AI Specialization for Pathways of Economic Diversification

Supplementary Information

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Data Description

AI Investment

Organization data is embedded from CapIQ and Crunchbase. These companies include all types of companies (private, public, operating, operating as subsidiary, out of business) in the world; The investment data include private investment, Mergers & Acquisitions (M&A), public offerings, minority stakes made by Private Equity/Venture Capital firms, corporate venture arms, governments, and institutions across more than 80 countries. Some data is simply unreachable when the investors are undisclosed, or the funding amounts by investors are undisclosed. We also embed firmographic information such as the year founded and HQ location. Quid embeds CapIQ data as a default and we add data from Crunchbase for the ones that are not captured in CapIQ. This way we not only have comprehensive and accurate data on all global organizations but also capture early-stage startups and funding events data that are publicly available.

A boolean search for "artificial intelligence" OR "AI" OR "machine learning" OR "deep learning" yields our source of private investments in AI. Private
investment is a private sale of newly issued securities (equity or debt) by a company to a selected investor or a selected group of investors. The stakes that buyers take in private placements are often minority stakes (under 50%), although it is possible to take control of a company through a private placement as well, in which case the private placement would be a majority stake investment. As AI investment is a relatively new field, our data is focused on the time period between 2010 and 2020. The complete list of AI sectors and sub-sectors is reported in Table S.1.

**Service Exports**

The source of the service exports analysis relies on Balance of Payments Manual (BPM6) classification of disaggregated data on credit accounts of services at 1-digit level. The BPM6 provides credit, debit and net accounts for services between 2010-2020. The coverage of trade in services data is still very limited and often unbalanced. Services, in contrast to goods, are characterized by several features, such as intangibility and non-storability, which complicate the collection of accurate international trade in services statistics [1]. In the spirit of [2, 3, 4] the combined goods and services dataset of world trade has been referred to as the universal matrix of world trade.

**Goods Exports**

Merchandise trade data was obtained from the U.N. Comtrade database available through the World Bank World Integrated Trade Solution System (WITS). The Standard International Trade Classification (SITC) Revision 2 is preferred, which contains 786 items at its 4-digit level. The SITC Revision 2 was published in 1975 and the majority of countries continue to use it for various purposes, such as study of long-term trends in international merchandise trade and aggregation of traded commodities into classes more suitable for economic analysis. More recent revisions, nonetheless, have new set of product categories that have been created in recent years [2]. Since countries report both their imports and their exports to the United Nations, the raw data duplicates flows. As a result, there is a process for reconciling data due to well-known discrepancies in trade statistics. In general terms, we consider mirror statistics for fragile countries low-income countries.

Using the trade data, standard metrics of trade were constructed following [5] a series of network metrics were calculation on top of the merchandise trade data, such as revealed comparative advantage, proximity, and density. In addition, the product space shows that products group naturally into highly connected communities. This suggest that product in these communities are closely connected.

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1The World Integrated Trade Solution (WITS) software provides access to international merchandise trade, tariff and non-tariff measures (NTM) data. [https://wits.worldbank.org](https://wits.worldbank.org)

2The SITC classification reflects (a) the materials used in production, (b) the processing stage, (c) market practices and uses of the products, (d) the importance of the commodities in terms of world trade, and (e) technological changes. [https://unstats.un.org/unsd/classifications/Family/Detail/1070](https://unstats.un.org/unsd/classifications/Family/Detail/1070)
to each other than products outside of the community. Following [6] product communities complement the trade database. These communities were originally created using the two-step algorithm introduced by [7].
## Tables and Figures

