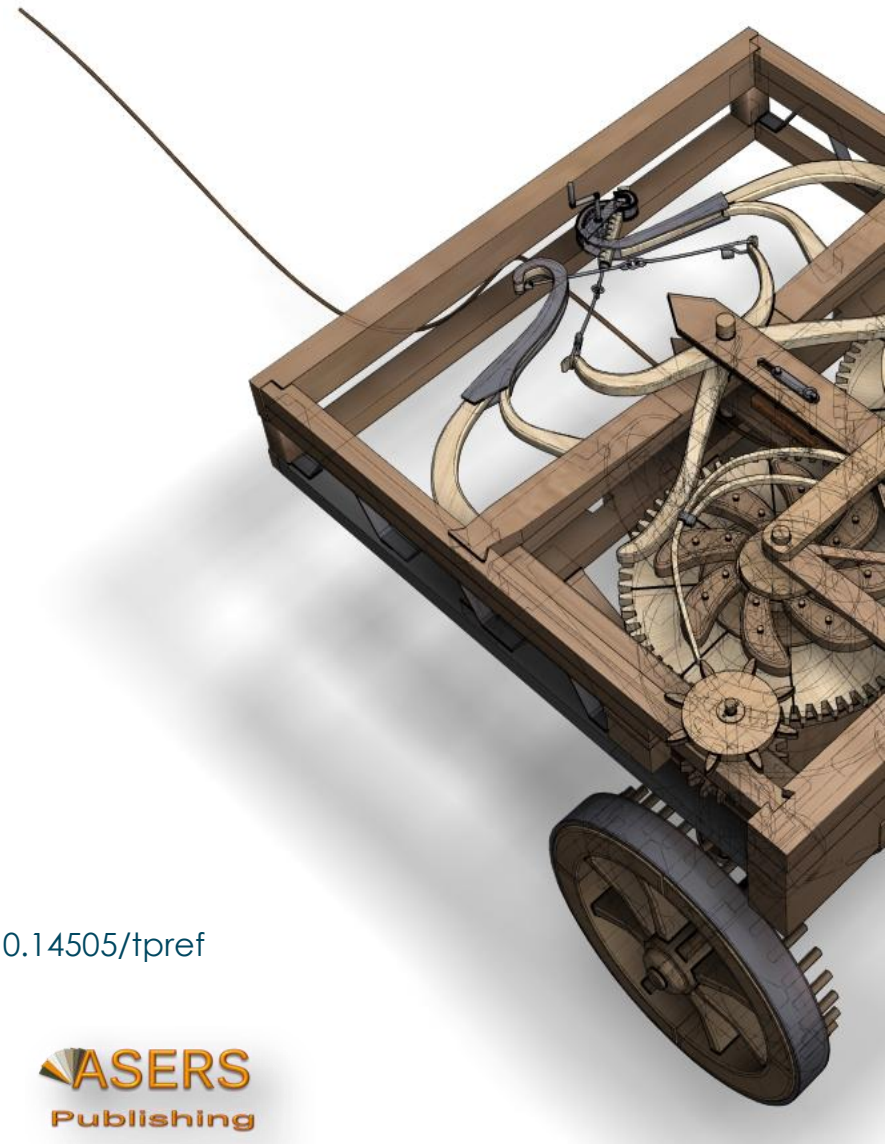
Theoretical and Practical Research in Economic Fields



Quarterly
Volume XVI
Issue 3(35)
Fall 2025

ISSN: 2068 – 7710
Journal DOI: https://doi.org/10.14505/tpref

ASERS
Publishing

Volume XVI
Issue 3(35)
Fall 2025

ASERS Publishing
ISSN 2068 – 7710
Journal's Issue DOI:
https://doi.org/10.14505/tpref.v16.3(35).00

Table of Contents

Volume XVI
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ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7710
Journal's Issue DOI:
https://doi.org/10.14505/tpref.v16.3(35).00

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Volume XVI, Issue 3(35), Fall 2025

DOI: https://doi.org/10.14505/tpref.v16.3(35).13

Contemporary Analysis of Economic Multipliers in the Jordanian Economy: An Updated Input-Output Approach

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Article info: Received 22 June 2025; Received in revised form 7 July 2025; Accepted for publication 20 August 2025; Published 30 September 2025.

Abstract: By means of an input-output model, this study seeks to identify the most influential sectors in the Jordanian economy based on the value and direction of their multiplier effects. The analysis is based on the third 73 sector 2016 input-output table released by the Jordanian Department of Statistics as its core dataset. Through the use of this framework, the research identifies the key industries capable of stimulating production growth, stimulating income generation, and fostering employment creation, given the current macroeconomic backdrop, i.e. high levels of poverty and unemployment. The results show that production and infrastructure sectors have highest total and net multipliers, respectively, reflecting their significant position in intersectoral relations and in boosting aggregate demand. These findings are a reference base to set investment and resource allocation priorities in policy making. The originality of the work lies on a revised interindustry analysis applied on Jordan's current economy dimensions pertinences and problems, in a way different from the previous approaches, which were more generalists. The study is limited in that it is bound to the timescales of the data available and the poor representation of informal economic activities. However, the results also have practical use for economic planning and structural policy and more widely in societal terms regarding the capacity of each sector for employment generation and regional equalization.

