

## Understanding the impact of barriers to digital trade: Leveraging theories of factor mobility

### 1) Overview

A backlash against the globalization of Internet-based information industries by national governments is producing many new policy restrictions on digital trade. These interventions include data localization laws, ownership restrictions on information services, cybersecurity exclusions and outright blocking of domains or services. We need a better way of evaluating the impact of these policies on the global digital economy. This proposal tries to make both a conceptual and an empirical contribution to that effort.

Drawing on a recent OECD framework (Lopez-Gonzalez and Jouanjan, 2017) and on classical and “new” trade theory, we propose to treat data as a mobile factor of production in the digital economy, and then examine the way data flows, payment flows and foreign direct investment (FDI) are related. Policy interventions are likely to trigger adjustments in FDI as well as in payment flows, and the effects of both will be reflected in changes in data flows. We are especially interested in understanding how these factor flows respond to restrictive interventions in specific digital markets, and propose a focused empirical pilot study on the effects of a recent Chinese intervention in the cloud market.

We believe that a careful examination of data flow structures, the interdependence of factor flows and the impact of policy interventions can unlock a more comprehensive understanding of digital trade policy. The rationale behind this method, and our proposed empirical application of it are outlined in more detail below.

Section 2 of this proposal describes the proposal’s grounding in trade theory and the research questions we want to address. Section 3 describes our proposed methodology. Section 4 outlines the data requirements of the project. Section 5 describes the research team and the tentative schedule of the work proposed, and a budget.

### 2) Theory and Research Questions

In classical Ricardian/Heckscher-Olin trade theory, factor mobility is a substitute for trading goods across borders. If factors of production such as capital and labor can move freely and at low cost, they will disperse geographically to minimize transportation costs. Factor mobility also plays an important role in the reaction of firms to trade barriers. National policies that impose high tariffs while permitting capital mobility, for example, might induce FDI to build production in the protected country, so that foreign firms can continue selling into that market while avoiding the high tariffs.

The new trade theory recognizes the importance of factor flows, but also emphasizes the “centripetal” pull of scale economies, agglomeration economies, and access to large markets. These centripetal forces promote concentration of economic activity in a single provider that interacts with the rest of the world through trade rather than FDI and local production.

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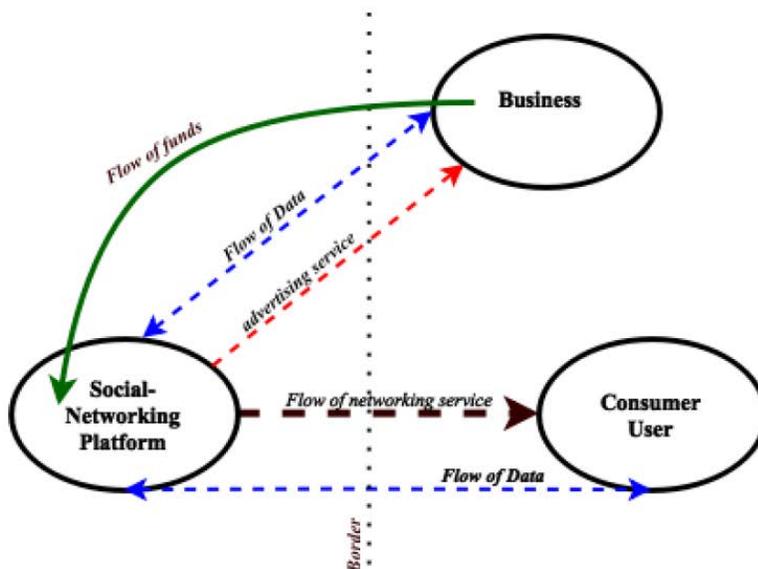
(Krugman, 1993) The newer trade theory also observes that as countries become more similar in size, relative factor endowments and technical efficiency, international economic activity will become dominated by multinational firms, which are “exporters of the services of firm-specific assets.” (Markusen, 1995; Markusen and Venables, 1995)

In both the old and the new theories, any attempt to understand trade patterns and assess the impact of national trade policies would require an analysis of the interdependent flow of *all* relevant factors of production. Yet too many approaches to digital trade only attempt to measure cross-border payments. Also, standard trade theory only treats labor and capital as the mobile factors of production. While the new trade theory sometimes engages with “knowledge capital” and the advantages of firm internalization, data flows are not typically treated as a factor of production.

*What happens if we treat data as a mobile factor of production in the digital economy?* This is the basic insight that underlies our proposal.

