Backward and Forward linkages and value chain for goods and services in Nepal

A Study Report Submitted to:

Ministry of Industry Commerce and Supplies
Singh Durbar, Kathmandu

Submitted by:

Central Department of Economics (CEDECON), TU
Kirtipur, Kathmandu
May 15, 2020

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Executive Summary

Export performance is a crucial issue for economic development in this globalization era globally, and Nepal may not be an exception. The main objective of this study is to make a systematic analysis of the backward and forward linkages of Nepalese products. Fort this purpose, this study uses the mixed method of research. The findings suggest the importance of the products and industries in the Nepalese economy. The primary sector and trade sectors have larger linkages. The value adds analysis also indicates the same. The value-added from the linkages shows the import value added is higher than the export value-added, which in fact, is the cause of the trade deficit in the country.

Based on the analysis, the potential export items already identified by MoCS/GoN (2010) and justified by MoCS/GoN (2016) are repeated. The carpet remains the prime product, and it adds value and exports with a high value. The peculiar Nepal aromatic herbal and spices group is the second. The cardamom is always in our basket. However, nutmeg seems another product for export potential. Guiding the overall trade strategies based on the linkages focusing on high value to weight products may be a good way to enhance the export performance in the country. There are many potentialities in Nepal for better export performance, but the challenges remain to channelize them into the basket of the opportunities. The ways to face the challenges may be to link all export-oriented activities based on the backward and forward linkages of the products focusing on high value to weight products, focusing on the manufacturing-based infrastructure, institution buildings to suit the linkages, tailoring the export incentive mechanism matching with the linkages priority, managing the bilateral trade agreements to suit the national needs to boos the exports and so on.

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1. Introduction

In the ordinary sense, backward and forward linkages refer to the origin and destination respectively of the one. Simply, backward linkages of a product suggest what other products have contributed to make or produce one particular product. And forward linkage refers to what other products can be built, produced, or made using that particular product. Looking at these facts, agricultural products generally seem to have greater backward and forward linkages compared to those of finished or manufactured products.

To analyze the backward and forward linkages, we need to link it with the export performance, which is possible by producing more of the exportable products. The importance of export trade in developing economies was established long ago by the researchers in many respects as discussed in Fosu (1990). This background suggests that integration with the global and domestic value chain should be the strategy to realize the gain from the export-based development strategy. This vision of development was strengthened practically by the East Asian Miracle, on which eight East Asian countries performed well with export promotion strategies and established the role of exports in the economic development of a nation (Stiglitz, 1996). The value chain pointed out by Banga (2014) has further expanded the role of backward and forward linkages issues in the export performance.

Improving export performance is known as one of the major strategies of economic development in this globalization era. In the meantime, it is accepted as a way to enhance economic welfare creating jobs, and reducing the prices of the products globally. Athukorala and Santosa (1996) explain how the welfare gain from export-growth and for this purpose this paper develops a conceptual framework on which linkages of goods and services play a crucial role in economic development. Further, an empirical test of such linkages channel to welfare gain is given in Athukorala and Santosa (1997). Therefore, forward linkages and backward linkages help to gauge the welfare impact of the export. Considering the degree and distance of linkages of specific goods and services or industries make sense while making export promotion in the economy, other things remaining the same.

Trade, particularly export trade, has been well-accepted as an essential means of poverty reduction and socio-economic development of a country. Nepal has been continuously concentrating its efforts to get benefit from the open and liberalized economic system through policy reform, program, and budgetary activities to promote export and reduce the trade gap.

Trade Policy, Industrial Policy, Nepal Trade Integration Strategy, and periodic plans have focused on the promotion of high value-added products, employment generation, and development of domestic industries. To execute these plans and policies forward and backward linkages of the export potential products are very essential to make a systematic analysis. Particularly, Trade Policy 2015 and Nepal Trade Integration Strategy 2016 have identified the potential export products of Nepal with comparative and competitive advantages. With the change in the governance system of the country and the shift of demand of the international market, it now seems rational to explore new export potential products and services of Nepal by studying forward-backward linkages and value chain study of the products.

Nepal, already, has identified the list of such goods and services in Nepal Trade Integration Strategy in 2010. The strategic report considers the export performance, world market condition, domestic supply condition, overall export potential, and potential socio-economic impact to identify the list of products having export potential (MoCS/GoN, 2010). The report identifies the large cardamom, Ginger, Honey, Lentils, Tea, Instant noodles, and medical herbs out of agro-food groups as the potential export products from Nepal. Similarly, in order, out of Craft and Industrial Goods group, the report identifies Handmade paper, Silver Jewelry, Iron and Steel products, pashmina products, and Wool products as potential export products. And seven service-related goods and services are identified as the export potential. They are Tourism, Labour services, information technology (IT) and Business process outsourcing (BPO) services, Health services, Education services, Engineering services, and Hydroelectricity on order. The MoICS/GoN (2019) identifies a list of 19 such products.

Going back to the story we noticed that the government of Nepal revised the export priority list of products again in 2016. The export potential goods and services were selected based on the specific criteria having 80 percent weight in export performances and 20 percent weight on possible contribution to inclusive and sustainable development (MoCS/GoN, 2016). This report identifies a list of 12 goods and services to be in priority. Almost all of them have higher values to weight and naturally seem to have more price competitive due to the constraints of landlockedness and in line with Paudel & Burke (2015). These products include Cardamom, Ginger, Medicinal Plants, and Tea from the agro-group. Similarly, fabrics, textiles, yarn, and rope are followed by carpets, pashmina, footwear, and leather from the manufacturing sector. The Tourism, IT, and skilled- professionals are from the service sector.

The structure of international trade at home and abroad might have changed over the years. The forward linkages and backward linkages of the products already in the export-list might have different indications. The value addition from those exportable goods services indicates the importance of those sectors and trade. Therefore, this report is evaluating the backward linkages and forward linkages of all goods and services. Also, it explains the possible exportable items triangulating it with their respective trade volume and value addition nature of the commodity.

2. Objectives of the study

The objectives of this study are as follows:

    i.   To study the backward forward linkages and value chain of the potential products and services.

    ii.   To suggest new potential products and services through a systematic analysis.

    iii.   To suggest a plan of action for export promotion of new potential products including products and value chain development.

3. Methodology of the study

Largely, this study is based on descriptive analysis. However, more of the analysis is based on the data published in various secondary sources as cited in the relevant places. We adopt the strategy to make clear that information contained in data presenting them in tables, figures, and graphs guided by the literature in the relevant fields.

3.1 Sources of data

The export data is from The Worlds Integrated Trade Solution. In the process of selecting the data used here, we chose Nepal as the exporter. The product coding and disaggregation are at SITC Revision 3 classification up to 5-digit subsidiary headings. As the trading partner, we select all countries, 122 countries in 2017, and the countries existing in the system. The data is available until 2017 only that limits the coverage period. This data is used to examine the volume and rank of the goods and services.

The linkages analysis is based on the input-output table available in ADB. The tables are available from 2010 to 2017. The latest one is available for FY 2017 only. The input coefficients matrix is of 35x35 dimensional standard disaggregation. We use the same data for the calculation of value add also.

3.2 Method of analysis

The Leontief matrix-based linkage analysis has a long tradition for this type of analysis. It captures the incoming and outgoing sides of all the economic sectors. In our purpose also, we are using the coefficient matrix of a balanced input-out table, this approach serves our best interest to make the situation clear. Based on the theoretical framework from Rasmussen (1956), key sector analysis based on a minimum information approach of intensity matrix represents. The Leontief inverse analysis is applied in Nepal data similar to Sonis, Hewings, and Guo (2000), which has analyzed the same in the case of trade data from the People Republic of China.

The gross value added (GVA) is a common indicator of an industry or sector's economic performance. While an economy's total GVA is always equal to its total final use, an individual industry/sector's GVA is usually not equal to its final use. Yet an accounting identity between an industry/sector's GVA and the final use of multiple industries/sectors can be established by a gross value added-final use (GVA-FU) matrix (Cai & Leung, 2020). We calculated the GVA for export and import volume following the Nguyen and Wu (2018) (*Please see Annex for details*).

4. Estimation and analysis

4.1 Linkages in economic activities

The economic activities are directly and indirectly connected to each other. In the process of value addition and intermediate production process, the connectedness of the economic activities can be grouped into after and before the production of the goods and services. For example, the paddy production process has the association with many other activities right from irrigation, fertilizer, rice mill, bakery shop, transportation, and many others. Certain activities like fertilizer and litigation are indeed important to produce paddy. Similarly, some of the activities are connected or exist because paddy production happens. The rice-mills-related activities, bakery activities, and other transportation of those products are the positive by-product activities of the paddy production.

These types of interconnected economic activities are named linkages in trade and development economics. The activities that are related to the raw materials and other input-related activities, which contribute to making a finished product, are called backward linkages. In our paddy production example, the total activities related to paddy production like irrigation, fertilizer, seeds, and other services related to paddy production are backward linkages. Whereas the activities generated due to paddy production is forward linkages. To be specific in paddy production example, the activities related to rice-mills, transportation, bakery, and other activities (post paddy production activities) are called forward linkages. Therefore, it is obvious that the larger backward and forward linkages result in more employment generation, growth acceleration, and enhances the welfare in the economy.

There are different ways to capture the linkages, backward and forward. However, the easiest one would be using the Input-Output Table (IOT) based analysis. The rationale behind this is that the row activities of IOT are income flow in the activities. It shows which of the other sectors used the product of the sector. And, the column entity of the same sector refers to the indication for which of the other activities-related products are used as the raw materials that the column account for is the expenditure of the very sector. As the row total and column total of each sector are equal in the balanced input-output table, relatively the share of every connectedness of the sectors is captured in monetary terms in such IOT. The following section is the details on it.