Keywords: economy; multiplier; model; input; output; sustainability.

JEL Classification: C67; E01; O53; R15; J21.

Introduction

The current economic problems of Jordan require reconsideration of the instruments of macroeconomic analysis for increasing efficiency of government policies of development. Significant unemployment, notably of young people and graduates, structural weaknesses in manufacturing, a reliance on external support and an uncertain regional environment put the onus on accurate policy responses for specific economic stimuli. In these cases, the role of instruments that provides us with well assessment of which sectors have the capacity to have a multiplier effect for the production, employment and income growth becomes indispensable (Tarawneh, 2022) Still one of the most appropriate instruments to study intersectoral relationships is the model I - O * imposed by V. Leontief and modified, in its various chores, to the national economic systems. The growing importance of I - O analysis for the region in terms of national planning and industrial development programmes not only results from the enhanced profile of I - O analysis in Jordan (namely by national institutions) but also from its popularity among international institutions involved in the context of national and regional planning in Jordan, prior applications of input-output (I–O) analysis have been limited. While several studies have addressed the use of I–O models in the Jordanian setting, much of the existing literature remains predominantly empirical and often relies on outdated data or overly aggregated frameworks. These approaches frequently overlook the structural transformations that have taken place in the Jordanian economy in recent years. At the same time, Jordan has undertaken notable steps toward updating its sectoral strategies -particularly in the areas of industry, logistics, and renewable energy - reflecting a shift toward more modern and diversified economic policies. This warrants for a new calculation of multiplier effects of the most recent input-output table (Awawdeh & Alkass, 2017). The aim of this study is to present updated quantitative evidence to assess the economic multipliers in Jordan using its official input-output table 2022 compiled by the Department of Statistic. The objective is to pinpoint the branches most likely to promote such effects on total output, employment, and income via a whole sequence of industrial interrelations. The method employed permits us to evaluate not only the direct but also the indirect impacts of the variation of the final demands, since these last ones are on all the sectors of the economy. Current study is different from the earlier approaches in that it uses finer level of disaggregation in terms of structure and makes use of more up to date techniques in the estimation of net and gross multipliers thereby making the policy recommendations with respect to formulation of industrial or for that matter investment policies more meaningful. An essential part is thus the qualitative interpretation, not only the quantitative assessment, of the results in terms of social and regional policy. Hence the paper adds value to applied economics and planning by providing a well grounded and data supported view of the priority areas of economic activity in Jordan. Thus, the discussion on what the policy can be for sustainable and inclusive developed on the joint structural advantages of the national economy can proceed a pace.

1. Research Background

The input–output (I - O) model developed by V. Leontief remains one of the most universal tools for quantitative analysis of economic structure and inter-industry links. Since its inception, this model has been adapted to solve a wide range of problems, from industrial policy planning to assessing the impact of structural changes on national income, employment, and investment. The I–O framework is well suited for capturing the ripple impacts of changes in final demand on each economic sector as shown by (Miller & Blair, 2022). This includes direct and induced effects, making it particularly useful to estimate economic multipliers. Internationally, significant interest exists in the use of I–O models in developing countries, since the development of intersectoral and intersectoral linkages among sectors is crucial to fostering balanced and inclusive growth. In the MENA region, it has been previously stressed that it is crucial to determine high-multiplier sectors to promote stability and development in countries typically characterized by limited resources and influenced by external shocks (Tarawneh, 2022; Global Solutions Initiative, 2023). However, I–O analysis is relatively undeveloped in Jordan. While there are several empirical studies available, these work in turn with either very outdated data or highly aggregated model classes, so that they are often of little use for the current economic policy. (World Bank, 2024) observed that multiplier effects in Jordan are highly contingent on import content, the share of informal employment, and variation in business environment over time. There are few sector-specific analyses: (Department of Statistics, Jordan, 2025; IMF, 2022) who investigated agricultural multipliers, finding low economy-wide effects. However, the nature of the Jordanian economy has transformed greatly in recent years with the growth of the services sector, infrastructure growth, and changing labor market dynamics. While attempts were recently made to update multiplier estimates (*e.g.*, World Bank, 2021), this is often based on regional averages, now outdated, that fit less well for national figures. In addition, numerous studies provide insufficient sectoral detail and do not properly consider recent developments including tax reform, energy strategy change, and import dependency (Mohtadi & Marquez, 2020).

This points to a particular lack in the literature: the lack of a complete and updated set of multipliers based on up-to-date input-output data that reflect the actual structure of the Jordanian economy. Efforts to narrow this gap are particularly critical with current unemployment and under investment challenges. This paper contributes toward furthering this orientation by empirically examining sectoral multipliers based on the 2016 input-output table, which we believe will provide useful information toward the making of evidence-based economic policy.

