

Inter-industry linkages, the transaction sector and the (digital) urban economy

- Draft, 28 September 2016 -

Extended Abstract

Inter-industry linkages and concomitant knowledge spillovers play a decisive role in the explanation of agglomeration economies. Much work has been undertaken in urban research to explore how input-output relationships of firms from different industries lead to economic advantages for metropolitan regions as opposed to less denser areas. In view of the rapid structural change in metropolitan areas characterized by a fast growth of digital industries, other knowledge-intensive and cultural industries these questions are receiving revived attention among researchers and policy makers.

Empirical research on these issues, however, is complicated by the fact that the possible number of input-output relationships increases exponentially with an increase in the number of industries under observation. Many studies thus include only selected industries or focus on certain sectors like manufacturing or services or subgroups thereof, although many categorizations of service industries into subgroups are anything but unequivocal. The latter problem is exacerbated by the continuing digitalization making a differentiation between goods and services ever more intricate. Investigations that concentrate on a narrow pre-selection of industries are therefore inappropriate to analyse the dynamics of contemporary urban change. Adding to that, comprehensive recent and detailed data on regional input-output linkages are difficult and costly to obtain.

In face of these difficulties, this paper explores inter-industry linkages on the basis of a complete input-output matrix for Germany containing inter-industry supplies between all 72 industries leading to more than 5000 possible interrelations. Out of those, the most important ones are selected by qualitative and quantitative criteria and discussed in more detail.

The example of the former and present capital of Germany, Berlin, is used to illustrate how the complex input-output relations of a diverse range of industries can influence economic restructuring in present day metropolises. Probably no other large city in Western Europe has recently undergone a more radical change in its economic base than Berlin. In the early nineties, local employment in manufacturing was still by far larger than employment in advanced services, but now employment in manufacturing is only half the size of employment in these services. And web related industries in recent years showed the strongest relative growth of all industries, turning Berlin in the internet economy into the 'digital capital' of Germany.

To categorize industries into sectors, recourse is taken to an approach based on institutional economics, that allows us to identify those industries in which mainly transactional activities are performed, covering organizational tasks on the micro (firm) level and coordination tasks at the macro economic level. These industries constitute the transaction sector, as opposed to e.g. personal services or manufacturing. The overwhelming part of the growing 'digital economy', is not only deeply interconnected with the transaction sector but can be considered as a component of it. This holds especially true for many internet companies, from platforms for brokerage, buying or booking - be they directed at consumers or businesses - to recent applications of the blockchain technology.