4.2 Linkages analysis

A proper analysis of commodities and services linkage contributes to improving the deemed performance of the export trade in the country. In the literature of the linkage analysis, the Leontief input-coefficients matrix framework has been widely used to analyze the backward forward linkage of commodities. We adopted the same framework and the results are presented in Table 1. The methodology is described in section 3. The 35 sectors SITC industrial items and their Total Backward Linkages, Total Forward linkages, and Total linkages are in table 1.

The Leontief input coefficient matrix is the reflection of the relative share of input and output of each sector under consideration. In line with the paddy example in the previous section, let the paddy is one of the sectors in the input-output table. Then the horizontal elements of the Leontief matrix are the share of the forward linkage which is the reflection of the forward connectedness of the paddy. Similarly, the vertical elements, that is column-wise elements in the paddy column are the relative share or weight of raw materials used to produce one unit of paddy. Therefore, it is related to the backward linkages.

The backward and forward linkages are estimated using the methodology mentioned in the previous section. The summary of the results is in Table 1. Among them, top five sectors in terms of total linkages are described here.

According to the results, Agriculture, hunting, forestry, and fishing (c1) group has the highest total linkages. This group has 1.36 backward linkage and 4.12 forward linkage. While generating one unit of Agriculture, hunting, forestry, and fishing-related product, it generates 1.34 units equivalent of backward linkage. Similarly, this sector generates 4.12 units of forward linkages, which means relatively a huge number of activities are generated by this sector. Among 35 sectors, this sector generates the highest forward linkages in the Nepalese economy. Altogether, the total linkage of Agriculture, hunting, forestry, and fishing is 5.49, the highest one in Nepal. Therefore, it can be said that the primary sector has a strong contribution to the Nepalese economy, thus the backbone of the economy.

The Basic metals and fabricated metal (c12) sector has the second-highest (4.76) total linkages. It has 1.78 units of backward linkages and 2.98 units of forward linkages. This sector might have used more electricity and raw materials than the agriculture sector. This sector has also a large forward linkage but not up to the agriculture sector level.

Another important sector in the Nepalese economy is Food, beverages, and tobacco (c3). This sector has the third-largest total linkages in the economy. It has very large (2.01 units) backward linkages that it is well connected to other sectors while producing the goods. Similarly, it has a larger forward linkage also (2.11) that it generates other business activities further also. The total

linkage of this sector is 4.12 units which means while producing one unit equivalent good and services in this sector 4.12 units equivalent other activities are generated in the economy. For example, while producing some Nepalese beverages items, it uses raw materials from agriculture, electricity, and transportation. Similarly, after it is produced, the beverages help to grow other sectors like retail, transportation, and hotel-related activities.

The retail trade is the fourth important sector in the Nepalese economy in terms of total linkages that has 3.99 units of total linkages in the economy. Out of it, the forward linkage is 2.76 units and the backward linkage is 1.22 units. This sector does not include the activities related to motor vehicles & motorcycles and the repair of household goods in it. This might be the reason for having smaller backward linkages. Moreover, the import-based economy of Nepal might be another reason for having smaller backward linkages of retail business in Nepal. However, the forward linkage is significantly larger making this sector one out of the top five in Nepal.

Inland transport (c23) is one of the 35 sectors under consideration in our study. This sector has the top fifth total linkages which make it one of the major sectors in the Nepalese economy. It generates 3.85 units of total linkages of which 1.19 units is backward linkage and 2.66 units are forward linkages. The small backward linkage might be the reflection of the import-based economy in Nepal where the economic activities before the production of the goods and services use the transportation facilities very little. Another reason might be the case that economy is predominantly agriculture-based which uses transportation very little in Nepal. Similarly, one can argue that the service and informal sector of the economy also used very less inland transportation that the value chain in the economy is very less are the top five industries in terms of total linkages in Nepal. However, the forward linkage is quite high in this case that inland transportation is well connected in industrial and formal service sectors of the economy.

Table 1: Forward, Backward, and Total Linkages

SN	Industry	Industry	TBL	TFL	TotalL
1	Agriculture, hunting, forestry, and fishing	**c1**	1.36	4.12	5.49
2	Mining and quarrying	c2	1.26	1.31	2.57
3	Food, beverages, and tobacco	**c3**	2.01	2.11	4.12
4	Textiles and textile products	c4	1.76	1.20	2.96
5	Leather, leather products, and footwear	c5	1.83	1.02	2.85
6	Wood and products of wood and cork	c6	1.92	1.41	3.33
7	Pulp, paper, paper products, printing, and publishing	c7	1.60	1.12	2.72
8	Coke, refined petroleum, and nuclear fuel	c8	1.82	1.04	2.86
9	Chemicals and chemical products	c9	1.64	1.35	2.99

10	Rubber and plastics	c10	1.85	1.74	3.59
11	Other nonmetallic minerals	c11	1.83	1.66	3.49
12	Basic metals and fabricated metal	**c12**	1.78	2.98	4.76
13	Machinery, nec	c13	1.51	1.01	2.52
14	Electrical and optical equipment	c14	1.64	1.06	2.70
15	Transport equipment	c15	1.60	1.00	2.61
16	Manufacturing, nec; recycling	c16	1.86	1.45	3.31
17	Electricity, gas, and water supply	c17	1.66	2.05	3.71
18	Construction	c18	1.63	1.40	3.03
19	Sale, maintenance, and repair of motor vehicles*	**c19**	1.24	1.18	2.42
20	Wholesale trade and commission trade**	c20	1.23	1.20	2.43
21	Retail trade, except of motor vehicles***	**c21**	1.22	2.76	3.99
22	Hotels and restaurants	c22	1.97	1.62	3.59
23	Inland transport	**c23**	1.19	2.66	3.85
24	Water transport	**c24**	1.00	1.00	2.00
25	Air transport	**c25**	1.25	1.06	2.31
26	Other supporting and auxiliary transport activities****	c26	1.93	1.23	3.16
27	Post and telecommunications	c27	1.86	1.63	3.50
28	Financial intermediation	c28	1.36	1.42	2.79
29	Real estate activities	c29	1.39	1.69	3.09
30	Renting of M & Eq and other business activities	c30	1.44	1.98	3.42
31	Public administration and defense*****	**c31**	1.27	1.02	2.29
32	Education	**c32**	1.23	1.13	2.36
33	Health and social work	c33	1.40	1.05	2.45
34	Other community, social, and personal services	c34	1.47	1.34	2.82
35	Private households with employed persons	c35	1.00	1.00	2.00

*Sale, maintenance, and repair of motor vehicles and motorcycles; retail sale of fuel; **Wholesale trade and commission trade, except of motor vehicles and motorcycles; ***Retail trade, except of motor vehicles and motorcycles; repair of household goods; ****Other supporting and auxiliary transport activities; activities of travel agencies; and *****Public administration and defense; compulsory social security. TBL=Total backward linkages, TFL=Total forward linkages, TotalL=Total linkages, the sum of TBL and TFL.

Some of the sectors have very low total linkages in the economy. Among them, the lowest five are discussed here. The Water transport (c24) sector has the lowest linkages in the economy. Only one backward and one forward linkage of this sector indicate the poorer connection of this sector to other sectors. It might be the reason that Nepal is a landlocked country and even very few water transportations related economic activities are performed in the country.

The Public administration and defense sector (c31) includes compulsory social security also (c31) is the sector having the second-lowest linkages in the economy. It has only 2.29 total linkages of which backward linkage is 1.27 and forward linkage is only 1.02. It might be the reason that defense and public administration-related industries heavily rely on imported goods and services. And, it is predominantly for social security by nature and has similar nature of transfer payment. Therefore, the forward and backward linkages of this sector are very small but not negligible.

The Air transport (c25) sector of the Nepalese economy seems very floating in nature that it has only 1.06 forward linkages. It shows poor air connectivity. The forward connection nature of air transportation seems very poor in Nepal than by accounting definition and mode of payment, other sectors are not connected to it. For example, the air travel fair paid by the tourist might have been recorded somewhere else when they book the flight from abroad. The air transport sector does not create other air transport-related business-like maintenance and training in Nepal. The backward linkages are also very small in this sector that only 1.25 backward linkages are recorded in Table 1. The air transportation sector hardly uses the goods and services produced in Nepal, which is the reality.

The Education (c32) sector has the third-lowest total linkages in the Nepalese economy. It records only 2.36 units of forward linkages out of which the backward linkage is 1.23 units and forward is only 1.13 units. The education sector, public and private both are poorly connected with other sectors. One reason for the poor forward linkage might be that education-related most of the activities besides classroom teaching is imported items. We can imagine books, copies, pens, sports materials to school buses, all are mostly imported items. It has fewer possibilities to generate the forward economic activities besides some teaching and other jobs. Similarly, the backward linkages are also poor signifying the poor connection of the evocation business to raw material produced in Nepal as well.

The Sale, maintenance, and repair of motor vehicles and motorcycles (c19) sector including the retail sale of fuel have the fifth-lowest linkages effect in the economy. The total linkage of this sector is only 2.42 units. It means while producing one unit equivalent good and services in this sector, only 1.24 units backward and 1.18 units forward economic activities are generated in this sector. This sector is one of the largest sectors in terms of employment meaning a lot of people work in this sector. It indirectly shows the poor performance of this sector in terms of productivity. It might have contributed to generate the individual and household level livelihood options, but hardly generates other economic opportunities in the economy. Similarly, the poor backward linkages indicate the poor use of homegrown raw materials in this sector also. The fuel component might be the reason that a huge portion of the raw material comes from outside the territory, basic nature of landlocked fuel importing economy.

The median value of the total linkages in the Nepalese economy examined at 35 sectoral disaggregations is 2.75 units only, which is indicated in Figures 1 and 2. The variation among the linkages within the sectors above the median value seems higher than among the sectors below the median value. The nature of the sectors having lower linkage values might have a similar nature to those of having higher values.