2.Materials and Methods

The research methodology is based on the application of inter-industry input-output (I–O) analysis, which provides a framework for evaluating the calculated quantitative multipliers of Jordan's economic sectors in terms of total output, employment, and value added. Considering the need to modernize analytical tools in the context of post-crisis recovery and evolving sectoral dynamics, particular emphasis is placed on refining and adapting the classical Leontief model to the current structure of the national economy. For this purpose, the empirical analysis relied on the Input-Output table (2022) as transmitted by the Jordan Department of Statistics. The table consists of 26 sectors, so that excessive aggregation is prevented and inter-industry relationships can be analyzed more accurately. In the first stage of analysis, we constructed a coefficient technological matrix (A) which represented direct inter-industry requirements. According to this $(I–A)^{-1}$ the inverse Leontief matrix was solved with which the total multipliers for each sector were computed. The following multipliers were used in the analysis: gross output multipliers; employment multipliers; added value multipliers (OECD, 2017). Second in the procedure was the use of direct and indirect link structural analysis using the Rasmussen and Hirschman approaches. This enabled the determination of the dominant and linkage sectors and an evaluation of the potential of their influence on economic movements given a specific demand to be stimulated. Unlike previous studies, this analysis also incorporates elements of disaggregation analysis: the internal sub-structure and its contribution to the multipliers of the series of partial key sectors (industry, transport, and construction) elements were examined. This improved the precision of the estimation of cross-sectoral effect and created conditions for public policy priorities. Allowance for the incomplete coverage of the informal sector and lag between structural changes and statistical data was made in that study. But the application of the official 2022 input-output table is so far from the most reliable foundation for economic modeling in Jordan. The method is an ideal knowledge synthesis of a method that is proven in theory with an empirical implementation to the national level which generates not only quantitative estimates but also interpretative conclusions for applied economic policy making and planning. This study seeks to estimate multipliers in the Jordanian economy so as to know which economic sectors have the most impact in terms of production, income, and employment (Ramadan & Qudah, 2021) and Provide policymakers with knowledge necessary for informed decision by channeling final demand into where it gets the most economic impact (Omar & Qudah, 2019). For example, favoring demand for the highest-income-multiplier products can stimulate income expansion and the growth of the economy. The Jordanian economy encounters several structural problems such as a relatively poor production capacity that is incapable of satisfying local demand, increasing unemployment, and static incomes (Sallam & Al-Ajlouni, 2019). These financial barriers impede sustainable development and economic progress. In dealing with these challenges, this article offers useful input to policymakers and planners aiming at how to refocus and to come up with the critical sectors that are capable of spurring production, income growth and employment. By concentrating on these types of productive sectors, policymakers can enact sound policies that will encourage economic growth and long term macro-economic stability more generally.

3. Research Methodology

Input-Output (I-O) tables provide a comprehensive set of data on the production and use of commodities that is at the same time produced in an economy or used as inputs for further production. These tables include detailed information on supply and demand for commodities, inter-industry transactions, and a variety of derived indicators, such as input-output multipliers. This kind of information is necessary for economic planning, policy failures' reasons finding, and forecasting models' construction (Shaban & Aljarrah, 2020). The present paper makes use of the Input-Output Tables released by the Jordanian Department of Statistics, 2022. These tables, originally disaggregated in a number of economic categories, have been consolidated in 40 sectors according to the International Standard Industrial Classification (ISIC) system. This classification ensures homogeneity and can be reprised for a structured analysis of sector impacts on the Jordanian economy. The output multiplier for sector j is thus obtained as the sum over the elements in the column for sector j of ΔX divided by the intitial 1 JD of additional demand:

- Simple Output Multipliers

The so-called simple output multiplier accounts for both the direct and indirect output effects in the economy under the assumption that households are exogenous (Silva & Tenreyro, 2018). The so-called direct effect is the effect on production in sector j directly due to increased final demand, and the so-called indirect effect is the effect on production in other sectors which supply inputs to sector j. The simple output multiplier is then the ratio of the combined direct and indirect effects to the initial effect. Mathematically, let:

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad (1)$$

is the matrix of direct input coefficients of order 2*2, and

$$L = \begin{bmatrix} L_{11} & L_{12} \\ L_{21} & L_{22} \end{bmatrix} \cdot (I - A)^{-1} \quad (2)$$

