Territorial Development - JRC Policy Insights

TERRITORIAL DEVELOPMENT INSIGHTS SERIES - FEBRUARY 2020

AN INPUT-OUTPUT SECTORIAL ANALYSIS OF NORTH MACEDONIA

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- The European Commission's Joint Research Centre (JRC) is supporting an Innovation Agenda for the Western Balkans (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia and Serbia).
- Smart Specialisation is the European Union (EU) place-based policy aiming at more thematic concentration in research and innovation (R&I) investments via the evidence-based identification of the strengths and potential of a given economy.
- Access to data and economic analysis are key to a better identification of both current and future socio-economic policy challenges.
- The EU Instrument for Pre-accession Assistance (IPA) supports reforms in the enlargement countries with financial and technical help.
- Out of the almost €4000 million of EU financial support to Western Balkans over the programming period 2014-2022, €664 are destined to North Macedonia.
- Economic modelling simulations using national Input-Output data for North Macedonia show the potential benefits related to investments in the country. The analysis uses a detailed sectorial disaggregation.

1. Policy context

North Macedonia is part of the so-called Western Balkan economies together with Albania, Bosnia and Herzegovina, Kosovo, Montenegro, and Serbia. Four of them have applied for future membership of the EU (application dates in parenthesis): North Macedonia (2004), Montenegro (2008), Albania (2009), and Serbia (2009). The other two are considered potential EU candidates.

The EU is supporting reforms in the Western Balkan economies. The European Commission's JRC is supporting an Innovation Agenda for the Western Balkans in cooperation with the Directorate-General for Neighbourhood and Enlargement Negotiations (DG NEAR). The main idea is that a successful structural transformation of the economies of the area, including North Macedonia, must be driven by innovation.

Work is concentrating on innovation policies and on improvements of the R&I efforts. The aim is to create efficient governance mechanisms for R&I policy by reaching out to the business sector and other important stakeholders of the innovation ecosystem for sustainable development and to ensure the continuity of policy monitoring and evaluation cycle.

*: This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

The EU tool used during the 2014-2020 programming period is IPA II which is prepared in partnership with the beneficiaries and builds on the previous IPA which worked for the 2007-2013 programming period.

Of the almost €12 billion allocated to the full IPA II program, almost €664 million are destined to North Macedonia and cover eight priority sectors: 1) democracy and governance, 2) rule of law and fundamental rights, 3) environment and climate action, 4) transport, 5) competitiveness and innovation, 6) social development, 7) agriculture and rural development, and 8) regional and territorial cooperation.

This Policy Insight presents an analysis of the potential effects of public investment in North Macedonia with a focus on the linkages among the various sectors of the economy. An Input-Output (IO) model based on official data of the country statistical office referring to the year 2016 is used to assess the economic benefits of a money injection related to investment and, in fact, any demand category.

This analysis can be considered as useful in the context of the application of the Smart Specialisation strategy, the EU place-based territorial innovation policy advocating a focus of public investment in R&I on a few carefully chosen priority domains where the impact can be the greatest (Gianelle et al., 2016).

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The Smart Specialisation process in North Macedonia started in March 2018 with a letter of commitment from the country's government on starting the development of the National R&I Strategy for Smart Specialisation (RIS3) to the JRC. The government intends to adopt its RIS3 in 2020 by following the JRC methodological framework for Smart Specialisation in the EU enlargement and neighbourhood countries.

The population of North Macedonia in 2016 was estimated at 2.08 million with a GDP per capita of €4.691, about 16% of the EU average. However, the average annual real growth rate of the economy over the period 2008-2016 has been substantially higher than the EU average, being equal to 2.57% as opposed to 0.64% in the EU. Over the same period, the exports of the country have grown at a particularly high rate, more than 7.11% on average. Household consumption has also recorded a substantial growth rate of 1.45% (almost three times the EU average which was 0.54%). Given these numbers, the impact of the IPA II policy injecting about €664 million over nine years could be substantial.

