EU-Swiss trade integration via input-output linkages

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This paper provides a first assessment of Switzerland's international input-output linkages. In doing so, the paper focuses on Switzerland's trade with the European Union, which rep- resents the country's most important trading partner. In 2015, more than 50% of Swiss exports were directed to the EU while more than 70% of Swiss imports were sourced from EU countries. Using data on Switzerland's transaction-level imports and data on the sector association of a subset of Swiss firms, we are able to characterize the detailed nature of these imports regarding the sectors they are directed to and the countries they originate from.

JEL codes: F1, F15
Keywords: global value chains, input-output tables

1 Introduction

This paper provides a first assessment of the importance of input-output linkages as a domain of Switzerland's trade linkages. Among other macroeconomic linkages between countries – for example, foreign direct investment, cross-border worker flows and migration, and services trade – trade in goods is a key source of interdependence among sectors and countries. Due to decreasing transportation costs – through transport infrastructure improvements and the reduction of tariffs and non-tariff trade barriers with selected trade partners (and even the complete removal thereof) – and advances in information technology, the structure of economic activity has changed substantially over the last decades. A sizable part of goods trade – roughly 60% – is in intermediates and components nowadays rather than final goods, which leads to a substantial decoupling of the magnitude of sales and value added. Measuring the magnitude of input-output linkages not only within, but also across, national borders has become a key object of interest in a cottage literature that is interested in quantifying the value-added chain and its organization across countries and sectors, and in considering the transmission of macroeconomic shocks across countries and sectors through this chain. In fact, for a proper evaluation of the effect of economic policy, it is now considered inadequate to disregard international input-output linkages. Ideally, the corresponding information supporting such an analysis is built up from firm-level data on goods transaction within and across national borders, where firms are associated with sectors. Such data do not exist as such, but the availability of firm-level trade transaction data in conjunction with a sector association of these

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firms and a domestic input output table provides an acceptable source to establish the data of interest.

The global demand for international input-output tables led to several promising databases such as the World Input-Output Database (WIOD), the OECD's Trade-in-Value-Added Database (TiVA) and the Global Trade Analysis Project (GTAP). An input-output table is an accounting framework that maps the output of industries to categories of use (in rows), and the inputs that are used (in columns) to produce this output. Hence, for every industry, total use and gross output have to be identical by construction (for more details, see TIMMER ET AL., 2015). Ideally, an international input-output table would use data on the input-output network of firms which are associated with sectors, and country-sector transactions, including the domestic economy. Such data do not exist. In practice, the main data source used to construct international input-output tables are national input-output tables or national supply and use tables. Based on the nationally identified product-use linkages, the international linkages within and across industries are then estimated using import data and applying the import proportionality assumption. Hence, any imported product is assumed to be used in the same proportion across industries. Since this assumption has been shown to be violated in many contexts, projects such as TiVA and WIOD try to apply an ad-hoc product-use mapping across broader use-categories before relying on the import-proportionality assumption for more detailed use categories (FEENSTRA and JENSEN, 2012; PUZELLO, 2012).

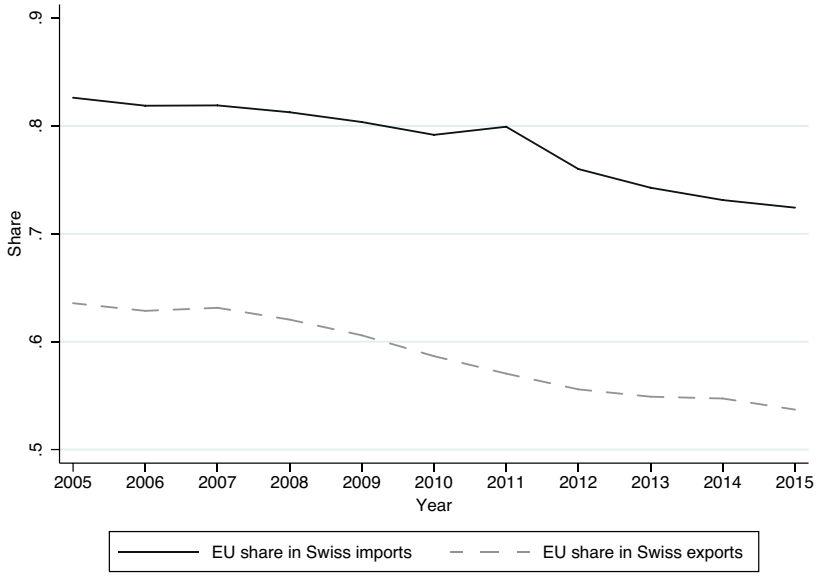
The present paper makes a first step in this direction for Switzerland, where solid information on its integration into the global value chain is missing to date. The main reason for this is that the Swiss Federal Statistical Office does not collect data on domestic supply- and use-linkages. To date, Switzerland's national input-output table is "experimental" and relies on transaction matrices that are taken from other European countries (assuming identical technology parameters between Switzerland and selected foreign countries). For that reason, WIOD does not contain a national or international input-output table for Switzerland. Databases such as TiVA and GTAP do include Switzerland but rely on the official national data with "experimental" character, the use of which the Swiss Federal Statistical Office itself advises against for such purposes.[2]

The present paper follows a different route and bases its insights on the transaction-level imports of Swiss firms and the linkage of these firms with sectors. In doing so, the paper focuses on Switzerland's trade with the European Union (EU),

2 See the Swiss Federal Statistical Office's explanatory note on Swiss national input-output tables (www.bfs.admin.ch/bfs/de/home/statistiken/volkswirtschaft/input-output.assetdetail.350310.html) and NATHANI ET AL. (2006).

which, en bloc, represents the country's most important trading partner. In 2015, more than 50% of Swiss exports were directed to the EU, while more than 70% of Swiss imports were sourced from EU countries. Figure 1 shows that this share has been declining over the last decades. Why did this decline occur? What are the effects on the Swiss economy? Is the decline due to a change of Switzerland's position in the global value chain? Answering these questions is key to better understanding the Swiss economy and to designing appropriate Swiss (monetary, fiscal, trade and industrial) policies.