Figure 1 is the summary of total linkages. The bar diagram shows that two of the industries have noticeably higher linkages in the economy. Agriculture, hunting, forestry, and fishing (c1) and Basic metals and fabricated metal, Food, beverages, and tobacco (c12) have more than four linkages in the economy. The major exportable items identified in MoCS/GoN (2010) and MoICS/GoN (2019) belong to this group. However, the Water transport (c24) related activities have even less than two, lowest among 35, units of total linkages in the economy, a typical nature of the business in this sector are reflected.
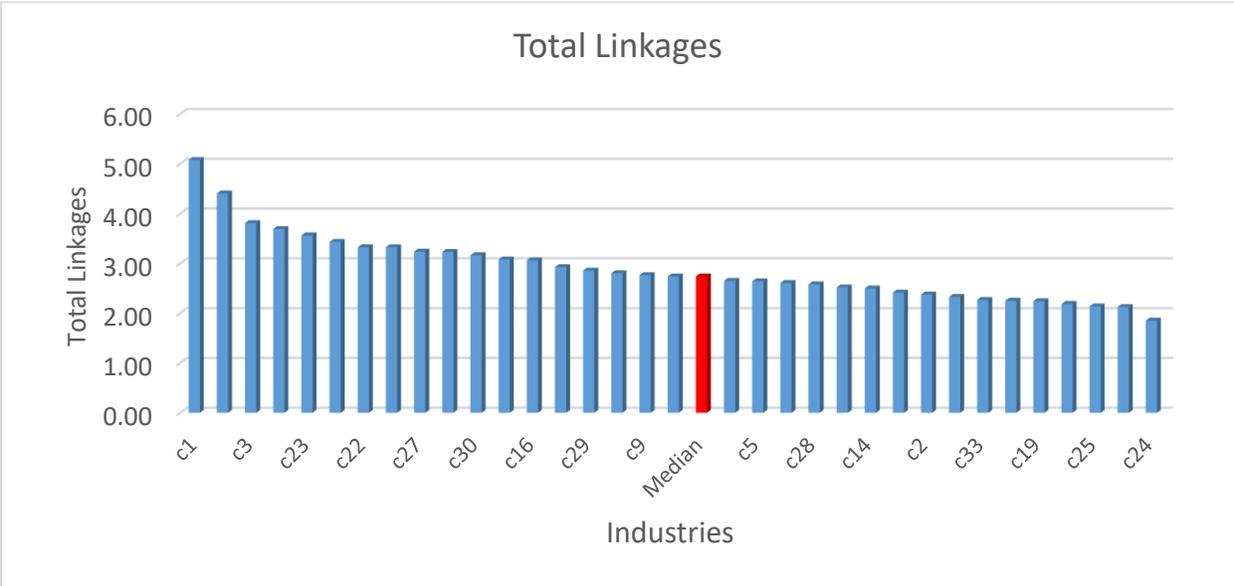
Figure 1: Total Linkages

The differences in the variation among the sectors in terms of total linkages can be seen clearly in Figure 2. The industries with the highest and lowest total linkages have interesting features in terms of their decomposition into backward and forward linkages. The forward linkages are relatively larger than their respective backward linkages for those top. The economic rationale behind it might be the case that these activities generate other business in the economy. More importantly, it might be the reason that the product and services from these sectors are of the nature of intermediate goods, which are reused in other sectors. Whatever the reason being these

are the sectors that generate more employment and revenue in the economy, the backbone of the economy.

The forward and backward linkages both are very smaller in those sectors which fall at the bottom of the total linkages, indicate in the lower section in Figures 1 and 2. The details are in Table 1 identifying and praising the top total linkages sectors does not mean that other sectors are unnecessary. Some of the sectors like defense and social security cannot be ignored that these sectors are for welfare purpose and national defense purpose. Similar might be the case in the case of the sector incorporating fuel. However, water transportation, education, and air transportation sectors and their poor connection with other domestic sectors are to be investigated further to understand why these sectors are failing to connect to other sectors.
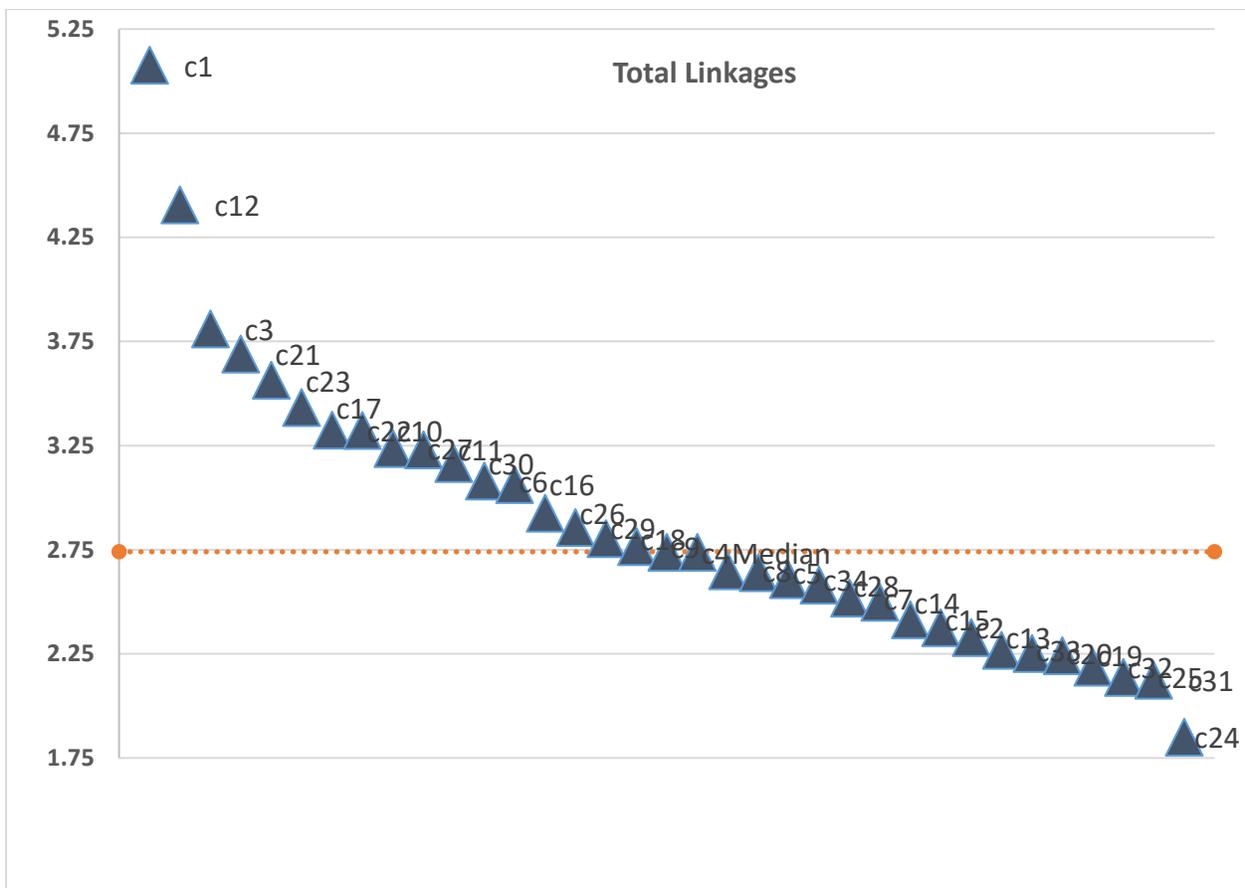
Figure 2: Total Linkages

Some of the sectors have larger forward linkages and on the other hand, we see that the backward linkages are higher for some products. There are very few sectors that have both forward and backward linkages at a higher level simultaneously. As noticed that some of the sectors do have both forward and backward linkages at a low scale. To see these dimensions,

figure 3 is helpful. The forward linkages are measured on the horizontal axis and the backward linkage is measured on a vertical axis. The mid-point lines for both the axes are in broken line intersected point is the remarked point that helps to group the sectors based on their linkages. We nominate the lower left quadrant as the first quadrant and move clockwise as the first, second, third, and fourth quadrant in the figure. As can be seen from the figure that most of the sectors fall into the fourth quadrant which measures the higher forward linkages and lower backward linkages. The second-highest number of sectors falls into the third quadrant which measures lower forward and backward linkages. Three sectors are in the second quadrant which means their forward linkages are at a lower range however, the backward linkages are at a higher range. Only one sector is in the third quadrant which indicates the higher forward and backward linkages. We want all the sectors to be in the third quadrant, where both backward and forward linkages are comparatively higher.

As discussed earlier, the summary of the industrial level comparison of forward and backward linkages is in figure 3, on which the horizontal axis represents the forward linkages and the vertical one represents the backward linkages. The Basic metals and fabricated metal (c12) have higher backward and forward linkages both. As explained before, this sector is the backbone of the economy in terms of its linkages that contribute to the economic activities in the nation.

The Agriculture, hunting, forestry, and fishing (c1), Retail trade (c21); and Inland transport (c23) sectors fall into the second quadrant. It means these sectors have very high backward linkages. However, the forward linkages are not that high in these sectors. These are the sectors where policy intervention is highly needed to increase the forward as well as total linkages.

Similarly, Food, beverages, and tobacco (c3); Rubber and plastics (c10); other non-metallic minerals (c11); Hotels and restaurants (c22); other supporting and auxiliary transport activities (c26); and Post and telecommunications (c27) are the sectors having high forward linkages but lower backward linkages. Some of the sectors have very low forward as well as backward linkages, for example, Private households with employed persons (c35). The Chord Graphs presented in Figure 4, 5, and 6 also support for the arguments.

