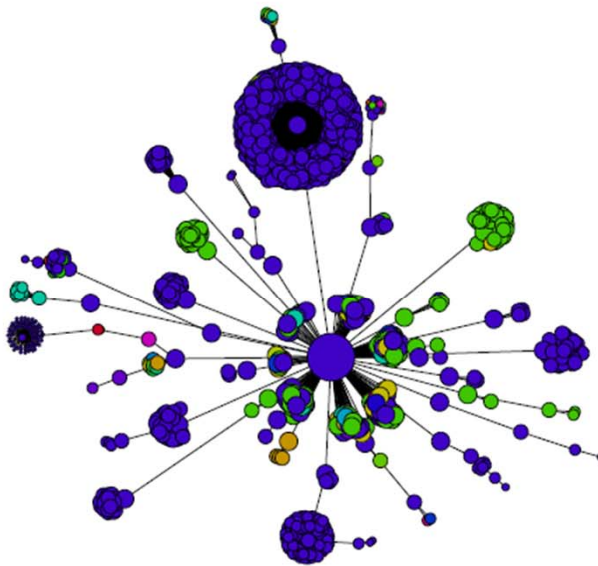


2-digit SIC (n=7)

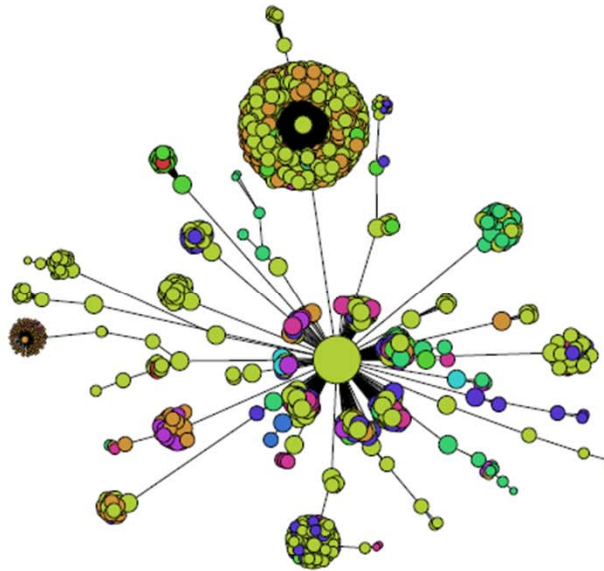
- By 2013, this firm had 1468 nodes across 23 countries, 34 industry classifications, and depth had expanded to 5

## Example 2: SIFI S16 (1778 nodes)

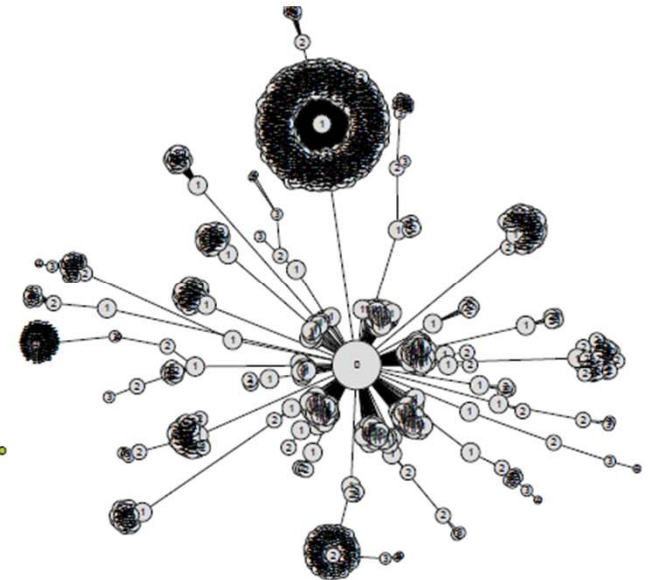
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Country (n=32)



1-digit SIC  
(n=10)



Depth (n=5)

- By 2013, this firm had 2545 nodes across 50 countries, 86 industry classifications, and depth had expanded to 11

# Perfect tree similarity

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- Fix topology
  - Take firm layout as given
  - Take heterogeneity at depth 1 as given
  - Simplest structure has all subsidiaries in same country and same industry (“perfect tree”)
  - Greater number of perfect groupings, less likely spillover will occur
- Accept firm’s decisions of countries and industries in which it operates
  - Take probability distribution as given
  - Merely assess efficacy of its control hierarchy
- Perfect tree statistic
  - Fraction of nodes with same “label” as immediate parent
  - Bounded between 0 and 1

# Table 4: Country Perfect Tree Statistics

Country	SIFIs	Non-SIFI Banks	Insurance Companies
2011 Actual	0.687	0.704	0.635
2011 Simulated	0.538	0.493	0.476
2013 Actual	0.891	0.847	0.830
2013 Simulated	0.699	0.676	0.503

- These are averages across all firms in group (averaged over a wide variety of topologies)

