Mary Cussen
"Identifying Inter-Sectoral Exposures in Ireland using Network Analysis"

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Introduction

Recent analysis by the Central Bank of Ireland looks at the financial connections between the economic sectors of the Irish economy using network analysis tools. This is an innovative approach in the Irish context. The method uses previously unpublished data. The period of the Global Financial Crisis and the following recession was one where boundaries between different sectors of the economy became more fluid with a range of inter-sectoral spillovers having occurred.

Broadly speaking, the analysis shows that, at a high level of aggregation, the broad sectors of the Irish economy are very connected. Non-Irish sectors have also had very strong network links with the domestic Irish economy. This mirrors the activities of multinational corporations. Additionally, domestic investment funds and money market funds have also shown very strong links with non-Irish sectors. Irish households have a high net exposure to non-Irish sectors through their holdings in insurance and pension fund products. This highlights the importance of continued monitoring of networks in this area.

Why has there been a growth in recent years of interest in the relationship between different sectors? The impetus came from international institutions. Developing better inter-sectoral data was a key recommendation outlined in the FSB/IMF report on addressing data gaps exposed by the financial crisis (FSB and IMF, 2009). In addition, tools for identifying possible risks of inter-sectoral spillovers such as centrality analysis, cluster analysis, and balance sheet simulation methods, have recently become a core feature of IMFs reports.

Cussen's work further divides Irish credit institutions into domestic credit institutions and non-domestic credit institutions in order that their linkages to the Irish domestic economy could be clearly identified.

Methods

Network analysis tools have been increasingly used to map the financial relationships between the institutional sectors of the economy and, where data are available, between individual financial institutions. This paper uses network analysis to examine the *institutional* (rather than *individual*) sectors of the economy. The approach uses gross connections between sectors and is utilised to identify potential contagion risks in the economy at a high level.

Using network analysis charts, this paper identifies three relationships: the *gross* connections between sectors, the *summed* transactions between sectors over time, and connections between sectors on a *net* basis where liabilities minus assets are considered. In Network Analysis each sector of the economy is known as a 'node'. It is regarded as connected to other sectors if a financial claim greater than 1% of GDP exists between them. In order to understand the scale of the connection, coloured lines are used to represent connections greater than 5% of GDP. Additionally, directed lines are used to indicate which sector is a creditor and which is a debtor. Using colour and thickness the lines between the sectors are used to show the relative size of the claims. The extent of connections between units within same sector is represented by the size of the sector's node. Network analysis charts give a valuable overview of connections and these are enhanced by network analysis statistics. They provide useful summary information which can make it easier to compare networks over time.

Results and Conclusions

This paper finds that the Irish economy is highly interconnected at a sectoral level. In an Irish context this leaves the economy less well protected. Economic shocks could transfer across sectors more easily. Cited papers find that there may also be stability benefits to this interconnectedness. For example, Allen and Gale (2000) and Chiak and Scuzzarella (2011) use more *granular* or drilled down data than Cussen. High levels of interconnectedness can mean that a financial shock is spread across different sectors negating its overall impact.

Cussen concludes that the most connected sectors are the non-Irish ones. This reflects in part the role of Multinational corporations as well as the openness of the Irish economy. The analysis concludes by highlighting the level of exposure of Irish households more globally through their holdings of pension fund and insurance products. Monitoring of this channel would be beneficial.

References

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