Figure 3: Forward and Backward linkages

Industry level Forward and Backward Linkages (2017)
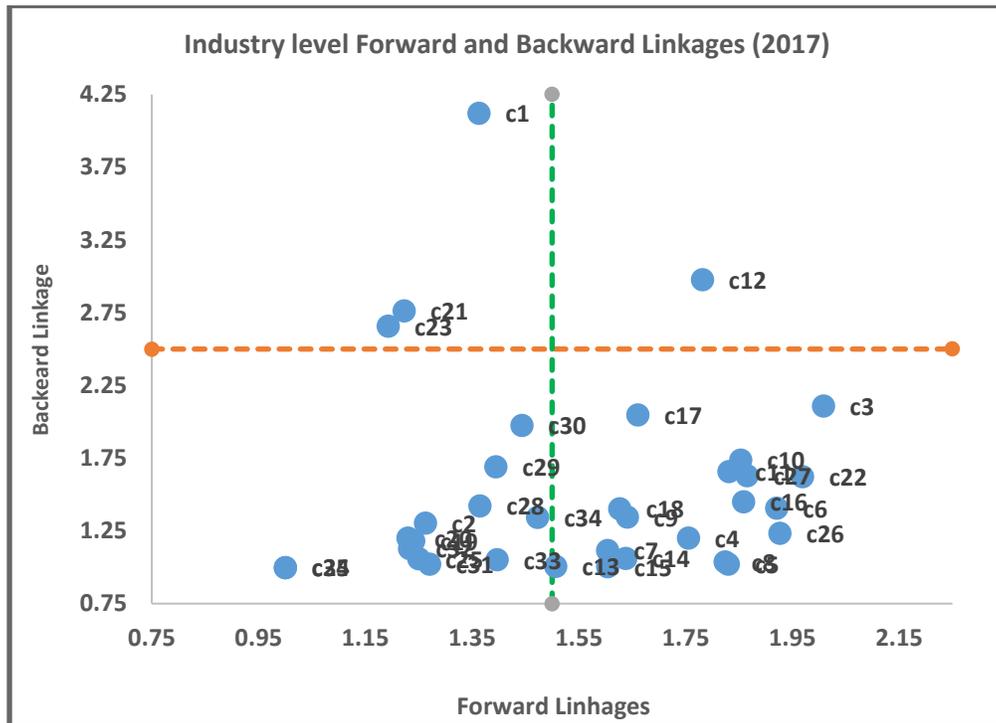
Understanding the status of backward and forward linkages for the sectors is an important issue in development economics, particularly by policymakers. Moreover, till this point, how the sectors are connected is not clear. To see that types of interconnectedness more clearly, various tools are available. The straightforward tool is the heat-map preparation and analysis. The alternative one is preparing the chord-diagram that gives more insight on the interconnectedness than the heat-map. Therefore, we prepared three separate chord-diagram and analyze them. The first chord-diagram is about total linkages which are in figure 4. The figure 5 and 6 are the chord-diagram for the forward and backward linkages, respectively.

Figure 4: The sector to sector sources of the Total linkages
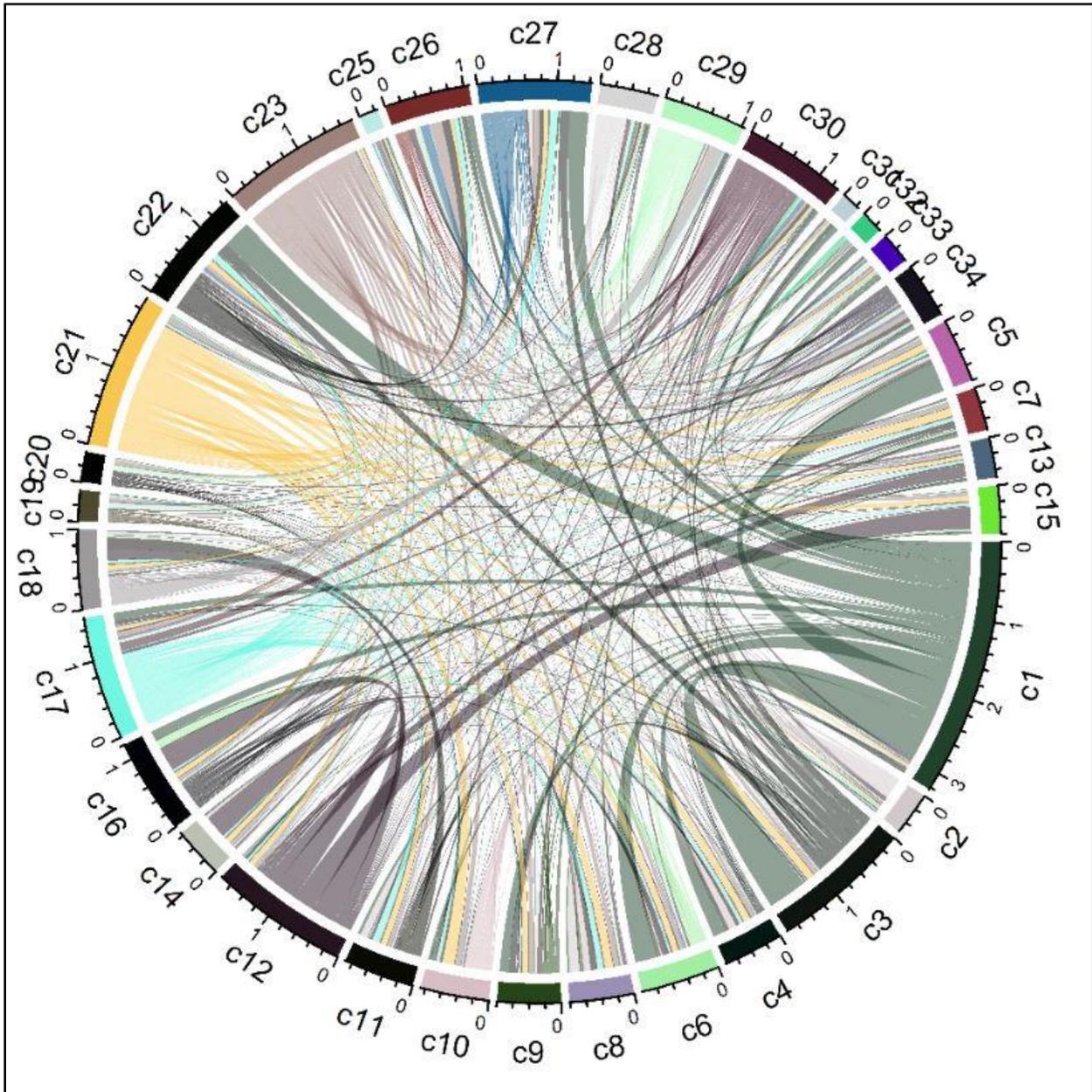
The chord diagram captures the two-way flow of individual transactions. In the case of our linkages analysis also, there are two-way transactions that show the linkages from one sector to another sector. Using the data calculated from the Leontief coefficient matrix analysis, we also sketched the chord diagram separately for total linkages, backward linkage, and forward linkages interpretation. The summary of the explanation of those sectors is as follows.

The sectoral in figure 4. It measures the interconnectedness of total linkages. Top 5 interconnectedness are explained here which gives the tentative structure of the economy. The

primary sector of the economy in general and its major component recorded as Agriculture, hunting, forestry, and fishing (c_1) has the major inter-linkages to other sectors. The top three inter-linkages out of the top 5 inter-linkages are from the agriculture sector(c_1) to Food, beverages, and tobacco (c_3), Leather, leather products, and footwear(c_5), and Hotels and restaurants (c_{22}). The other two major inter-linkages are from Basic metals and fabricated metal (c_{12}) to Transport equipment (c_{15}) and Construction (c_{18}) to Real estate activities (c_{29}).

Since the highest amount of the linkages is in c_1, which is the primary sector of the economy, has a major connection with Inland transport (c_{23} Post and Telecommunication (c_{27}) beside Food, beverages, and tobacco (c_3), leather products, and footwear (c_5) and Hotels and restaurants (c_{22}). It means our agriculture sector is well connected to Inland transport and Food, Beverage and Tobacco sector. It is related to the Leather sector and post and Telecomm nation as well. Since the connection has extensive coverage from primary, secondary to services sector industries; the c_1 makes a more substantial linkages impact in Nepalese economy. The Total linkages can be decomposed into the forward and backward linkages to see the nature of the economy further.

The sources or connection of the forward linkages of each 35 sectors to respective other sectors are sketched using a chord diagram. The flow of the chars reveals that Agriculture (c_1) has the most considerable forward linkages. It is substantially high that the Nepalese agriculture sector adds more forwards value adds. This sector is connected with Food, beverages, and tobacco (c_3), Hotels and restaurants (c_{22}), Post and telecommunications (c_{27}) and leather products, and footwear (c_5) sectors. And, Agriculture(c_1) sector, which is the primary sector, has very little connection with sectors like Basic metals and fabricated metal (c_{12}), Electricity, gas, and water supply (c_{17}), and Retail trade (c_{21}). The primary sector is very less connected to metal and fabrics related industries. The electricity and gas-related activities are very much less connected to the primary sector as well. The retail trade and primary sector are also less connected, showing the poor industrial development that uses agriculture-related products as the raw materials.