2011 Example	Statistic	Mean	Stdev	Quantile
S9	0.895	0.827	0.278	33.10%
S11	0.279	0.093	0.049	99.85%

# Table 5: SIC Perfect Tree Statistics

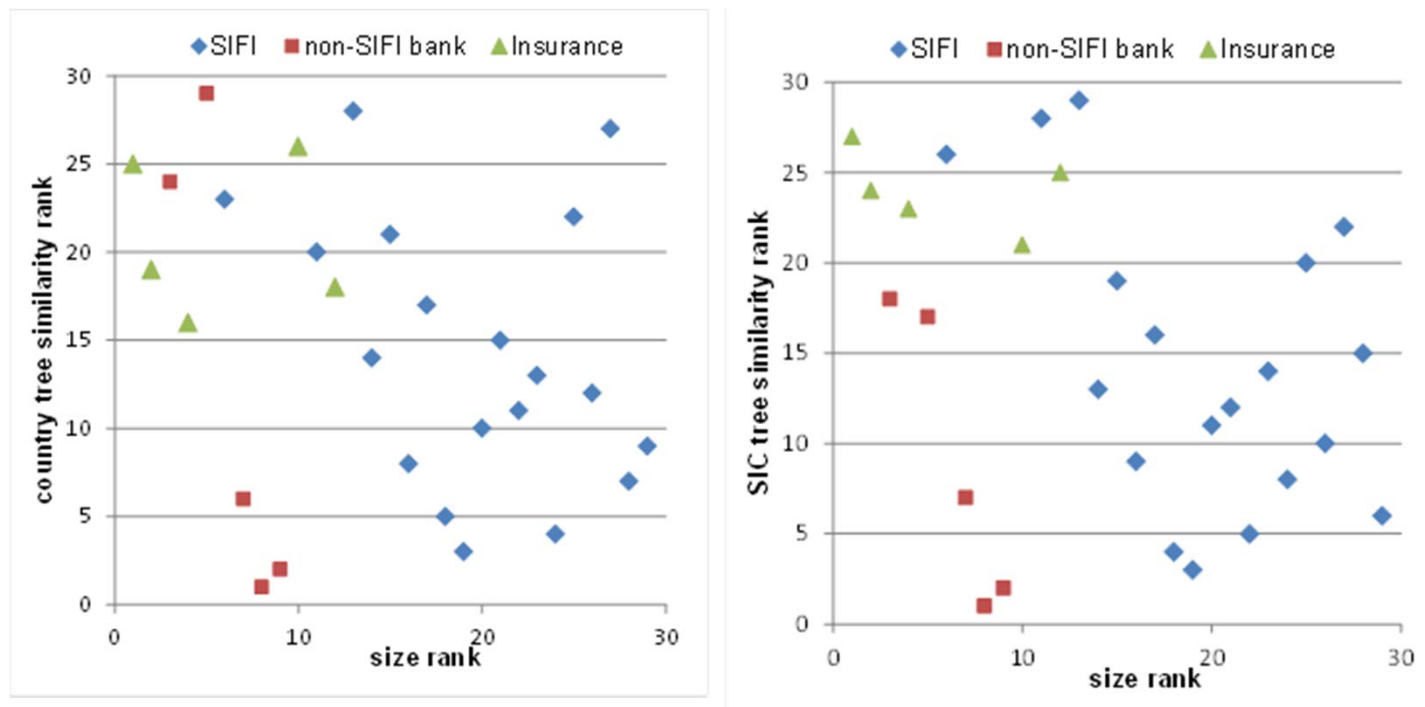
SIC	SIFIs	Non-SIFI Banks	Insurance Companies
2011 Actual	0.365	0.411	0.262
2011 Simulated	0.287	0.273	0.220
2013 Actual	0.739	0.825	0.538
2013 Simulated	0.607	0.719	0.370

- These are averages across all firms in group (averaged over a wide variety of topologies)

S18	nodes	countries	SIC	C-stat	Quantile	SIC-stat	Quantile
2011	11,487	47	279	0.963	68.5%	0.666	75.1%
2013	10,007	52	134	0.973	100%	0.844	37.3%

# Is size a sufficient statistic (Figure 7)?

- Size is usually specified in financial terms rather than in terms of control hierarchy
  - Basel II/III capital regulations
  - Dodd-Frank
- Obtained data on total consolidated assets from Bloomberg®
  - Rank correlation with perfect tree stats is -0.32 and -0.36
  - Rank correlation with number of nodes is 0.58



# Conclusions

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- Calls to end “Too big to fail” has focused on size and interconnectedness aspects of the SIFI definition with relatively little emphasis on complexity
- We propose using firm’s control hierarchy to assess supervisory challenges
- Size and complexity are not synonymous
- We propose using the perfect tree statistic to quantify the ease of supervision regarding:
  - Coordination with other supervisors
  - The implications of severing a subtree or grafting a new subtree
- We find that on average, ease of supervision has improved
- We find little difference between SIFI and non-SIFI banks but insurance companies are more complex