The economic analysis reported in this Policy Insight is an update of the one featured in the report on the support of an innovation agenda for the Western Balkans published in 2018 (Matusiak and Kleibrink, 2018). The analysis has been carried out by means of a Leontief IO model applied to 2016 data for North Macedonia. The model covers 64 sectors and results are reported using less detailed sectorial aggregations for the sake of brevity.

2. The modelling assumptions

An IO model can be used to study the effects of investment and, more in general, of any demand-side injection of money in the economy. This modelling framework originally proposed by Leontief (1936) was created to study the relationships among the various industries of an economy, which remains its main use today. The interindustry transactions table constitutes the bulk of an IO dataset and contains information on the flows of products from each industrial sector, considered as a producer, to each of the sectors, considered as consumers. The data also include information on the sales by the sectors to the various categories of final demand, and on value added (the non-industrial inputs to production such as labour, capital, indirect taxes, and imports).
As explained by Mandras et al. (2019), using an IO dataset solving a system of linear equations based permits to carry out a number of different economic analyses mainly based on the so-called IO output multipliers. The economic effects of a change in demand such as in investment project in a certain sector can be analysed via multipliers which quantify the knock-on effects throughout the economy on aggregate and sectorial activities generated by the initial change in final demand.

The initial increase in demand for a certain sector (the so-called direct effect) generates additional economic activity in all the rest of the sectors that must produce intermediate inputs for the final products of that initial sector (this is the indirect effect). The sum of the direct and indirect effects divided by the initial change in demand is normally referred to as type-I multiplier.

Type-II multipliers can be calculated by relaxing the assumption of exogenous final demand: for instance, it can be assumed that household consumption reacts to the increase in production and income, so that final demand increases even further (induced effect). This alternative multiplier can be calculated as the sum of direct, indirect, and induced effects divided by the direct effect and it's always larger than the type-I multiplier.

This brief introduction to IO modelling should have clarified that the strengths of the approach lie in its ability to study the supply chain linkages and to produce detailed sectorial results. It should be noted that the results rely on a number of assumption such as fixed production techniques, constant returns to scale, and the absence of any supply constraint. This should be kept in mind when looking at the results of any IO analysis, including the ones illustrated in the next section.

The policy impact of this research

The main results of this analysis are an update of those featured in the report on the support of an innovation agenda for the Western Balkans published in 2018 (Matusiak and Kleibrink, 2018). The report includes data and analyses for all the economies of the Western Balkans, with a specific focus on the challenges and good practices related to innovation policies to transform territories.

3. Main results

Matusiak and Kleibrink (2018) identified both specialised industries with critical mass and emerging industries with increasing degrees of specialisation and relative size. By taking advantage of this work at the three-digit NACE 2 sector level, the results of the IO analysis presented below concentrates on the macro-sectors containing the industries for which North Macedonia exhibits either current or emerging strengths (reported in Table 1 below with the pertaining two-digit NACE 2 sectors in parenthesis).

Table 1: Identified economic specialisations - North Macedonia

Current strengths:
Manufacture of clothes except fur (C13-15)
Retail in other household articles in specialised stores (G47)
Retail in other goods in specialised stores (G47)
Freight transport by road and removal services (H49)
Restaurants and mobile food service activities (I56)
Emerging strengths:
Plant propagation (A01)
Services in agriculture and post-harvest crop activities (A01)
Manufacture of electric components and boards (C27)
Manufacture of other general purpose machines (C28)
Manufacture of other parts/accessories for motor vehicles (C29)
Steam and air conditioning supply (D35)
Wireless telecommunication services (J61)
Renting and operating of own or leased real estate (L68)
Management of real estate on a fee or contract basis (L68)

Source: Matusiak and Kleibrink (2018).

Type-I and type-II output and value added (VA) multipliers for the specialised sectors of the economy of North Macedonia are reported in Table 2 below. The table also contains information on the transmission mechanism of the indirect effects in the rest of the economy are reported. The data used for the analysis come from the official Supply and Use tables of the country for the year 2016 (latest available) published by the national statistical office. Note that in order to calculate the multipliers, we firstly transformed these tables into a symmetric IO table.