Figure 5: The sector to sector sources of the Forward linkages
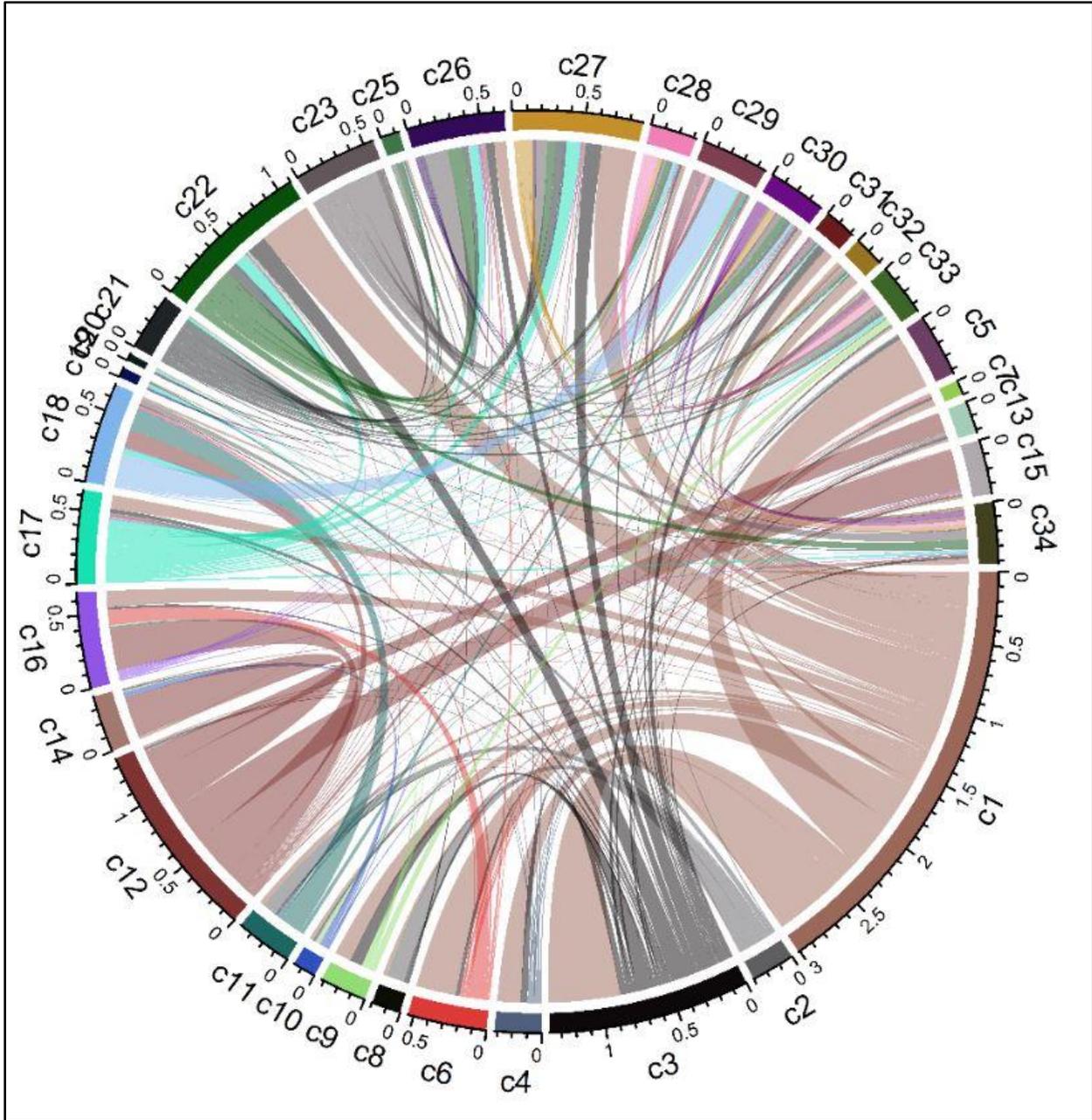
Figure 6 is the chord diagram that summarizes the sources of backward linkages. The major backward linkage in the economy is of the transportation industry(c23) and retail trade (c21) and Renting of machines and other business activities (30). Among these sectors, the retail trade itself generates major five linkages to other important sectors. This sector is well connected to many

other sectors, however, Textiles and textile products (c4), Leather, leather products, and footwear (c5), Wood and products of wood and cork (c6), Pulp, paper, paper products, printing, and publishing (c7), Coke, refined petroleum, and nuclear fuel (c8) and Rubber and plastics (c10) are the significantly larger linkages.

Figure 6: The sector to sector sources of the Backward linkages
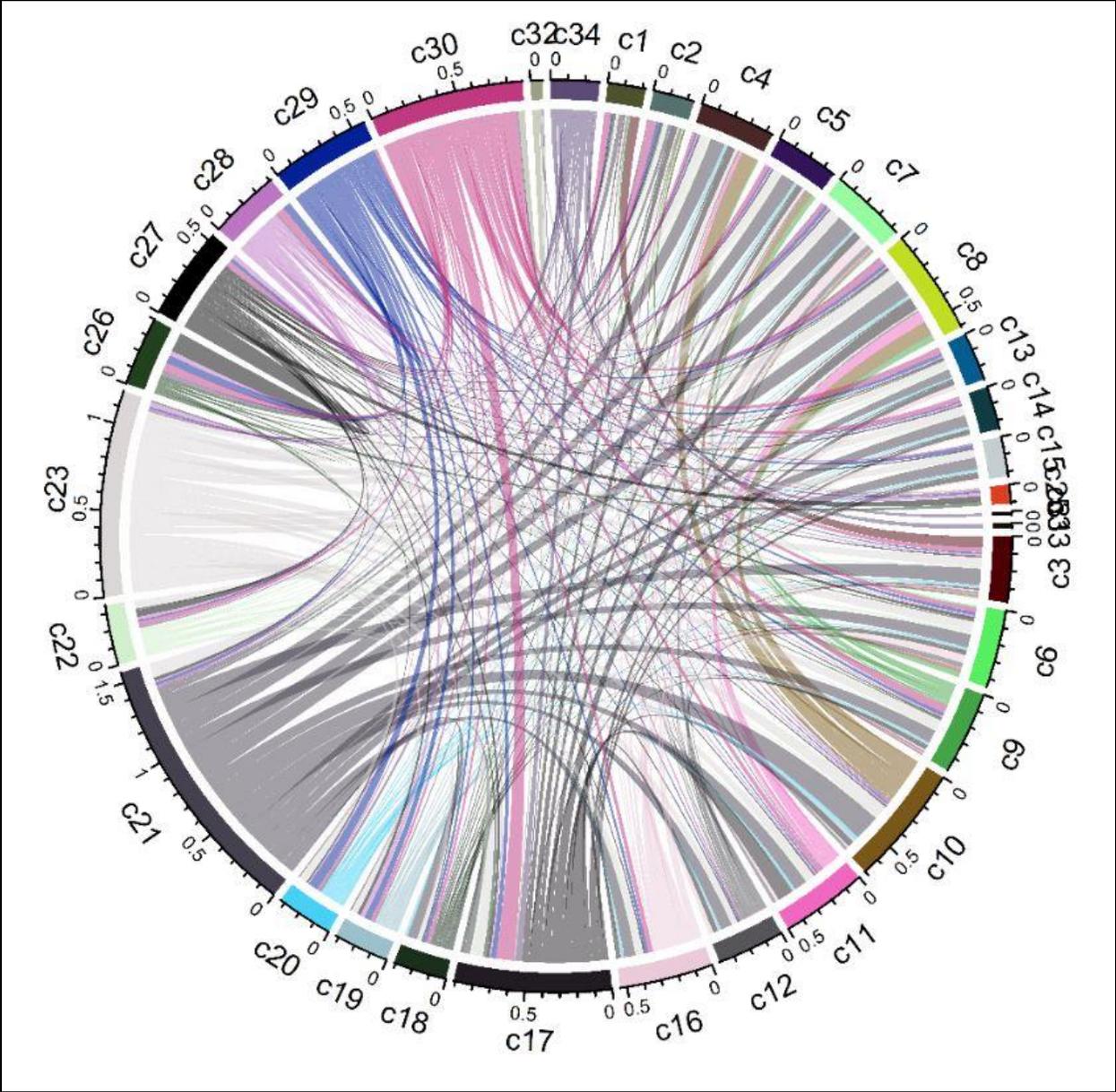
Similarly, the transport sector or industry has an association with several industries. It is quite natural that other areas use the transport sector as an intermediate product. It can be said that the transport sector generates economic activities related to other industries as well. Similarly, the

trade and retail sector also create backward linkages in the economy. The renting, merger, and acquisition-related financial industries also create backward linkages at a large scale in the Nepalese economy.

4.3 Value Added analysis

The aggregate sectoral level export and import value add analyses are done using ADB (2017) Data. The primary sector value adds out of export and import is very large in Nepal. The trade sector and public service sector adds a huge amount of value add in Nepal. The major export items of Nepal are from the trade and primary sector also. Notably, import value-added is greater in all cases, except the public section, compared to that of export of value-added indicating the real scenario of import dominant trade practice in the country. The summary of the value add is presented in Table 2.

Table 2: Aggregative level value add

SN	Industry	Export of Value-Added	Import of Value-Added
1	Primary	6,776	8,756
2	Low Tech	919	1,594
3	High Tech	597	2,911
4	Utilities	278	560
5	Construction	1,727	1,766
6	Trade	3,002	3,945
7	Tourism	458	497
8	Transport	1,588	2,160
9	ICT	378	531
10	Finance	1,214	1,702
11	Properties	2,237	2,698
12	Public	3,804	3,654
13	Household	-	1

Figure 7 shows the value-added by industry in 2017. The information contained in the figure reveals few important messages; first, both export and import value-added are found in the primary sector, however, import value-added is more by around 20 percent. Public expenditure and trade sectors' value-added is around second big contributors, but public expenditure is the only sector that has more value of export value-added than the import's value-added. Tourism has fairly competitive in the import and export value-added but with a low base. Due to the low

scale of investment in research and innovative ideas, the largest gap between import and export value-added is found in the High-Tech industries, where export value-added is just around 1/8th of import value-added.