### Table S.1: AI sectors used and their sub-sectors disaggregation

| AI Investment sectors used | AI sub-sectors included |
|----------------------------|--------------------------|
| Advertising                | Advertisers, Programmatic, Mobile advertising, Real time bidding, Influencer, Social media marketing, Content marketing, Advertisers |
| AgTech                     | Agriculture, Farmers, Farming, Crop |
| AR, VR                     | Augmented reality, Vr, Virtual reality, Ar |
| Authentication Technology  | Facial, Face recognition, Law enforcement, Video surveillance |
| Autonomous Vehicle         | Autonomous vehicles, Fleet, Road, Autonomous driving |
| Cancer, Drug Discovery     | Drug, Cancer, Therapy, Genomic |
| Computing Technology       | Quantum, Quantum computing technologies, Applications for quantum, Simulation of quantum, Semiconductor, Chips, Processors, Low power |
| Crypto, Wealth Management  | Crypto, Wealth management, Traders, Cryptocurrency |
| Data Science, Data Platform| Data centers, Migration, Cloud management, Application performance, Reinforcement learning, General intelligence, Sift through data, Platform for AI, Sql, Hadoop, Python, Data preparation |
| Drone, Satellite           | Drone, Satellite, Unmanned, Remote sensing |
| Education                  | Student, Edtech, Children, Career |
| Energy Management          | Energy management, Buildings, Renewable, Electricity |
| Fitness and Wellness       | Wellness, Wearable, Fitness, Emotions |
| Fraud Detection, Money Laundering | Fraud detection, Merchants, Laundering, Personal finance |
| Gaming, e-sports           | Player, Esports, Mobile games, Fans |
| Hospitality                | Hotels, Booking, Business travel, Online travel |
| Insuretech                 | Insurtech, Insurance industry, Underwriting, Insurance products |
| Legal Tech                 | Legal, Law, Contract management, Lawyers |
| Media Content              | Editing, Instagram, Photo sharing, Reserve a table, Topics, Video content, Readers, Personalized content |
| Medical Technology         | Doctors, Hospital, Physicians, Medication, Medical device, Surgical, Blood, Cardiac |
| Money, Personal Finance    | Invoices, Medium businesses, Cash flow, Receipts, Lending, Loans, Credit score, Consumer finance |
| Network Security           | Threat, Network security, Cybersecurity, Security solutions |
| Oil and Gas                | Gas, Predictive maintenance, Industrial automation, Machinery |
| Real Estate                | Commercial real estate, Landlords, Estate agents, Property management |
| Recruiting                 | Recruiting, Candidate, Hiring process, Recruiters |
| Restaurants, Food and Beverage | Food and beverage, Kitchen, Grocery, Food delivery |
| Retail Tech, E-Commerce    | Ecommerce, Marketing automation, Shoppers, Retail technology |
| Robotic Automation         | Industrial automation, Ai robotics, Mobile robot, Warehouse management, Robotic process automation, Rpa, Test automation, Business process automation |
| Sales Automation, Meeting Management | Meetings, Sales automation, Prospects, Sales teams |
| Category               | Relevant Keywords                                                                 |
|-----------------------|-----------------------------------------------------------------------------------|
| Supply Chain Management | Supply chain management, Freight, Shipping, Procurement process                   |
| Text Analytics        | Bots, Chatbots, Conversational ai, Messenger, Sentiment, Customer feedback, Employee experience, Text analytics, Speech recognition, Musical, Podcasts, Songs |
| Venture Capital       | Equity, Technology startups, Mentorship, Platform for startups                    |
| Wifi, Home Tech       | Requires ios, Ipod touch, Requires ios compatible, Compatible with iphone, Wi fi, Indoor, Wifi, Lights |
| Image Recognition, Visual Search | Fashion, Visual search, Shoes, Apparel                               |
| Neuroscience          | Palo alto, Semantic analysis technology, Knowledge mapping, Public opinion monitoring |
Figure S.1: Percent of global AI private investment by World Bank income groups, 2019-2020.

Figure S.2: Percent of global AI private investment by World Bank regions, 2019-2020.
Figure S.3: Heatmap presentation of linkages from AI investment to goods and services export specialization. The darker shade of blue indicates statistically validated stronger linkages.
References

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