Figure 1: EU dependence of Swiss trade flows



Note: The trade flows considered to construct these numbers exclude precious metals, precious stones and antiques.

Source: Swiss-Impex.

Switzerland's trade with the EU – above that with other trading partners – is particularly interesting to study in recent years, as the relative price of traded goods was repeatedly exposed to shocks of the nominal exchange rate through unforeseen sharp appreciations of the Swiss franc relative to the euro (and other currencies) and caps on the exchange rate announced and successfully defended by the Swiss National Bank to prevent economically harmful rates (at times when such caps were necessary and could be defended at all).

The remainder of the paper is organized as follows. The next section describes the data used for the approach pursued in this paper. Section 3 presents the main results on Swiss international input-output linkages with the EU in a descriptive way. The last section concludes with a brief summary.

2 Data

2.1 Data sources

The data set constructed to describe the input-output linkages of the Swiss economy in the present paper consists of two main sources. First and foremost, we rely on the transaction- level records of Swiss imports collected by Swiss Customs. These data include, among other characteristics, recipient and sender identifiers, trade intermediaries, the value and quantity of (cross-border) trade transactions, as well as the Harmonized-System 8-digit product classification. Complete data on imports are available from 2007 onwards. Second, we use data on the primary NACE Rev. 2 four-digit industry affiliation of 286,548 Swiss firms from the Bureau van Dijk's ORBIS database.

2.2 Data challenges and proposed solutions

In order to match importing firms with sector identifiers, we have to rely on a name-matching algorithm. For this to be successful, the names used in the different data sets must be harmonized. This is a challenge, as the firms contained in the import data do not share a common name or identifier for the years available up until now. Hence, the first step consists of finding those records in the import data that refer to the same entity. The variation of names within firms is due to (official) spelling variations and abbreviations, as well as spelling errors such as missing letters and encoding problems that arise in the context of using different file types.

This record-linkage task is challenging in view of the amount of data: for the present purpose, more than 80,000,000 million potentially different entries have to be compared. We approach this task using the affine gap string distance metric. Distance metrics measure the string-edit distance between two strings (words) in a computationally meaningful way. A lower distance metric reflects a higher probability of two strings referring to the same entity. This allows for matching entries that refer to the same entity but are misspelled or differently spelled for the aforementioned reasons. The string metric technically allows for a pairwise comparison of all entries in the data. However, given its computational costs, a

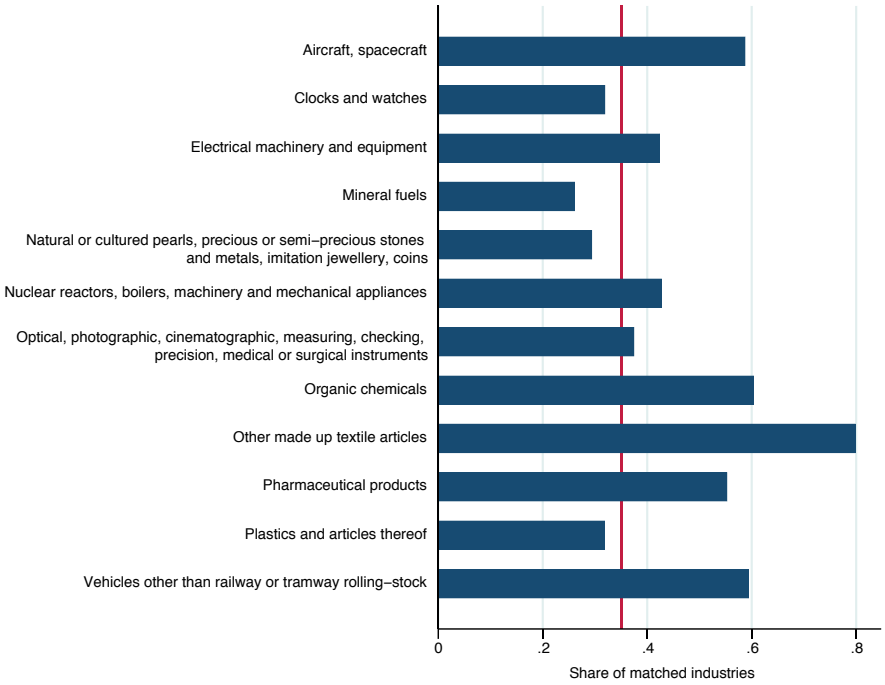
first step is to block similar entries into groups and calculate the distance metric only within groups of the source data (without grouping the data with the problem at stake, one would have to identify unique entries from $80{,}000{,}000^2$ possible pairings of records). To construct these blocks, several so-called predicates are used. Examples for such predicates are sequences of substrings of 2, 3, 4, … characters, of beginning characters, of proximate characters (letters or integers), or of common n-grams. Then, pairwise string distances are determined within such blocks of the source data by a hierarchical clustering algorithm with centroid linkage. Within every cluster there exists one entry that functions as a centroid. All entries with a certain probability of referring to the same entity as this centroid are combined in one cluster. This clustering step is conducted in an iterative process, with the centroids being randomly assigned in the first step and the match being improved in the following iterations. The threshold used to define a cluster is set by taking precision and recall statistics as a decision criterion. Precision indicates the percentage of retrieved instances in a cluster that are correctly assigned, while recall indicates the fraction of relevant instances that are retrieved.[3]

2.3 Descriptive statistics

It is impossible to assign an importing firm and a sector to each of the products, but we are able to assign a sector to about 36% of the imports. Using an aggregation to two-digit Harmonized System product levels, we may consider how well the sector match works across relatively aggregate import product categories. Figure 2 shows the share of imports by two-digit product group that could be matched onto a firm and sector in Switzerland. In every product group, at least 25% of all imports could be assigned a destination industry. Since there is no reason to believe that the matching success is correlated with the input usage within industries, the subsequent descriptive statistics of the Swiss input-output linkages are based on the subsample of 36% of all imports can be seen as very reliable estimates of the true structure.