Figure 7: The value added by industry in 2017, US $ million
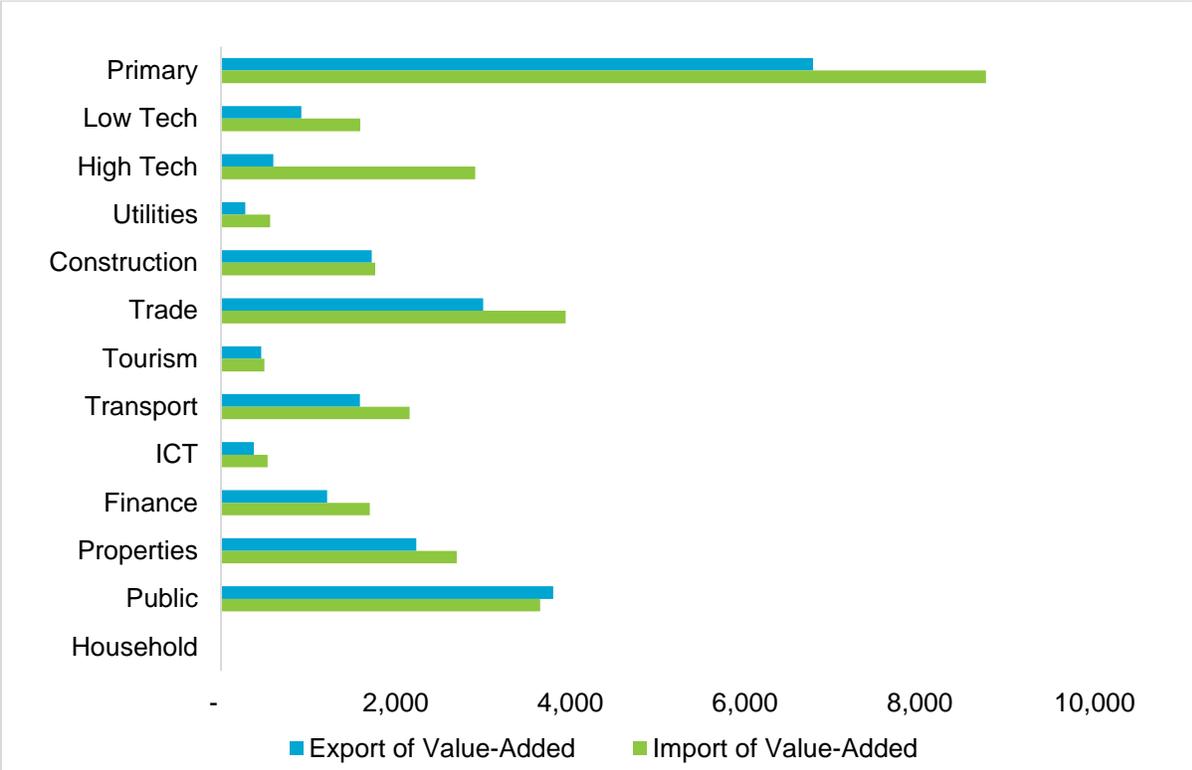
The primary sector, which is a major sector for total linkages and forward linkages in the Nepalese economy, and is the sector that has the highest value add in the economy too. The trade sector, represented by the retail sector is the sector that generated the highest level of backward linkages and more interconnectedness in the economic sectors, has the second-highest value add in the economy. Other Inland transport and public service sector have a significant amount of a=value add in the economy too.

In the case of the export value add also, agriculture is the key followed by the trade sectors, Services sectors also generate backward linkages in the economy, and they have relatively smaller export value add in the economy. The tourism sector export and import value add are relatively smaller in the economy though it has a national focus and has higher linkages in the economy. It seeks a serious examination of why higher linkages and lower value add to the economy from this sector.

4.4 Trade volume and Destination

The total export volume in USD is collected from the World Integrated Trade Solution (WITS) that covers fiscal years 2010, 2015, 2016, and 2017. The reporter is in Nepal in the WITS data portal. The product level disaggregation is based on SITC Revision 3 that covers the products and services up to 5-digit disaggregate. We select all available trading partners, that includes 122 countries following Paudel (2019). The summary of the products for the top 30 products for 2017 is presented in Tables 3, 4, and 5.

The Knotted, Wool/hair (65921) is the major export item of Nepal. It occupies a 10.56 percent share in total export which was recorded at 8.33 percent in 2010. It was in the second rank in 2010 but consistently in the first rank during 2015, 2016, and 2017. The top ten export item from Nepal in terms of trade value-based share are share: Nutmeg/mace/cardamoms (Second), Syn Stap (<85%) yarn bulk (Third), Syn Stap (>85%) yarn bulk (Forth), Mixtures of diff juices (Fifth), Woven fabric from the strip, etc. (Sixth), Black tea, bulk (Seventh), Shawl/scarf/ etc. not kn/c (Eighth), Jute, etc. sacks/bags (Ninth) and Rosin/resin acid/oil/der (Tenth).

According to the information in Table 3, the Carpet group (65921) used to be in the second rank in 2010 and increased to the first rank in 2015, 2016, and 2017 regularly. This product belongs to the textile group in 35 sectors economic classification which has fewer total linkages, backward linkages, and forward linkages as well. In terms of value-add analysis also, it belongs to the trade group and the value add of the sectors is second highest in Nepal. Therefore, it is the prime product of Nepal to focus on export promotion. The expansion of this sector to wider interconnection to another sector might help. Further, the value addition of this sector has scope to improve to the first position near the agriculture sector.

The cardamoms group (7525) is the second-largest export item of Nepal in 2017. It used to be second largest in 2016 and 2015 as well. One of the primal products of NTIS-2010, cardamom used to be the 8the largest commodity by volume that year. The Syn stap (<85%) yarn bulk (65184) records as the third largest trade item of Nepal in 2017. It used to be seventh in 2016 followed by sixth in 2015. It improved the rank from 20th in 2010 by volume, the share in the total export is also improved significantly from one percent to more than six percent in 2017. Similarly, the Syn stap (>85%) yarn bulk (65182) is the fourth largest export item of Nepal. Its share in total export volume 5.53 percent in 2017. This item used to be sixth largest in 2016, fourth largest in 2015, and fifth largest in 2010. The size of the share is also consistently higher in Nepalese export. If we put the third ad fourth item together, which are close to each other, it becomes the largest product share in total export, points to be noted.

The Mixtures of diff juices (5996) item remains a consistently fifth-largest export item of Nepal. It is in fifth position since 2015 onwards, this item was not even in the 30 largest item list in

2010, son not in the product list of the NTIS-2010 and even not in newer NTIS list. The Woven fabric from strip etc (65312) is the sixth-largest export item of Nepal and was fourth and third largest in 2016 and 2015. It used to be the fourth largest in 2010. The Black tea, bulk (7414) is the seventh-largest product of Nepal. Its share and position both improved since a couple of years that it was recorded as 9th largest product in 2016 and 2015. It increased from the 12th largest product in 2010.

Table 3: Share of Products in total export and their rank

SN	Code	Product Description	2017		2016		2015		2010	
			Share	Rank	Share	Rank	Share	Rank	Share	Rank
1	65921	Carpet,knotted,wool/hair	10.56	1	11.76	1	11.13	1	8.33	2
2	7525	Nutmeg/mace/cardamoms	6.94	2	5.88	2	7.50	2	2.69	8
3	65184	Syn stap(<85%)yarn bulk	6.38	3	4.43	7	3.90	6	0.95	20
4	65182	Syn stap(>85%)yarn bulk	5.53	4	4.43	6	4.97	4	7.07	5
5	5996	Mixtures of diff juices	5.00	5	4.80	5	4.02	5		
6	65312	Woven fabr frm strip etc	4.71	6	5.27	4	6.18	3	7.24	4
7	7414	Black tea, bulk	4.30	7	4.03	9	3.02	9	2.35	12
8	84612	Shawl/scarf/etc not kn/c	3.70	8	4.15	8	3.70	7	2.69	9
9	65811	Jute etc sacks/bags	2.96	9	2.85	10	3.29	8	3.73	6
10	59814	Rosin/resin acid/oil/der	2.53	10	2.79	11	2.41	13	0.90	21
11	67413	Zinc coated steel w>600	2.51	11	1.23	18	2.65	12	11.12	1
12	8136	Oil cake of rape/colza	2.41	12	1.86	14	1.02	23		
13	85151	Footw text up,ru/pl sole	1.71	13	2.58	12	2.98	11	1.08	17
14	65719	Felt impregnated etc	1.65	14	1.52	15	1.35	18		
15	29299	Veg material/product nes	1.60	15	1.09	20	1.26	19	2.62	10
16	5424	Dried lentils	1.48	16	2.22	13	1.47	17	7.76	3
17	54291	Medicaments nes non-ret.	1.32	17	1.04	21	1.06	21		
18	68252	Alloy copper sheet etc	1.31	18	1.33	16	1.75	16	1.72	14
19	29249	Pharmacy plants nes	1.16	19	0.99	22	0.92	26	0.81	25
20	8195	Dog/cat food, retail	1.13	20	0.71	28				
21	25119	Waste nes/unsorted	1.03	21						
22	84843	Knit/croch/lace/etc hats	0.92	22	0.88	23	0.90	27	0.86	23
23	65813	Manmade text sacks-bags	0.83	23	0.88	24	1.00	24		
24	1122	Beef, frozen, boneless	0.74	24						
25	61141	Tanned bov/equin leather	0.74	25			1.09	20	0.67	28
26	66521	Glass-ceramic table ware	0.74	26	0.70	29				
27	8119	Fodder-veg residues	0.73	27						

28	65751	Twine/cordage/rope/cable	0.73	28	0.69	30	0.80	30	2.02	13
29	89611	Paintings/drawngs/pastel	0.72	29			0.84	28	0.79	26
30	76432	Radio transceivers	0.71	30						
*Trade value measured in USD										

The Shawl/scarf/etc not kn/c (84612) is the eighth largest product item exported from Nepal in 2017. And, it is consistently in between seventh to 9th position since 2010. The Jute etc sacks/bags (65811) is the 9th largest export item and slightly decreased its rank from sixth in 2010, to eighth in 2015, tenth in 2016, and 9th in 2017. The Rosin/resin acid/oil/der (59814) is the item that significantly improved the export share and rank since 2010. It is recorded as 21st position in 2010 which is only 0.90 percent of total export. It increased to the tenth position and even share is 2.53 percent of the total export.

The Zinc coated steel w>600 (67413) is the eleventh largest export item in 2017. It used to be the first largest item in 2010 decreased to 12th in 2015 and 18th in 2016. It used to occupy an 11.12 percent share of the total export of Nepal during 2010 and it is only 2.51 percent in 2017. The Oil cake of rape/colza (8136) is the new export item of Nepal that was not in the top 30 list before 2015. It is the 12th largest item in 2017.