Table 1. Simple Output Multipliers

Sector	Value	Sector	Value
Crop production	1.175744545	Wholesale trade	1.3951949
Animal production	1.7167398	Transportation by air, rail, pipeline, and water	1.605646
Mining and quarrying	1.47425163	Transport by road	1.26772202
Manufacture of coke and refined petroleum products	1.0712977	Warehousing, postal, courier, and transportation support activities	1.424143
Manufacture Processing and preserving of meat and fish	2.10822713	Accommodation	1.563702663
Other food products Manufacture	1.54921236	Food and beverage service activities	1.647114999
Manufacture of bakery products	1.938873003	Information and communication	1.30356666
Manufacture of beverages and tobacco	1.465780482	Financial and insurance activities	1.21019053
Manufacture of wood and paper and printing	1.796477	Real estate activities	1.16131047
Manufacture of chemicals and chemical products	1.65517185	Professional, scientific and technical activities	1.262356964
Manufacture pharmaceutical products	1.58017824	Administrative and support service activities	1.665910097
Manufacture of rubber and plastics products	1.463525202	Public administration and defence compulsory social security	1.34988826
Manufacture of other non-metallic mineral products	1.837020225	Education – Private	1.237936393
Manufacture of basic metals and fabricated metal products	1.44881356	Education – Government	1.085729856
Manufacture of other products	1.456694	Human health activities – Private	1.41403
Manufacture of wearing apparel, textiles, and leather	1.3239578	Human health activities – Government	1.385988
Electricity, gas, steam and air conditioning supply	1.220052	Arts, entertainment and recreation	1.669868
Water supply; sewerage, waste management and remediation activities	1.697365597	Other service activities	1.557149
Construction	1.85290062	Activities of households as employers of domestic personnel	1.0000
Retail trade	1.467308343	NPISHs - All activities	1.4285

Source: Jordan Department of Statistics, 2022; World Bank, 2021-23

ΔF represent an additional 1 JD of final demand for the output of a sector. For instance, $\Delta f(1) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ is an extra JD of final demand for the output of sector 1. The impacts for against each sector in the economy of an extra JD worth of final demand for any sector it output are:

$$\Delta x = (I - A)^{-1} \cdot \Delta f \quad (3)$$

The output multipliers for sector j are given by the sum of the elements of sector 1 colum $\Delta x(1)$ divided by 1 JD. The 1 JD in the denominator has the immediate effect on sector 1 output of the new JD's worth of final

demand for sector 1's product. The output multiplier for sector j emerges as the sum of the elements in the column of sector j in divided by the initial 1 JD extra demand:

$$OM_j = \sum_{i=1}^{n} L_{ij} \quad (4)$$

Table 1, made it so clear for Jordanian economy has (UNESCWA, 2020) Manufacture parties, thus conjure parties unparties, make will (i.e. or round import the and higher of low) in. This indicates that an increase in final demand for this industry's output has the largest total production impact throughout the economy.

- Total Output Multipliers

Total output multipliers are calculated on the basis of an input-output model, which is expanded to include an endogenous household sector in the system. This method, or the closed model, treats household real spending as endogenous interindustry transactions, instead of pure exogeneous final-filled demand. Therefore, the total output multipliers have another component added to them, the induced effect, that considers the role of household income as a producer of labor services (Miller & Blair, 1985).

Table 2. Total Output Multipliers

Sector	Value	Sector	Value
Crop production	4.9027	Wholesale trade	5.1345
Animal production	4.1664	Transportation by air, rail, pipeline, and water	3.9826
Mining and quarrying	5.003	Transport by road	4.169
Manufacture of coke and refined petroleum products	2.3598	Warehousing, postal, courier, and transportation support activities	4.4335
Manufacture Processing and preserving of meat and fish	4.5009	Accommodation	4.6989
Other food products Manufacture	3.9102	Food and beverage service activities	4.4038
Manufacture of bakery products	4.6705	Information and communication	4.6085
Manufacture of beverages and tobacco	4.4598	Financial and insurance activities	5.1856
Manufacture of wood and paper and printing	4.3644	Real estate activities	5.0647
Manufacture of chemicals and chemical products	4.6026	Professional, scientific and technical activities	4.7745
Manufacture pharmaceutical products	4.5558	Administrative and support service activities	5.0583
Manufacture of rubber and plastics products	3.3971	Public administration and defence compulsory social security	4.9126
Manufacture of other non-metallic mineral products	5.2367	Education – Private	5.0127
Manufacture of basic metals and fabricated metal products	3.7173	Education – Government	5.1757
Manufacture of other products	3.7978	Human health activities – Private	4.7497
Manufacture of wearing apparel, textiles, and leather	3.7045	Human health activities – Government	4.748
Electricity, gas, steam and air conditioning supply	3.1219	Arts, entertainment and recreation	5.1042
Water supply; sewerage, waste management and remediation activities	4.3828	Other service activities	5.2083
Construction	4.2487	Activities of households as employers of domestic personnel	5.2499
Retail trade	5.2211	NPISHs - All activities	4.9953

Source: Jordan Department of Statistics, 2022; World Bank, 2021-23

In this model, the technical coefficient matrix A is extended toward an augmented technical coefficient matrix Ā that grows by one column and one row to accommodate the household sector. The associated augmented Leontief-invertible inverse matrix is then given by:

$$\overline{OM_j} = \sum_{i=1}^{n+1} \overline{L_{ij}} \quad (5)$$

Ā is a square matrix of order (n+1)*(n+1). It has an added household row and column (the household is endogenous). And $\sum_{i=1}^{n+1} \overline{L_{ij}}$ is the column sum of the augmented Leontief inverse matrix, recorded for direct, indirect, and induced outputs. To Jordan's input-output tables are shown in Table 2. Results show that the Retail Trade sector has a (more than) 1 JD ripple ratio equal to (more than) 5.22 JD, in which a 1 JD increase in the

final demand for products of retail trade causes an increase of 5.22 in JD of total production in all sectors (including labour services provided by households). Then, very importantly, importance of retail trade in economic activity and associated income generation is underscored through induced household expenditure.