3 More details on the challenges and solution algorithms of the record linkage task can be found in Cohen et al. (2013) and Gregg and Eder (2016).

Figure 2: Share of imports matched to firms and industries across products

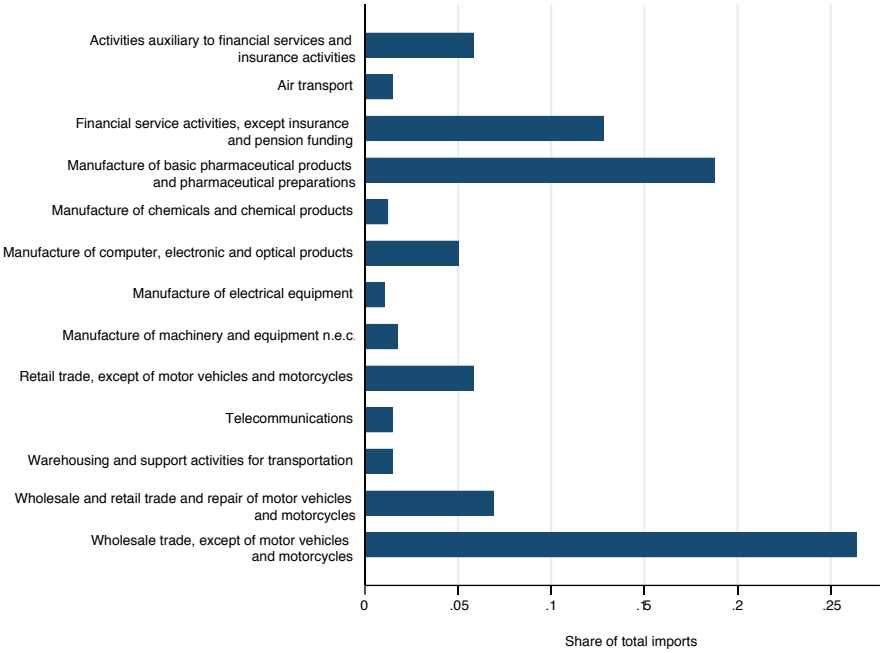


Note: This figure depicts the share of trade flows (in values) that can be assigned an importing industry across the most important 2-digit product categories in terms of import value. The red line indicates the average share in the entire sample. The year considered is 2013.

Figure 3 indicates those two-digit industries that account for the majority of imports by Switzerland. The biggest share is directed towards the wholesale sector followed by the pharmaceutical sector, which represents the most relevant importer among the manufacturing industries. The financial sector is important mainly due to imports of precious metals, which account for a substantial share in Swiss imports. Regarding the input-output linkages, we are mainly interested in the manufacturing industries. Besides the pharmaceutical sector, the manufacture of chemicals, the manufacture of computer, electrical and optical products, the manufacture of electrical equipment and the manufacture of machinery are the most relevant importing sectors in manufacturing. Note that the manufacture of watches and clocks forms part of the computer sector. Illustrating the product-level variation as well as the country-of-origin variation of these imports is the main purpose of this article. The next section will describe the composition of industry-level imports in these two dimensions in order to support a better

understanding of the Swiss trading network sectors, products and countries of origin.

Figure 3: Share of total imports across industries



Note: The industries considered in this figure are those that import more than 1% of total imports (in values). The year considered is 2013.

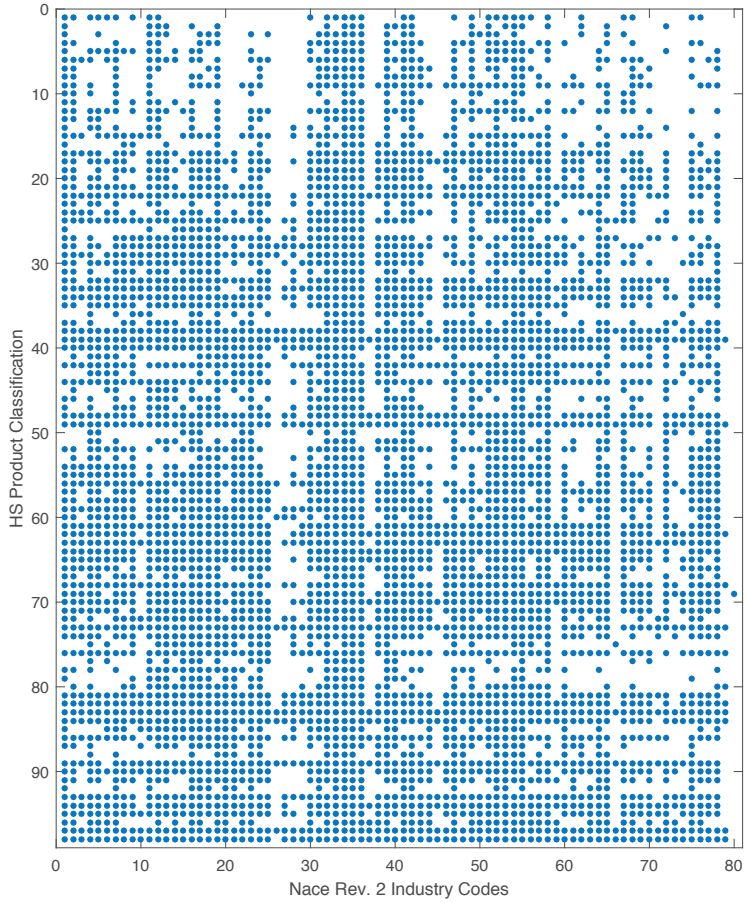
3 A characterization of Switzerland's international input-output linkages