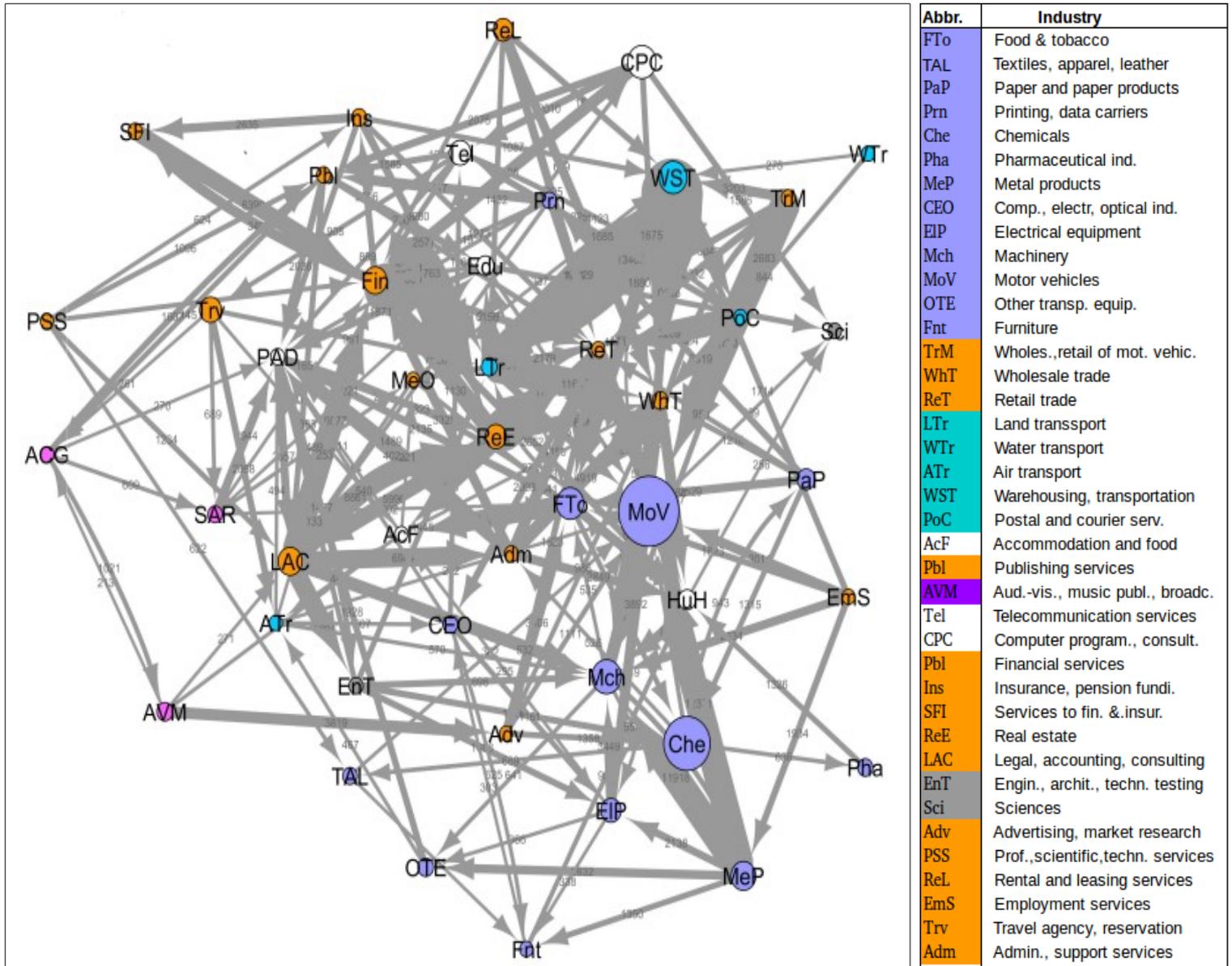
Empirical results are presented in form of a matrix of inter-industry input-output relations and interpreted from an urban economy background. To visualize the complexity of economic linkages, a graph is created representing an interlocking inter-industry network. Industries connected by the most intensive exchange can be identified in the clustered structure of the graph (see Figure).

Besides the focus on digital industries such as computer programming and consulting (CPC), special weight is given to knowledge-intensive business services e.g. advertising (Adv), finance (Fin) or legal services, accounting and consulting (LAC), that are part of the transaction sector and concentrate in metropolitan areas. And also to other 'future' industries that are seen as motors of eco-

conomic growth in metro areas, comprising (a) high technology branches like the pharmaceutical industry (Pha) or telecommunication (Tel), (b) cultural industries such as arts, culture & gambling (ACG) or audiovisual products and music publishing (AVM) and (c) science (Sci) and research & development resp. engineering (EnT).

Network of strongest input-output relationships for 45 industries

Organic Layout (Preliminary version)



Width of edges: Output from industry X to industry Y (Mill. Euro)

Size of nodes: Output from industry Z to industry Z (Relative to largest value)

Color of nodes: Categorization of industries into sectors (Preliminary version):

Manufacturing

Transaction sector

Cultural industries

Transportation

Science & Engineering

Other industries

Some of these industries prove to be highly connected by supply chains that are conducive to the formation of dense economic complexes with strong ties in urban environments. The well known 'FIRE Sector' e.g. is closely intertwined with other transaction industries like publishing, wholesale and law, accounting and consulting as well as digital and certain cultural industries. Others (e.g. advertising) show weaker and different interconnections. Also, a number of manufacturing and other industries offering 'analogous' output, e.g. the printing industry (Prn) - usually neglected in urban research - are strongly interlinked with many of the aforementioned typical metropolitan industries.