• Income Multipliers

Income multipliers seek to quantify the effects of final demand spending changes on income received by the household sector as a labor supplier (Miller and Blair, 1985), these will generate a series of changes in other sectors' production and labor income.

Table 3. Simple Income Multipliers

Sector	Value	Sector	Value
Crop production	0.877	Wholesale trade	0.8799
Animal production	0.5764	Transportation by air, rail, pipeline, and water	0.5593
Mining and quarrying	0.8303	Transport by road	0.6827
Manufacture of coke and refined petroleum products	0.3032	Warehousing, postal, courier, and transportation support activities	0.7081
Manufacture Processing and preserving of meat and fish	0.563	Accommodation	0.7377
Other food products Manufacture	0.5556	Food and beverage service activities	0.6487
Manufacture of bakery products	0.6428	Information and communication	0.7777
Manufacture of beverages and tobacco	0.7045	Financial and insurance activities	0.9354
Manufacture of wood and paper and printing	0.6042	Real estate activities	0.9185
Manufacture of chemicals and chemical products	0.6935	Professional, scientific and technical activities	0.8264
Manufacture pharmaceutical products	0.7	Administrative and support service activities	0.7982
Manufacture of rubber and plastics products	0.455	Public administration and defence compulsory social security	0.8383
Manufacture of other non-metallic mineral products	0.8	Education – Private	0.8882
Manufacture of basic metals and fabricated metal products	0.5338	Education – Government	0.9624
Manufacture of other products	0.5509	Human health activities – Private	0.7849
Manufacture of wearing apparel, textiles, and leather	0.56	Human health activities – Government	0.7911
Electricity, gas, steam and air conditioning supply	0.4475	Arts, entertainment and recreation	0.8081
Water supply; sewage, waste management and remediation activities	0.6319	Other service activities	0.859
Construction	0.5637	Activities of households as employers of domestic personnel	1.0000
Retail trade	0.8833	NPISHs - All activities	0.8393

Source: Jordan Department of Statistics, 2022; World Bank, 2021-23

Basic income multipliers can be developed by taking components from the Leontief inverse matrix$(I - A)^{-1}$, when the household sector is exogenous. This can be written mathematically as:

$$IM_j = h(I - A)^{-1} \quad (6)$$

Where: h' is a row vector of technical coefficients (of labor) income). h' is the row vector of technical coefficients labor income. Using equation (6) on the Jordanian Input-Output tables the results are illustrated in Table 3. These results display the effect of another JD in final demand for output of a sector. They calculate through which channels these direct and indirect effects, if expressed in terms of income increases, trickle down to workers in that sector. As an example, the income multipliers for Retail Trade sector are evidence where an additional JD of final demand for the output of this sector would lead to the creation of JD 0.88 worth new household income, including all direct and indirect effects in household income.

• Total Income Multipliers

In this multiplier calculation, the augmented matrix $(I - A)^{-1}$ is employed in the closed system, with the household sector treated as an endogenous variable. The estimates give the total income effect (combination of direct, indirect, and induced effects), known as the total household income multiplier (Yamano & Ahmad, 2021). This is given by the equation:

$$\overline{IM_j} = h(I - A)^{-1} \quad (7)$$

The values of these multipliers as presented in Table (4) indicate the total direct and indirect impacts on household income due to a one JD increase in final demand. So, if the final product demand for construction products increases by one JD, the workers in this sector will earn 1.22 JDs (That of the direct and induced effect of that demand increase).

Table 4. Total Income Multipliers

Sector	Value	Sector	Value
Crop production	1.8914	Wholesale trade	1.8977
Animal production	1.2432	Transportation by air, rail, pipeline, and water	1.2063
Mining and quarrying	1.7908	Transport by road	1.4724
Manufacture of coke and refined petroleum products	0.6539	Warehousing, postal, courier, and transportation support activities	1.5272
Manufacture Processing and preserving of meat and fish	1.2142	Accommodation	1.5911
Other food products Manufacture	1.1982	Food and beverage service activities	1.399
Manufacture of bakery products	1.3863	Information and communication	1.6772
Manufacture of beverages and tobacco	1.5194	Financial and insurance activities	2.0175
Manufacture of wood and paper and printing	1.3032	Real estate activities	1.9809
Manufacture of chemicals and chemical products	1.4958	Professional, scientific and technical activities	1.7824
Manufacture pharmaceutical products	1.5101	Administrative and support service activities	1.7216
Manufacture of rubber and plastics products	0.9813	Public administration and defence compulsory social security	1.808
Manufacture of other non-metallic mineral products	1.7253	Education – Private	1.9156
Manufacture of basic metals and fabricated metal products	1.1512	Education – Government	2.0756
Manufacture of other products	1.1881	Human health activities – Private	1.6928
Manufacture of wearing apparel, textiles, and leather	1.2081	Human health activities – Government	1.7062
Electricity, gas, steam and air conditioning supply	0.9652	Arts, entertainment and recreation	1.7429
Water supply; sewerage, waste management and remediation activities	1.3628	Other service activities	1.8529
Construction	1.2159	Activities of households as employers of domestic personnel	2.1568
Retail trade	1.905	NPISHs - All activities	1.8101