3.1 Product-level linkages

International supply and use tables are an accounting framework that match product-level imports to different industries. We build such tables by assigning the share of industry-level imports to different product groups. One matrix we build indicates industries in columns and products in rows. By definition, the shares in each column must add up to one. Even at the two-digit level, this leads to an extensive matrix of dimension 98 × 80. Figure 4 plots the non-zero entries of this matrix. Around two-thirds of the matrix is filled with non-zero entries, showing that most products are imported by many different industries

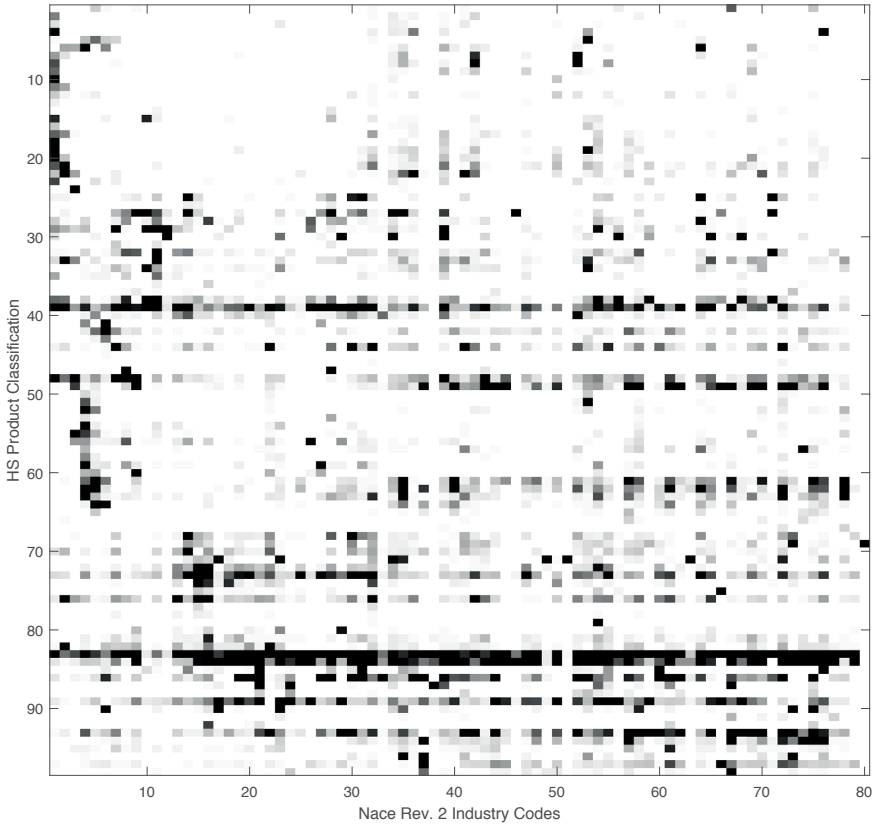
in Switzerland. Figure 5 gives a more detailed picture by indicating the actual share of industry imports that a product has. For instance, the product group of nuclear reactors, boilers, machinery and mechanical appliances – admittedly a big group – accounts for major shares of imports across all sectors. This product group comprises engines, turbines and motors that are needed in basically every manufacturing sector, but also air conditioning and other electrical household goods that are relevant for service sectors as well. Another important product group for many sectors is plastic articles.

Figure 4: Non-zero entries of the Swiss international supply and use matrix



Note: This matrix shows the non-zero product-industry-level imports across products and industries. The share of non-zero entries is 66%. The year considered is 2013.

Figure 5: A graphical representation of the Swiss international supply and use matrix



Note: The supply and use matrix shows the product content of industry-level imports (in values) across all products and industries. The year considered is 2013.

While it is difficult to present the detailed matrix of supplied products and using industries in print, Tables 1 and 2 present input diversification index (IDI) numbers for each industry. This index is a variant of the Herfindahl-Hirschman Index that indicates concentration. It is defined as follows:

$$IDI_i = \sum_j share_{ij}^2, \tag{1}$$

where i indicates the industry and $share_{ij}$ denotes the share of product j in industry i's imports. The advantage of this index is that not only does it reflect how many different products an industry uses, but it also takes into account the shares of this usage across products. The index ranges from zero (indicating maximum diversification) to unity (indicating full concentration). Across all manufacturing sectors in 2013, the manufacture of textiles and the manufacture of food products show the highest levels of diversification, indicating that their imports are spread across a particularly wide range of product groups. In the case of textiles, for example, the most important product groups are different kinds of fabrics and yarn that are spread across different product groups, as well as special purpose machinery. The manufacture of pharmaceuticals, in contrast, shows a high degree of concentration of imports. Among the service sectors, some industries exhibit very high product concentration, such as the financial sector in precious metals. In general, we might think of a higher concentration of products among the goods inputs to a sector as indicating less diversification against the risk of a negative shock to one of these products (for example, through higher prices) for the importing sector. It should be noted that the IDI is defined in terms of expenditure shares on certain products. Hence, a higher concentration across products could be driven not only by changes in real usage shares, but also by differential changes of the underlying product prices.

In international trade, the increase in outsourced production and trade in intermediates is a very prominent topic that has been subject to many recent research efforts. Specifically, the sectoral differences of value chains make it difficult to formalize a valid theoretical model. It is interesting, however, to look at sectoral changes in position within global value chains to assess the effect of such changes on economic outcomes. Figure 6 plots the time series of the input diversification index for Switzerland's main importing manufacturing industries. While the trend seems to be relatively stable for the pharmaceutical sector as well as the machinery and electrical equipment industry, we can observe an upward trend in the chemical and, especially, the computer industry. These sectors seem to become less diversified in their input expenses. Actually, the peak in the chemical sector's time series is due to an increase in expenditure on organic chemicals (from 30% to 60% of overall expenditure). The rise in the computer sector – including watches – seems rather stable over time. It is mainly generated by the concentration of import expenses on the product group of natural or cultured pearls, precious or semi-precious stones and metals, imitation jewellery and coins, which comprised 50% of the associated imports in 2013 as compared to 9% in 2007.