In an obvious sense, information exchanges underpin and enable all forms of trade. What’s different now is the emergence of a globally compatible data communication infrastructure – the Internet – that has drastically reduced the cost and increased the functionality of information exchanges. Data flows substitute for some goods and services and the cost of digital transport approaches zero. Clearly, neither the quantity nor the direction of Internet-enabled data flows can be strictly equated with the value, volume or balance of trade in digital goods and services. But they are certainly an indicator of trade and likely have a non-arbitrary relationship to trade in digital goods and services. Research can be done to analyze the correlations.

A recent OECD paper hints at this approach. Figure 2 of that paper (reproduced below) diagrams the structure of digital platform in a simplified way, showing data flows, the direction



of service provision, and payment flows as separate elements in the structure of digital trade.

Focusing on the size, structure and direction of data flows across borders mitigates some (not all) of the problems associated with the arbitrary and fragmented classifications of existing trade in services statistics. Cross-border data flow represents an international transaction, however classified, and its size and direction can be measured based on technical sources that do not rely on inappropriately or inconsistently classified trade statistics. It is possible to look at the quantity and direction of Internet-enabled data flows at various levels of aggregation and assess the way they are related to growth in trade and GDP.

With enough data, this line of research might also support a more ambitious agenda. It might allow us to explore the way data flows are correlated with other mobile factors, such as capital, and with payment flows in the delivery of a digital good/service. (In this proposal, we exclude labor flows due to data limitations and because of the complexity of that factor.) We can also examine how data's interactions with capital flows and payments are affected by policy interventions. For example, a data localization law might increase FDI (by forcing affected cloud providers to build or invest in local facilities), but it might also decrease cross-border data flows, negatively impacting local and foreign Internet service providers, and result in higher prices and lower levels of traded value-added in the cloud market. When data localization laws are combined with ownership and operation restrictions, as in China, we should expect partnerships or licensing to replace FDI, leading to a reduction in FDI and in cross-border data flows.

Based on this line of analysis, the proposed study would attempt to answer the following research questions:

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*RQ #1 How are changes in the volume and direction of data flows between countries related to changes in the value of trade in services and changes in country GDP?*

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*RQ #2 Do specific, recognizable data flow patterns characterize the three different categories of digital trade (platforms, digital goods and services, digital wrappers)? If so, how do various policy interventions affect them?*

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*RQ #3 How did China's 2016 intervention in the cloud market affect data flows, FDI flows and payment flows in that market?*

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### 3) Proposed methodology

Step 1 in our method is to identify data sources that could be used to pursue this idea and evaluate their quality, completeness, and suitability for answering the research question. This

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will involve finding pairwise country data, 2013 - 2017 for the USA, UK, Canada, Australia, European Union, Japan, South Korea, China, Brazil, India and Russia. This would involve:

- Data sources that quantify incoming and outgoing internet traffic at the country and, if possible, Autonomous System level. (See section 4 for a more detailed discussion)
- Data sources on Foreign Direct Investment flows that can be obtained at the country, industry and, if possible, firm level. Sources to be explored include OECD statistics, UNCTAD, World Bank, U.S. Bureau of Economic Affairs and other national government statistical authorities.
- Firm-level data on data flows, FDI, and services revenue. Sources to be explored include Facebook, Microsoft, Google, and Amazon.

After suitable data sources have been identified, compiled and processed, the researchers will analyze the correlations and structural relationships between the three types of flows.

RQ1 would be addressed at various levels of aggregation, depending on the data that is made available. At the highest level, we would look at total data flows between countries and correlate it with all trade. At the next level we would explore the correlation between data flows and trade in services; then we would explore the correlation between country pair data flows and specific categories of service trade that (more or less) capture digital goods and platforms (e.g., advertising, telecommunication, information and computer services). At the lowest level of aggregation, data permitting, we would look at firm-level flows between specific internet platform providers and specific countries and compare it with revenue flows to and from that country. This would allow us to address RQ2.

RQ 3 would depend on the availability of firm-level data for robust findings. The researchers will try to test and apply this method in a pilot study of the US-China cloud services market. The study would examine incoming and outgoing data, FDI and trade revenue flows before and after the 2016 regulations that restricted foreign providers' ownership rights in the Chinese domestic market. If firm-level data is provided, the pre-intervention and post-intervention patterns should provide a more scientific way to assess the impact of protectionism on the digital economy, although a less accurate version of it could be done based on general industry data and journalistic sources.

#### 4) Data requirements

- a. List of datasets to which we have access

For data flow structure we have access to CAIDA, RouteViews, and RIPE Atlas.

For FDI and revenue/payments data we are currently working with OECD statistics primarily, but also examining World Bank, U.S. BEA and other national government statistical authorities.

- b. List of private data sought

For data flow data, we have negotiated with Telegeography Inc., which has made an offer of discounted short term access to their Global Internet Geography database covering international

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internet capacity, country-by-country traffic flows, service providers, ASN connectivity, and pricing.

## 5) References

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