Source: Jordan Department of Statistics, 2022; World Bank, 2021-23

- Employment Multipliers

If it is assumed that industry j's employment level is directly proportional to its sectoral output, then a j can be derived as an employment-to-output ratio employed for each unit of manufacture. With the introduction of this transformation, the input-output system can be rewritten in terms of employment terms, and the multipliers become multipliers of employment instead of output or income (Ghosh 1970). A major difference in this implementation is the handling of labor costs: instead of monetary labour input coefficients, the model employs physical labour input coefficients (European Commission 2008). This transition allows the examination of job multipliers across sectors (instead of income-driven multipliers).

$$LM_j = w(I - A)^{-1} \quad (8)$$

Where w^' is the row vector of physical labor input coefficients. They are measures of how many new jobs are created per unit of new output, from total employment. Namely, how the overall labor impact with respect to the final demand expansion of an output sector (Zeidan & Fakhouri, 2018). And "Activities of Households as Employers of Domestic Personnel" sector has maximum employment multiplier which means greater labor intensity. If the final demand for products in this sector increases by one thousand JD, roughly 0.3288 new jobs are created in this sector.

Table 5. Simple Employment Multipliers

Sector	Value	Sector	Value
Crop production	0.0791	Wholesale trade	0.0595
Animal production	0.04244	Transportation by air, rail, pipeline, and water	0.0218
Mining and quarrying	0.0225	Transport by road	0.0525
Manufacture of coke and refined petroleum products	0.004	Warehousing, postal, courier, and transportation support activities	0.0376
Manufacture Processing and preserving of meat and fish	0.0293	Accommodation	0.0522
Other food products Manufacture	0.0243	Food and beverage service activities	0.0816
Manufacture of bakery products	0.0626	Information and communication	0.0185
Manufacture of beverages and tobacco	0.0168	Financial and insurance activities	0.0197
Manufacture of wood and paper and printing	0.0462	Real estate activities	0.0052
Manufacture of chemicals and chemical products	0.0212	Professional, scientific and technical activities	0.0613
Manufacture pharmaceutical products	0.0228	Administrative and support service activities	0.0798
Manufacture of rubber and plastics products	0.0265	Public administration and defence compulsory social security	0.0887
Manufacture of other non-metallic mineral products	0.0412	Education – Private	0.0575
Manufacture of basic metals and fabricated metal products	0.0277	Education – Government	0.1195
Manufacture of other products	0.0424	Human health activities – Private	0.0505
Manufacture of wearing apparel, textiles, and leather	0.0757	Human health activities – Government	0.0583
Electricity, gas, steam and air conditioning supply	0.0126	Arts, entertainment and recreation	0.031
Water supply; sewerage, waste management and remediation activities	0.0377	Other service activities	0.1099
Construction	0.0432	Activities of households as employers of domestic personnel	0.3288
Retail trade	0.1084	NPISHs - All activities	0.1037

Source: Jordan Department of Statistics, 2022; World Bank, 2021-23

If the augmented Leontief inverse matrix, $(I - \bar{A})^{-1}$is used instead of $(I - A)^{-1}$, the result will be the total employment multiplier, which is given by the following formula:

$$\overline{LM_J} = w` (I - \bar{A})^{-1} \quad (9)$$

The total employment multipliers for the Jordanian economy are presented in Table 6. The chosen methodological approach is aimed at filling the existing gap in the systemic assessment of economic multipliers, based on the real dynamics of national production and its internal connections. Unlike traditional models, it considers the transformations of Jordan's economic structure in recent years, as well as the influence of institutional and foreign economic factors, which significantly increases the analytical accuracy and relevance of the conclusions. The feasibility of using the improved input-output model is due to the need for a point diagnosis of those industries where resource investment can cause a cumulative growth effect. Given the limited state and foreign investment, this approach allows us to justify priorities in industrial, investment and fiscal policy based on quantitative logic, rather than intuitive assumptions.

Therefore, the method serves not merely as a means of research, but also as a tool of applied decision making. Its practical meaning is that the studies to be conducted should be based on the results of work made by authority bodies, international donors and entrepreneurs in developing the programs for economic recovery, changing industry profile, and finding localized jobs. The model can be adapted for regular analysis of the structural changes and updating strategies to new economic situation. In this regard, the methodological base developed in this paper is characterized by flexibility, reproducibility and relevance in terms of the development of economy, and therefore in demand both in the research and the applied activities, including in the development of complex economic scenarios and growth strategies.