Table 1: Input diversification for manufacturing industries

Sector (Nace Rev.2)	**IDI**
Manufacture of basic metals	0.31
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.50
Manufacture of beverages	0.15
Manufacture of chemicals and chemical products	0.20
Manufacture of coke and refined petroleum products	0.22
Manufacture of computer, electronic and optical products	0.30
Manufacture of electrical equipment	0.33
Manufacture of fabricated metal products, except machinery and equipment	0.10
Manufacture of food products	0.06
Manufacture of furniture	0.23
Manufacture of leather and related products	0.25
Manufacture of machinery and equipment n.e.c.	0.34
Manufacture of motor vehicles, trailers and semi-trailers	0.25
Manufacture of other non-metallic mineral products	0.12
Manufacture of other transport equipment	0.14
Manufacture of paper and paper products	0.16
Manufacture of rubber and plastic products	0.39
Manufacture of textiles	0.06
Manufacture of tobacco products	0.36
Manufacture of wearing apparel	0.21
Manufacture of wood and of products of wood and cork, except furniture	0.18
Other manufacturing	0.20

Note: The input diversification index (IDI) indicates the diversification of inputs in an industry. It ranges from 0 (extremely diversified) to 1 (completely concentrated). The year considered is 2013.

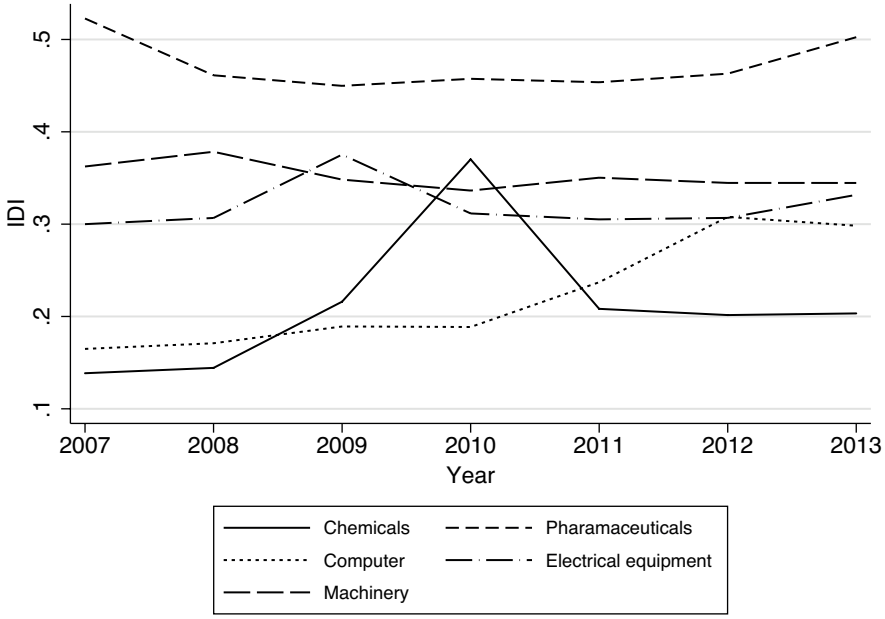
Table 2: Input diversification for service industries

Sector (Nace Rev.2)	IDI
Accommodation	0.18
Activities auxiliary to financial services and insurance activities	0.99
Activities of extraterritorial organisations and bodies	1.00
Activities of head offices; management consultancy activities	0.05
Activities of membership organisations	0.10
Advertising and market research	0.09
Air transport	0.59
Architectural and engineering activities; technical testing and analysis	0.13
Civil engineering	0.14
Computer programming, consultancy and related activities	0.26
Construction of buildings	0.09
Creative, arts and entertainment activities	0.07
Education	0.08
Electricity, gas, steam and air conditioning supply	0.48
Employment activities	0.10
Financial service activities, except insurance and pension funding	0.94
Food and beverage service activities	0.10
Gambling and betting activities	0.45
Human health activities	0.30
Information service activities	0.29
Insurance, reinsurance and pension funding, except compulsory social security	0.26
Land transport and transport via pipelines	0.22
Legal and accounting activities	0.09
Libraries, archives, museums and other cultural activities	0.14
Motion picture, video and television programme production, sound recording and music publishing activities	0.20
Office administrative, office support and other business support activities	0.12
Other personal service activities	0.33
Other professional, scientific and technical activities	0.10
Postal and courier activities	0.18
Printing and reproduction of recorded media	0.15
Programming and broadcasting activities	0.37

Sector (Nace Rev.2)	IDI
Public administration and defence; compulsory social security	0.34
Publishing activities	0.23
Real estate activities	0.08
Remediation activities and other waste management services	0.27
Rental and leasing activities	0.29
Repair and installation of machinery and equipment	0.51
Repair of computers and personal and household goods	0.53
Residential care activities	0.16
Retail trade, except of motor vehicles and motorcycles	0.09
Scientific research and development	0.24
Security and investigation activities	0.91
Services to buildings and landscape activities	0.08
Sewerage	0.19
Social work activities without accommodation	0.18
Specialised construction activities	0.08
Sports activities and amusement and recreation activities	0.10
Telecommunications	0.50
Travel agency, tour operator and other reservation service and related activities	0.20
Undifferentiated goods- and services-producing activities of private households for own use	0.79
Veterinary activities	0.22
Warehousing and support activities for transportation	0.08
Waste collection, treatment and disposal activities; materials recovery	0.17
Water collection, treatment and supply	0.32
Water transport	0.16
Wholesale and retail trade and repair of motor vehicles and motorcycles	0.81
Wholesale trade, except of motor vehicles and motorcycles	0.16

Note: The input diversification index (IDI) indicates the diversification of inputs in an industry. It ranges from 0 (extremely diversified) to 1 (completely concentrated). The year considered is 2013.