The Footwtext up,ru/pl sole (85151) is gradually improving product item of Nepal that it from 17th position in 2010 it emerged to eleventh largest in 2015. It is recorded as the 13th largest product in 2017 and the 12th largest in 2016. The Felt impregnated etc (65719) is now an item in the top 30 items list. It is the 18th largest product of 2015 and improves the position in 2016 to fifteenth and fourteenth in 2017. The share is also gradually increasing every year.

The Dried lentils (5424) used to be the third-largest product item of Nepal in 2010 and its share decreased to 1.47 percent from 7.76 in 2010. It was the 17th largest product in 2015, 13th in 2016, and 16th in 2017. It is one of the decaying products of Nepalese export. The Medicaments nes non-ret (54291) is the new product in the top 30 list. It used to be the 21st largest product in 2015 and improved to 17th in 2017. The Alloy copper sheet etc (68252) and Pharmacy plants nes (29249) are the 18th and 19th largest product exported from Nepal in 2017. The Dog/cat food, retail (8195) is the newer product on the list. This item emerged in the list in 2016 with the 28th product. Its position and share both improved to 20th rank with 1.13 percent share in total export.

Knit/croch/lace/etc hats (84843) is the 22nd largest export item and consistently around the same rank since 2010. The Twine/cordage/rope/cable (65751) is the 28th item in 2017 however it used to be 13th in 2010 and gradually in 30th rank in 2015 and 2016. The Manmade text sacks-bags (65813) and Glass-ceramic tableware (66521) are emerging goods in the export list that they

emerged in 2016 onwards. These two items are the 23rd and the 26th largest export item in 2017 and both are improving the rank slowly.

The Waste nes/unsorted (25119), Beef, frozen, boneless (1122), Fodder-veg residues (8119), and Radio transceivers (76432) products emerged in 2017 as 2st, 24th, 25th, 27th, 29th, and 30th exported item in Nepal. Tanned bov/equin leather (61141) and Paintings/drawngs/pastel (89611) are 25th and 29th item in 2017 which were not in top 30 lists in 2016 though were in 2015. Therefore, these are unstable items in exportable goods.

Table 4: Major export Destinations of Nepal (Countries)

		2017		2016		2015		2014		2010	
SN	Partner	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank
1	India	56.92	1	53.67	1	64.28	1	65.11	1	65.98	1
2	USA	11.54	2	12.53	2	10.64	2	8.31	2	5.99	3
3	Turkey	7.58	3	4.44	4	2.20	5	2.20	6	1.13	10
4	Germany	3.82	4	3.95	5	3.93	3	3.51	3	4.13	4
5	China	2.76	5	2.64	7	1.92	6	3.19	4	1.70	6
6	UK	2.46	6	2.65	6	2.60	4	1.89	8	1.62	7
7	Italy	1.56	7	1.44	10	1.25	8	1.23	9	1.02	11
8	Bangladesh	1.56	8	2.09	8	1.20	10	2.42	5	7.87	2
9	UAE	1.26	9			0.27	23	0.45	16	0.28	19
10	France	1.22	10	1.29	11	1.23	9	1.10	10	1.13	9
11	Japan	1.07	11	1.46	9	1.08	11	1.09	11	0.79	12
12	Canada	1.05	12	1.08	12	0.99	12	0.95	12	1.19	8
13	Vietnam	0.79	13	0.63	14	0.61	14	0.62	13	0.08	27
14	Australia	0.77	14	0.75	13	0.71	13	0.61	14	0.38	17
15	Netherlands	0.52	15	0.56	15	0.49	15	0.49	15	0.45	14
16	Switzerland	0.47	16	0.44	16	0.47	16	0.34	20	0.25	20
17	Denmark	0.45	17	0.43	17	0.32	19	0.27	22	0.33	18
18	Malaysia	0.38	18	0.34	19	0.37	18	0.35	18		
19	Belgium	0.35	19	0.38	18	0.31	20	0.35	19	0.40	15
20	Austria	0.29	20	0.32	20	0.26	24	0.21	26	0.21	21
21	Singapore	0.29	21	5.89	3	0.21	27	0.15	27	0.39	16
22	Russia	0.27	22								
23	Korea, Rep.	0.23	23	0.16	24					0.06	30
24	Spain	0.23	24	0.25	21	0.29	21	0.22	24	0.21	22
25	Norway	0.20	25	0.16	27	0.23	25	0.21	25		

26	Hong Kong	0.18	26	0.24	22	0.23	26	0.15	28	0.51	13
27	Sweden	0.15	27	0.16	26	0.15	30	0.13	29	0.10	25
28	Pakistan	0.15	28	0.16	25					0.20	23
29	Kuwait	0.13	29								
30	Other Asia	0.12	30	0.13	29	0.20	28	0.23	23	0.09	26

Based on the trade volume, India occupies the first destination as usual. A considerable share of export goes to India (56.92 %) from Nepal. The second-largest destination is the USA which shares 11.54 percent. The neighboring country China records top fifth only. The share is only 2.76 percent.

Similarly. Turkey, Germany, and third and fourth destination to Nepali export. After fifth China, other destinations are the UK, Italy, Bangladesh, USE, and France in descending order. Since 2010, there seemed a significant change in export destination to USE and USA. Nepali export is increasing into these two destinations. Others have some degree of variations in terms of remaining in the top 10 destinations. Nepali export destination is decaying for Norway and Pakistan. However, new destinations are in records like Russia and Kuwait.

Table 5: Product-wise Top 10 exporters and Nepal's position rank in 2017

1	65921	Carpet, knotted, wool/hair	Iran, India, Pakistan, Nepal, Germany, EU, Turkey, UAE, China, Italy (4/90)
2	7525	Nutmeg/mace/cardamoms	Guatemala, India, Indonesia, Nepal, Netherlands, Sri Lanka, Vietnam, Singapore, Germany, EU (4/99)
3	65184	Syn stap(<85%)yarn bulk	China, USA, Indonesia, Vietnam, Hong Kong, Italy, Thailand, EU, Turkey, Nepal (14/98)
4	65182	Syn stap(>85%)yarn bulk	China, Indonesia, Turkey, India, Slovak Republic, Germany, Italy, Romania, EU, Spain, Nepal (16/85)
5	5996	Mixtures of diff juices	Netherlands, Saudi Arabia, Germany, USA, EU, Spain, UAE, South Africa, UK, Belgium, Nepal(15/138)
6	65312	Woven fabr frm strip etc	China, European Union, India, Belgium, Germany, Netherlands, Italy, Turkey, UAE, Spain, Nepal(16/101)
7	7414	Black tea, bulk	Kenya, Sri Lanka, India, China, Vietnam, Argentina, Indonesia, Germany, Malawi, Uganda, Nepal(16/120)
8	84612	Shawl/scarf/etc not kn/c	China, EU, India, Italy, France, Germany, UK, Hong Kong, Turkey, Spain, Nepal (17/134)
9	65811	Jute etc sacks/bags	India, Myanmar, EU, UK, Nepal, Cote d'Ivoire, Pakistan, El Salvadore, China, Netherlands(5/108)

10	59814	Rosin/resin acid/oil/der	China, USA, Brazil, Portugal, EU, Indonesia, Netherlands, Belgium, Sweden, Finland, Nepal (18/83)
11	67413	Zinc coated steel w>600	China, Korea Rep, Belgium, Netherlands, Italy, Germany, EU, Japan, India, Other Asia nes, Nepal (52/113)
12	8136	Oil cake of rape/colza	Canada, Germany, Belgium, Poland, UAE, EU, India, France, Czech Republic, Netherlands, Nepal(18/63)
13	85151	Footw text up,ru/pl sole	China, Vietnam, European Union, Italy, Germany, Indonesia, Belgium, Netherlands,Spain, France, Nepal (48/132)
14	65719	Felt impregnated etc	China, Italy,United State, European Union, Turkey, Spain, Saudi Arabia, Germany, Australia, Nepal(10/87)
15	29299	Veg material/product nes	Indonesia, Malaysia, Mexico, Kenya, Peru, China, Sri Lanka, Netherlands, India, Chile, Nepal (18/112)
16	5424	Dried lentils	Canada, Australia, Turkey, USA, Kazakhstan, Russian Federation, Mexico, UAE, Belgium, China, Nepal (16/94)
17	54291	Medicaments nes non-ret.	Israel, Germany, EU, USA, Spain, UK, Belgium, France Switzerland, Netherlands Nepal(37/116)
18	68252	Alloy copper sheet etc	Germany, EU, Japan, Korea, Rep., USA, Hong Kong, China, Other Asia, nes, China, Italy Singapore Nepal (29/98)
19	29249	Pharmacy plants nes	Egypt, Arab Rep. Mexico, Singapore, Vietnam, Ukraine, Nepal, Uzbekistan, European Union, Hungary, Tunisia(6/80)
20	8195	Dog/cat food, retail	Germany, France, USA, European Union, Thailand, Netherlands, China, Poland Belgium, Canada Nepal (48/127)
21	25119	Waste nes/unsorted	USA, EEU, UK, Netherlands, Germany, Japan, Canada, United Arab Emirates, Belgium, Poland, Nepal(48/127)
22	84843	Knit/croch/lace/etc hats	China, Vietnam, EU, Germany, Netherlands, Italy, Belgium, Hong Kong, China, UK, France, Nepal(37/137)
23	65813	Manmade text sacks-bags	China, India, Vietnam, Turkey, Iran, Islamic Rep., Thailand, Belgium, Mexico, Germany, United States, Nepal(60/133)
24	1122	Beef, frozen, boneless	Brazil, India, Australia, USA, New Zealand, Uruguay, Argentina, Paraguay, European Union, Nicaragua, Nepal(45/107)
25	61141	Tanned bov/equin leather	United States, Brazil, European Union, Germany, Australia, Italy, France, Netherlands, Canada, Spain, Nepal(69/121)
26	66521	Glass-ceramic table ware	China, EU, Egypt, Arab Rep., France, United States, Saudi Arabia, Poland, Jordan, Turkey, Netherlands, Nepal(12/111)
27	8119	Fodder-veg residues	China, Argentina, Brazil, USA, Iran, Islamic Rep., Netherlands, Sweden, EU, Denmark, Germany, Nepal(25/93)

28	65751	Twine/cordage/rope/cable	China, EU, Portugal, United States, Korea, Rep., India, Germany, Ghana, Thailand, Czech Republic, Nepal (54/147)
29	89611	Paintings/drawngs/pastel	EU, USA, United Kingdom, Switzerland, France, Germany, Hong Kong, China, Japan, Singapore, Italy, Nepal(36/135)
30	76432	Radio transceivers	China, Hong Kong, China, Vietnam, EU, Netherlands, UAE, Germany, USA, Korea, Czech Republic, Nepal(73/145)

"How competitive are Nepali export items in the global market?" is reflected in terms of rank among the competitors. Table 5 is a summary of those 30 identified products. It can be one of the proxies to the competitiveness of export.