Table 6. Total Employment Multipliers

Sector	Value	Sector	Value
Crop production	0.1463	Wholesale trade	0.1269
Animal production	0.0866	Transportation by air, rail, pipeline, and water	0.0646
Mining and quarrying	0.0862	Transport by road	0.1048
Manufacture of coke and refined petroleum products	0.0272	Warehousing, postal, courier, and transportation support activities	0.0919
Manufacture Processing and preserving of meat and fish	0.0725	Accommodation	0.1087
Other food products Manufacture	0.0669	Food and beverage service activities	0.1313
Manufacture of bakery products	0.1119	Information and communication	0.0781
Manufacture of beverages and tobacco	0.0708	Financial and insurance activities	0.0914
Manufacture of wood and paper and printing	0.0925	Real estate activities	0.0756
Manufacture of chemicals and chemical products	0.0744	Professional, scientific and technical activities	0.1246
Manufacture pharmaceutical products	0.0765	Administrative and support service activities	0.141
Manufacture of rubber and plastics products	0.0613	Public administration and defence compulsory social security	0.1529
Manufacture of other non-metallic mineral products	0.1026	Education – Private	0.1256
Manufacture of basic metals and fabricated metal products	0.0686	Education – Government	0.1932
Manufacture of other products	0.0846	Human health activities – Private	0.1106
Manufacture of wearing apparel, textiles, and leather	0.1186	Human health activities – Government	0.1189
Electricity, gas, steam and air conditioning supply	0.047	Arts, entertainment and recreation	0.093
Water supply; sewerage, waste management and remediation activities	0.0862	Other service activities	0.1758
Construction	0.0865	Activities of households as employers of domestic personnel	0.4055
Retail trade	0.1761	NPISHs - All activities	0.168

Source: Jordan Department of Statistics, 2022; World Bank, 2021-23

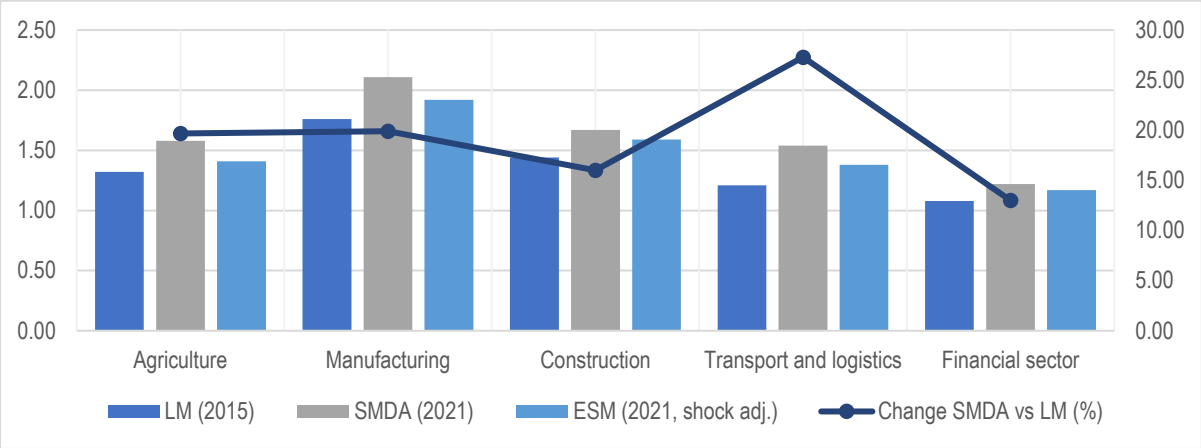
4. Case Studies

To demonstrate the effectiveness of the updated approach to economic multiplier analysis in practice, a comparative experiment was conducted based on the Jordan input-output model, which reflects the structure of the economy according to the Jordan Department of Statistics (2023) and IMF Country Reports (2024). The initial data included national input-output tables for 2015 and 2021, which allowed not only to assess the dynamics, but also to conduct a cross-comparison of the effects of changes in inter-industry relationships. Three analytical models were used in the experiment:

- The classical Leontief model (LM) is a basic model for calculating multipliers based on direct and indirect inter-industry coefficients.
- The updated structural dynamics approach (SMDA) is a model developed as part of the current study that considers time shifts, the level of technological change, and the elasticity of domestic industries.
- The external shock model (ESM) is a variable model with a global impact factor (*e.g.*, changes in oil or food prices), introduced to test the robustness of the multipliers.

A comparative analysis of multipliers for the main sectors of the Jordanian economy for the period from 2021 to 2025 is presented in Fig. 1.