Figure 6: Development of the input diversification index over time



Note: The industries selected for this graph are those manufacturing industries that account for the biggest share in all imports.

3.2 Country-level linkages

Industries differ not only in terms of the products they import, but also in terms of the countries of origins of their imports. This leads to interesting dependencies that policy-makers as well as trade economists have paid relatively little attention to until recently. To the extent that trade policy addresses products non-differentially by country of origin (through the most-favored nation clause, as one of the key principles of cross-border transactions governed by the World Trade Organization), and that sectors display different linkage structures with countries of origin (which is associated with a product pattern), even a uniform trade policy may lead to changes in the concentration of the trading network not only in the product but also in the country-of-origin space. Clearly, an understanding of such effects requires data on international input-output linkages. Shocks to the concentration or diversification of sectors across countries of origin relate not only to trade policy but also to prices, which are affected by the macroeconomic and industrial policies pursued in the countries of origin themselves as well as by the nominal exchange rate between the country of destination (here, Switzerland) and the country of origin.

Similar to the supply and use table presented in the previous section, a matrix indicating the countries of origin within sector-level imports provides interesting insights for the question at stake. Figure 7 shows that the majority of imports are highly concentrated on a small subset of countries that are important to almost all industries. Germany is the most important country of origin in almost all sectors, but Switzerland's other neighboring countries – France, Austria and Italy (Liechtenstein's trade is collected by Swiss customs, and international trade between Switzerland and Liechtenstein is not published due to a trade agreement between the two countries) – also supply a large share of Swiss imports. China and the United States are less important for a wide range of sectors, but they are more important in sectors such as the manufacture of other transport equipment, where the United States supplies almost 20% of all imports, or the repair of computers, where China accounts for 38% of Switzerland's imports. Tables 3 and 4 report several industry-specific characteristics of the country-of-origin diversification in imports. The country diversification index (CDI) is calculated analogously to the IDI as a variation of the Herfindahl-Hirschman-Index:

$$CDI_i = \sum_k share'^2_{ik} \tag{2}$$

with $share'_{ik}$ denoting the share of industry i's imports sourced from country k. The third and fourth columns report the share of an industry's imports that originate from an EU country or a euro area member, respectively. The last column indicates the share of industry-level imports that is sourced from the main input supplier in that industry, and which country this main supplier is. According to the numbers in the tables, the wearing apparel sector is very diversified compared to other manufacturing sectors. The manufacture of tobacco products and wood products, in contrast, is more concentrated in terms of countries of origin. As with the IDI, service sectors seem to exhibit a higher degree of concentration in terms of countries of origin. The public administration sector, for instance, imports exclusively from Germany. Not surprisingly, the CDI is relatively high for both wholesale and retail trade.