The carpet group ranks the top product of Nepal in terms of the value of the export. Out of 90 exporters, Nepal's position is 4th, which is quite a commendable position. Similarly, the second largest export item for Nepal, which is related to Cardamoms. Nepal is in the 4th position in the global picture out of 99 competitors. The Yarn Bulk-related product is third by export volume. The competitiveness is 14th out of 98 exporters. The Syn stap (>85%) yarn bulk is the fourth-largest product having 16th position. The Mixtures of diff juices stands the fifth-largest product. Among the 85 exporters, Nepal stands out at 16th position only.

The sixth-largest product is Woven fabric from strip etc, Nepal's position was only 16th out of 101 exporters in 2017. The Black tea, bulk is the seventh export item by export value. However, Nepal falls into 16th rank out of 120 exporters. The eighth export item is Shawl/scarf/etc, not kn/c. Again, out of 134 exporters of similar items, Nepal falls into the 17th position.

The ninth-largest export item of Nepal is a Jute-related product. Out of 108 exporters of such items, Nepal's position is 5th. And, the tenth product is Rosin/resin acid/oil/der however, the rank among the exporters is only 18. Therefore, out of the top ten export items, we have a competitive edge in a couple of them alone.

The Felt impregnated etc (5424) is the top 14th product of Nepal in terms of export value. Nepal's rank among 87 exporters is at 10. The Pharmacy plants nes (29249) is 19th item in terms of export value; however, among 80 exporters, Nepal is in the sixth rank. The Glass-ceramic tableware (66521) has a high export potential that among 111 exporters, Nepal stands at 12th position by export value. And, the Fodder-veg residuals (8118) is the 27th larger product of Nepal. The global position among the 93 exporters, Nepal falls into the 25th one.

5. Conclusion

The findings of the total linkages analysis, forward linkages, and backward linkages analysis suggest the importance of the products and industries in the Nepalese economy. The primary sector and trade sectors have larger linkages. The value adds analysis also indicates the same. The value-added from the linkages shows the import value added is higher than the export value-added, which in fact, is the cause of the trade deficit in the country.

The Zinc coated steel w>600 (67413) is the eleventh largest export item in 2017. It used to be the first largest item in 2010 decreased to 12th in 2015 and 18th in 2016. It used to occupy an 11.12 percent share of the total export of Nepal during 2010 and it is only 2.51 percent in 2017.

The cardamoms group (7525) is the second-largest export item of Nepal in 2017. It used to be second largest in 2016 and 2015 as well. One of the primal products of NTIS-2010, cardamom used to be the 8the largest commodity by volume that year. The Syn stap (<85%) yarn bulk (65184) records as the third largest trade item of Nepal in 2017. It used to be seventh in 2016 followed by sixth in 2015. It improved the rank from 20th in 2010 by volume, the share in the total export is also improved significantly from one percent to more than six percent in 2017.

The Waste nes/unsorted (25119), Beef, frozen, boneless (1122), Fodder-veg residues (8119), and Radio transceivers (76432) products emerged in 2017 as 2st, 24th, 25th, 27th, 29th, and 30th exported item in Nepal. Tanned bov/equin leather (61141) and Paintings/drawngs/pastel (89611) are 25th and 29th item in 2017 which were not in top 30 list in 2016 though were in 2015. Therefore, these are unstable items in exportable goods.

Based on the analysis, the potential export items already identified by MoCS/GoN (2010) and justified by MoCS/GoN (2016) are repeated. The carpet remains the prime product. Adds value and exports with a high value. The peculiar Nepal aromatic herbal and spices group is second. The cardamom is always in our basket. However, nutmeg seems another product for export potential.

Guiding the overall trade strategies based on the linkages focusing on high value to weight products may be a good way to enhance the export performance in the country. As we know, export performance is a crucial issue for economic development in this globalization era. There are many potentialities in Nepal for better export performance, but the challenges remain to channelize them into the basket of the opportunities. The ways to face the challenges may be to link all export-oriented activities based on the backward and forward linkages of the products focusing on high value to weight products, focusing on the manufacturing-based infrastructure, institution buildings to suit the linkages, tailoring the export incentive mechanism matching with

the linkages priority, managing the bilateral trade agreements to suit the national needs to boos the exports and so on.

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Annex

Extension on methodology

When the proto-type of the input-output table of NxN matrix as a transaction table, representing

Production function as Column-wise:

$$X_1 = f_1(X_{11}, X_{21}, \ldots\ldots\ldots\ldots\ldots\ldots\ldots.X_{n1}, L_1)$$

$$X_2 = f_2(X_{12}, X_{22}, \ldots\ldots\ldots\ldots\ldots\ldots.X_{n2}, L_2)$$

$$X_n = f_n(X_{1n}, X_{2n}, \ldots\ldots\ldots\ldots\ldots.X_{nn}, L_n)$$

And, the equality of supply and demand as row-wise;

$$X_1 = X_{11} + X_{12} + \ldots\ldots\ldots\ldots\ldots..\ldots\ldots. + X_{1n} + D_1$$

$$X_2 = X_{21} + X_{22} + \ldots\ldots\ldots\ldots\ldots..\ldots\ldots. + X_{2n} + D_2$$

$$X_n = X_{n1} + X_{n2}, + \ldots\ldots\ldots\ldots..\ldots\ldots\ldots.. + X_{nn} + D_n$$

The matrix representation becomes where , X_i = Total output of ith sector ; X_{ij} = output of ith sector used as an input by the jth Sector ; D_i = Final Demand of the ith Sector and L_i = Primary input requirements (labor) of the ith sector. The input Coefficient Matrix (a_{ij}) becomes $X_{ij} = a_{ij} X_j$. With the help of this relationship, the transaction table can also be represented in terms of input coefficients. Thus, we expressed the transaction table into input coefficient matrix as:

Table XX: Transaction table in terms of input coefficients:

_____

       Input requirements of sectors Final demand (D)

_____

industries (X) X_1 X_2 .……....……....X_n

_____

_____

X_1	$a_{11}X_1$ $a_{12}X_2$ ....$a_{1n}X_n$	D_1
X_2	$a_{21}X_1$ $a_{22}X_2$ ....$a_{2n}X_n$	D_2

X_n	$a_{n1}X_1$ $a_{n2}X_2$ ....$a_{nn}X_n$	D_n

_____

Total

Primary(L)　　　l_1X_1　l_2X_2 .... l_nX_n 　　　　　　　　—

The structure of the input-output system is depicted by the input coefficient matrix:

$$A = [a_{ij}] = \begin{bmatrix} a_{11} & a_{12} & --- & a_{1n} \\ a_{21} & a_{22} & --- & a_{2n} \\ -- & -- & -- & -- \\ a_{n1} & a_{n2} & --- & a_{nn} \end{bmatrix}$$

If no industries uses its own product as an input then the elements in the principal diagonal of matrix A will all be zero:

$$A = \begin{bmatrix} 0 & a_{12} & a_{13} --- & a_{1n} \\ a_{21} & 0 & a_{23} --- & a_{2n} \\ --- & --- & --- & --- \\ --- & --- & --- & --- \\ a_{n1} & a_{n2} & a_{n3} ---- & 0 \end{bmatrix}$$

In the input coefficient matrix the sum of elements in the columns must be less than 1

i,e, $\sum\limits_{i=1}^{n} a_{ij} < 1$　$(j = 1, 2, ...n)$.

and $1 - \sum\limits_{i=1}^{n} a_{ij}$ is the value of the primary input needed.

Now, the matrix multiplication of matrix L=| I – A| is the sources of linkages. The row-wise summation of the inverse matrix gives the forward linkages and the column-sum gives the the backward linkages of the economy.

The gross value add (GVA) is a common indicator of an industry's or sector's economic performance. While an economy's total GVA is always equal to its total final use, an individual industry/sector's GVA is usually not equal to its final use. Yet an accounting identity between an industry/sector's GVA and the final use of multiple industries/sectors can be established by a gross value added-final use (GVA-FU) matrix (Cai & Leung, 2020). We calculated the GVA for export and import volume following the Nguyen and Wu (2018).

The value-add analysis is captures as the gross output of each industry minus its inter -industry purchases is value added by the industry. Technically,

$$\text{or}, V = \left[X_1 + X_2\right] - \left[X_{11} + X_{21} + X_{12} + X_{22}\right]$$

Value added is also the summing up of the total factor payments. Thus, Value added in this sense is the total primary input payments by the industry or the system. If V is total value added, then in case of two industry:

$$V = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} X_1 & X_2 \end{bmatrix} \begin{bmatrix} l_1 w \\ l_2 w \end{bmatrix}$$

And can be extended to:

$$V = \begin{bmatrix} X_1 X_2 X_3 .... X_n \end{bmatrix} \begin{bmatrix} l_1 w \\ l_2 w \\ -- \\ l_n w \end{bmatrix}$$

The value-add analysis and linkages analysis exercise is made using excel. Necessary graphs and tables were also prepared based on this analysis.