Looking at type-I output multipliers, we can see that the manufacture of machinery and equipment (C28) sector has the highest multiplier (1.96), meaning that investments in this sector may be expected to have the greatest impact on the rest of the economy. When Household final demand is treated as endogenous so that induced effects are included in the analysis, the sector with the highest output multiplier is the food and beverage service activities sector (the I56 type-II output multiplier is equal to 3.73). This information should be used as an indication of the potential effects on the economy of boosts in the sectoral activities of the economy, with the potential effects depending on the kind of strategies that the policy-makers decide to implement.

Table 2: IO multipliers - specialised and emerging sectors

NACE 2 Sector	Sector Indirect effect	Industrial support effect	Type-I output mult.	Type II output mult.	Type I VA mult.	Type II VA mult.
Current strengths						
C13-15	0.267	0.225	1.49	3.39	0.46	0.96
G47	0.002	0.604	1.61	3.11	0.78	1.17
H49	0.119	0.631	1.75	2.88	0.46	0.76
I56	0.025	0.820	1.85	3.73	0.65	1.15
Emerging strengths						
A01	0.242	0.376	1.62	1.93	0.67	0.76
C27	0.046	0.270	1.32	1.57	0.10	0.17
C28	0.140	0.818	1.96	2.21	0.17	0.23
C29	0.193	0.377	1.57	2.43	0.22	0.45
D35	0.076	0.588	1.66	2.85	0.54	0.86
J61	0.155	0.490	1.65	2.94	0.64	0.99
L68	0.003	0.558	1.56	2.79	0.80	1.13

Source: JRC elaborations based on official Supply and Use tables published by the National Statistical Office of North Macedonia.

As an example of the multipliers' interpretation, consider an increase of €1 in final demand of the agricultural products sector (A01). The type-I output multiplier for this sector indicates that a change in final demand of €1 induces an increase in total output of €1.62. This means that, in order to produce an additional unit of output in the target sector, the national economy's output must increase by an additional €0.24 in order to provide inputs to the sector itself, and by €0.38 in all stages of the supply chain to provide inputs to the suppliers of the sector.

The value of the type-I output multiplier is the sum of the direct effect (1.00), the indirect effect on the sector where a change of final demand is assumed (0.24), and the industrial support effect (0.38). This highlights the importance of considering the inter-industry linkages in an economy in an economic impact analysis. The same logic applies for all the other sectors of the economy as well as for type-II multipliers. Considering the same example, when households' consumption is assumed to react positively to the demand increase, the final effect of the initial €1 increase in demand would be much higher and equal to €1.93.

It is generally more interesting to analyse the economic impacts of changes in final demand in terms of increased VA rather than simply gross output. Looking at the type-II multipliers, the effect of €1 invested in the manufacture of clothes sector generates an increase in total value added of €0.96 (considering direct, indirect, and induced effects). It is

a standard result for the VA multiplier to be lower than the output multiplier mainly because the intermediate goods and services enter the calculation of output, but not that of VA.

4. Conclusions

The analysis summed up in this Policy Insight provides an initial idea of the potential impact of a positive demand shock in the economy of North Macedonia. This can be used to give the policy makers a first intuition of the potential effects of any investment project and to understand better the nature of the inter-industry relationships of the country.

This analysis fits into the broader framework of the IPA II policy for the Western Balkans which sees an active role of the European Commission's JRC to support the economic transformation of the economies of that region thanks to innovation and growth policies.

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Read more

Gianelle, C., Kyriacou, D., Cohen, C., and Przeor, M. (ed.) (2016). Implementing Smart Specialisation: A handbook. Brussels: European Commission, EUR 28053 EN, doi:10.2791/610394.

Mandras, G., Conte, A., and Salotti, S. (2019). The RHOMOLO-IO modelling framework: a flexible Input-Output tool for policy analysis. JRC Working Papers on Territorial Modelling and Analysis No. 06/2019, European Commission, Seville, 2019, JRC117725.

Matusiak, M. and Kleibrink, A. (ed.) (2018). Supporting an Innovation Agenda for the Western Balkans: Tools and Methodologies. Publications Office of the European Union, Luxembourg 2018, ISBN 978-92-79-81870-7, doi:10.2760/48162, JRC111430.

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