Figure 7: Countries of origin within industry-level imports

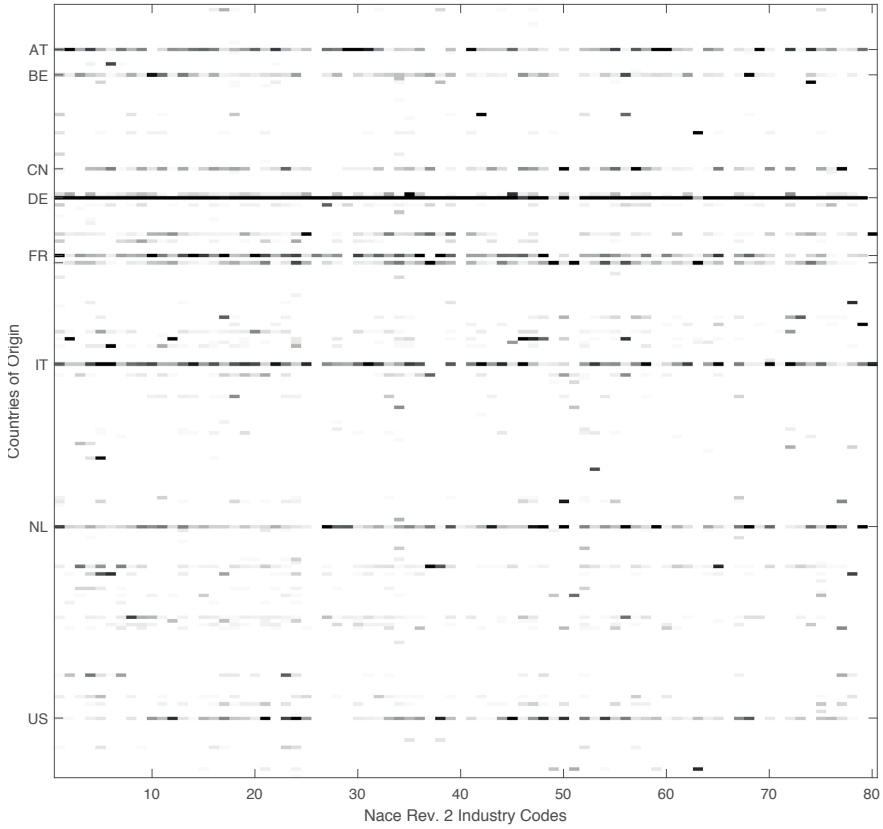


Table 3: Country-of-origin diversification for manufacturing industries

Sector (Nace Rev.2)	CDI	EU	EURO	Main partner	Share
Manufacture of basic metals	0.33	0.89	0.86	DE	0.55
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.18	0.83	0.78	IE	0.31
Manufacture of beverages	0.22	0.95	0.89	IE	0.29
Manufacture of chemicals and chemical products	0.20	0.79	0.74	DE	0.41
Manufacture of coke and refined petroleum products	0.15	0.91	0.82	DE	0.28
Manufacture of computer, electronic and optical products	0.14	0.64	0.59	FR	0.31
Manufacture of electrical equipment	0.22	0.75	0.65	DE	0.45
Manufacture of fabricated metal products, except machinery and equipment	0.27	0.86	0.82	DE	0.50
Manufacture of food products	0.13	0.86	0.78	DE	0.28
Manufacture of furniture	0.33	0.97	0.91	DE	0.54
Manufacture of leather and related products	0.16	0.61	0.58	DE	0.22
Manufacture of machinery and equipment n.e.c.	0.25	0.87	0.79	DE	0.47
Manufacture of motor vehicles, trailers and semi-trailers	0.25	0.95	0.83	DE	0.46
Manufacture of other non-metallic mineral products	0.26	0.98	0.94	DE	0.43
Manufacture of other transport equipment	0.16	0.67	0.54	DE	0.32
Manufacture of paper and paper products	0.27	0.93	0.78	DE	0.50
Manufacture of rubber and plastic products	0.21	0.90	0.84	DE	0.42
Manufacture of textiles	0.14	0.80	0.68	DE	0.31
Manufacture of tobacco products	0.37	0.93	0.80	DE	0.59
Manufacture of wearing apparel	0.09	0.70	0.53	DE	0.15
Manufacture of wood and of products of wood and cork, except furniture	0.37	0.93	0.83	DE	0.60
Other manufacturing	0.14	0.62	0.56	DE	0.32

Note: The country diversification index (CDI) indicates the diversification of inputs in an industry. It ranges from 0 (extremely diversified) to 1 (completely concentrated). The year considered is 2013.

Table 4: Country-of-origin diversification for service industries

Sector (Nace Rev.2)	CDI	EU	EURO	Main partner	Share
Accommodation	0.27	0.95	0.89	AT	0.43
Activities auxiliary to financial services and insurance activities	0.66	0.81	0.01	GB	0.80
Activities of extraterritorial organisations and bodies	0.59	1.00	1.00	ES	0.72
Activities of head offices; management consultancy activities	0.22	0.81	0.70	DE	0.42
Activities of membership organisations	0.37	0.94	0.89	DE	0.55
Advertising and market research	0.20	0.66	0.58	DE	0.35
Air transport	0.23	0.84	0.66	DE	0.36
Architectural and engineering activities; technical testing and analysis	0.18	0.80	0.71	DE	0.39
Civil engineering	0.30	0.98	0.93	DE	0.49
Computer programming, consultancy and related activities	0.16	0.82	0.73	DE	0.34
Construction of buildings	0.27	0.96	0.91	DE	0.48
Creative, arts and entertainment activities	0.20	0.85	0.70	DE	0.38
Education	0.29	0.83	0.76	DE	0.52
Electricity, gas, steam and air conditioning supply	0.27	0.91	0.83	DE	0.45
Employment activities	0.53	0.97	0.92	DE	0.72
Financial service activities, except insurance and pension funding	0.74	0.91	0.05	GB	0.86
Food and beverage service activities	0.22	0.79	0.75	IT	0.33
Gambling and betting activities	0.23	1.00	0.77	DE	0.42
Human health activities	0.24	0.88	0.84	DE	0.42
Information service activities	0.16	0.83	0.77	DE	0.26
Insurance, reinsurance and pension funding, except compulsory social security	0.12	0.49	0.46	DE	0.19
Land transport and transport via pipelines	0.17	0.91	0.83	FR	0.34

Sector (Nace Rev.2)	CDI	EU	EURO	Main partner	Share
Legal and accounting activities	0.38	0.88	0.83	DE	0.59
Libraries, archives, museums and other cultural activities	0.51	0.88	0.82	DE	0.70
Motion picture, video and television programme production, sound recording and music publishing activities	0.33	0.92	0.83	DE	0.55
Office administrative, office support and other business support activities	0.17	0.89	0.70	DE	0.33
Other personal service activities	0.41	0.94	0.92	DE	0.62
Other professional, scientific and technical activities	0.30	0.88	0.82	DE	0.51
Postal and courier activities	0.97	1.00	1.00	DE	0.98
Printing and reproduction of recorded media	0.24	0.93	0.82	DE	0.46
Programming and broadcasting activities	0.23	0.76	0.60	DE	0.40
Public administration and defence; compulsory social security	0.99	1.00	1.00	DE	1.00
Publishing activities	0.45	0.93	0.92	DE	0.66
Real estate activities	0.22	0.77	0.69	DE	0.44
Remediation activities and other waste management services	0.36	0.99	0.96	AT	0.49
Rental and leasing activities	0.33	0.97	0.94	AT	0.41
Repair and installation of machinery and equipment	0.10	0.64	0.52	DE	0.21
Repair of computers and personal and household goods	0.25	0.47	0.45	CN	0.38
Residential care activities	0.53	1.00	0.95	DE	0.70
Retail trade, except of motor vehicles and motorcycles	0.16	0.86	0.59	DE	0.28
Scientific research and development	0.10	0.77	0.57	NL	0.16
Security and investigation activities	0.35	0.57	0.05	GB	0.51
Services to buildings and landscape activities	0.51	0.97	0.94	DE	0.71
Sewerage	0.28	1.00	0.86	DE	0.48
Social work activities without accommodation	0.34	0.91	0.88	DE	0.54

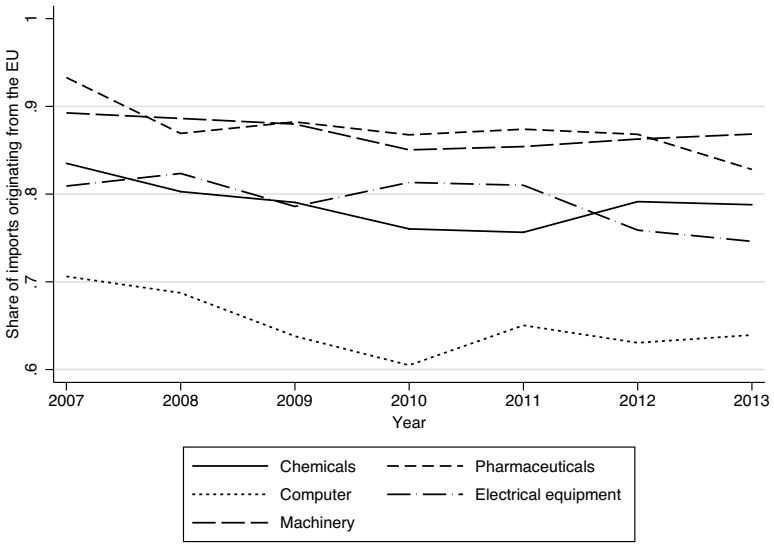
Sector (Nace Rev.2)	CDI	EU	EURO	Main partner	Share
Specialised construction activities	0.29	0.91	0.86	DE	0.52
Sports activities and amusement and recreation activities	0.31	0.81	0.75	DE	0.54
Telecommunications	0.17	0.88	0.82	IE	0.32
Travel agency, tour operator and other reservation service and related activities	0.51	0.98	0.92	DE	0.70
Undifferentiated goods- and services-producing activities of private households for own use	0.25	1.00	0.74	DE	0.34
Veterinary activities	0.28	0.94	0.90	NL	0.41
Warehousing and support activities for transportation	0.18	0.93	0.85	DE	0.38
Waste collection, treatment and disposal activities; materials recovery	0.35	0.98	0.93	DE	0.57
Water collection, treatment and supply	0.87	1.00	1.00	DE	0.93
Water transport	0.17	0.85	0.51	DE	0.30
Wholesale and retail trade and repair of motor vehicles and motorcycles	0.30	0.89	0.75	DE	0.54
Wholesale trade, except of motor vehicles and motorcycles	0.09	0.61	0.51	DE	0.23

Note: The country diversification index (CDI) indicates the diversification of inputs in an industry. It ranges from 0 (extremely diversified) to 1 (completely concentrated). The year considered is 2013.

The EU dependence of Swiss imports was already illustrated in Figure 1. In 2013 around 75% of all imports came from EU countries, and it is interesting to compare this benchmark to the percentages for different industries. For many manufacturing industries, the share of imports originating from the EU is actually higher than the overall average. This is especially true for the big importing sectors, namely the manufacture of pharmaceuticals, chemicals, and machinery. The manufacture of computers constitutes a notable exception to this. The majority of EU imports across industries originate from members of the euro area. Among the service sectors, the share of imports from EU or even euro area countries is relatively high. However, it is way below the average for wholesale trade – the most important importing sector. In all sectors but one, the main country of origin is a European country. Among these countries, Germany is by far the most important trading partner. It is interesting to observe that the main diversification in terms of countries of origin of products is among countries that are geographically close to Switzerland. Not surprisingly – in view of both the relative economic size and the small geographical distance – the EU is of exceptionally high importance to Switzerland's production structure. Accordingly, shocks to the EU are of key importance to Switzerland, more so than shocks to other countries.

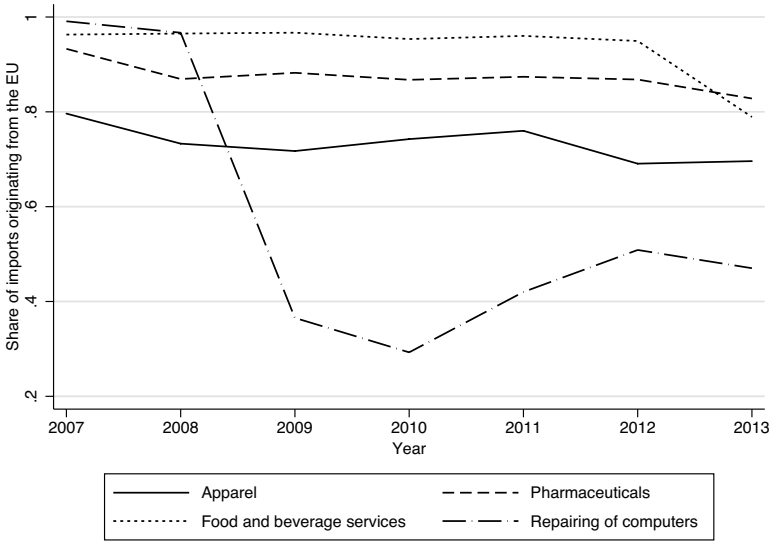
Figure 1 showed a general decrease in the share of imports sourced from the EU. Figure 8 depicts the corresponding trend for the major importing industries in manufacturing. The figure suggests that all industries display a downward trend over the observation period, but this trend is most evident for pharmaceuticals, where the share of EU-sourced imports fell by about 10 percentage points. Figure 9 shows the time series for those industries that experienced a major decrease in that respect. A huge fall can be observed in the computer repair sector. While this sector sourced almost all inputs from the EU in 2007, the majority of inputs are now sourced from China.

Figure 8: Share of EU imports over time for main manufacturing sectors



Note: This figure shows the time trend for the most important manufacturing industries. The definition of EU was held stable over the time series and is based on the year 2013.

Figure 9: Share of EU imports over time for sectors with a major fall in shares



Note: This graph shows the time trend for those industries that experienced major drops in their EU dependence. The definition of EU was held stable over the time series and is based on the year 2013.

4 Conclusions

This paper has provided first insights into the diversification of Swiss trade across industries, products and countries. The insights are based on an ongoing data effort aiming at establishing an international, sector-by-sector country supply and use table for Switzerland, which will permit its integration into the international input-output tables.

The main focus of this paper was on Swiss imports and, for the country dimension, on the EU. However, even this limited focus reveals interesting patterns of concentration and diversification across Swiss industries in terms of imported products and of countries of origin. This suggests that there is substantial variation across sectors in exposure to product-specific and country-specific shocks abroad which will be interesting to study in the future.

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