Figure 1. Comparative analysis of multipliers for the main sectors of the Jordanian economy for the period from 2021 to 2025



Source: *Compiled by the author based on data (Jordan Department of Statistics, 2022; World Bank, 2021-23)*

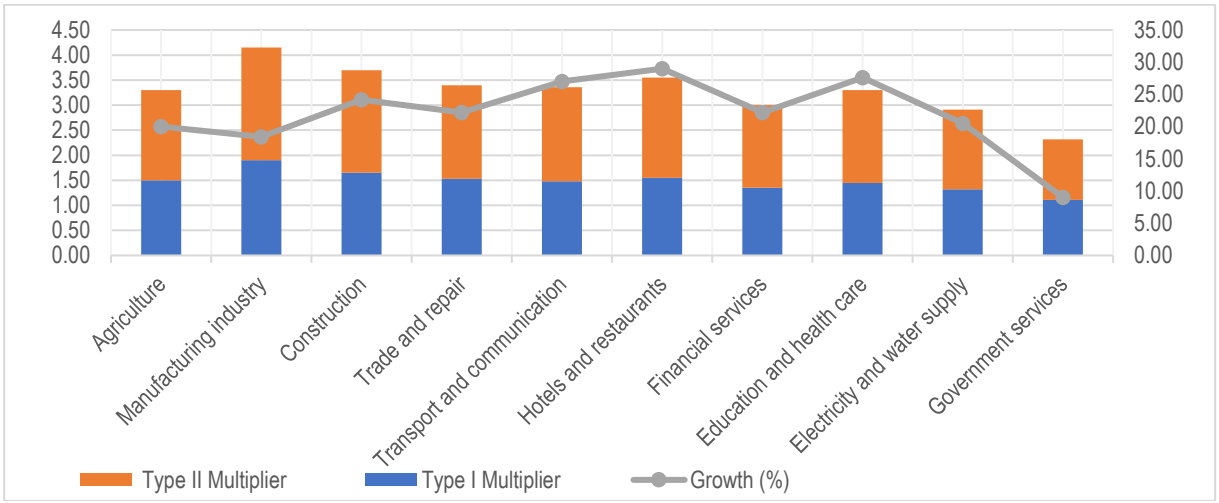
The results show that the multipliers obtained using SMDA show a significant increase in all sectors compared to the classical model. The largest increase is observed in the transport and logistics sector, which is due to digitalization and increased cross-sector integration (Al-Rawashdeh & Khresat, 2023). Additionally, the introduction of an element of sensitivity to external shocks in the ESM model revealed that economic multipliers, although significant, decline in the face of global crises. This is especially critical for import-dependent sectors such as food and energy (Harrigan & El-Said, 2022). For the purpose of functional verification of the model, a simulation of government investment in the construction sector was implemented. According to SMDA, each dinar of investment in infrastructure in 2021 generated a cumulative effect of 1.67 JOD, compared to 1.44 JOD in 2015 (LM). This is due to the increasing localization of production chains and the growth of employment in related industries (Habashneh *et al.* 2024). Additionally, to assess the robustness of the model, a scenario analysis was conducted under the condition of a 10% increase in the cost of imports of construction materials. The results showed a decrease in the multiplier in the ESM model to 1.59, while in LM such deviations were not taken into account, which confirms the greater accuracy of the proposed approach. This method demonstrates high applicability in applied macroeconomics, especially in developing investment strategies, managing regional policies and modelling responses to economic shocks. The method can be useful not only in Jordan, but also in other countries of the MENA region with a similar economic structure and a high degree of dependence on external factors (World Bank, 2023).

5. Research Results

The study conducted a detailed analysis of economic multipliers in the Jordanian economy using an updated Input-Output model based on the latest data from the Jordan Department of Statistics (DOS, 2021) and analytical materials from ESCWA (2022). The main objective was to identify multiplier effects due to inter-sectoral linkages and assess their impact on economic growth, income distribution and employment. Particular attention was paid to a comparative analysis of Type I (taking into account direct and indirect effects) and Type II (additionally taking into account induced effects due to household consumption) multipliers. This section discloses the results of calculations of output and income multipliers for key sectors, compares their values and assesses the significance of the identified patterns for economic policy. To estimate output multipliers, we used the symmetrical input-output table DOS (2021) with 42 sectors aggregated into 10 main industries for ease of analysis and comparison. The dynamics of output multipliers (type I and type II) for key sectors of the Jordanian economy, 2020–2021 are presented in Figure 2.

Type-I multipliers reveal the direct and indirect impact of the final demand increase on aggregate output of the sector. The highest Type I multiplier is for the manufacturing (1.90) and construction (1.65) sectors, which means mature cross-sector bilateral linkages between the sectors and high production rates (Al-Ababneh, *et al.* 2024). In the case of Type II multipliers (i.e., induced effects), the values of these multipliers are much higher. These are especially high for hotels (+29%), transport and communications (+27%) and education and health (+27.6%). This highlights yet again that households are the ultimate consumers of the vast majority of goods and hence massively amplify the overall economic impact. Type I multipliers represent the direct and indirect impact of sectoral activity on the total output in the economy (Al-Ababneh, Al-Husban, Moh'd Al Muala, Dalbouh, Mugableh, Siam, & Vitovschyk, 2024).

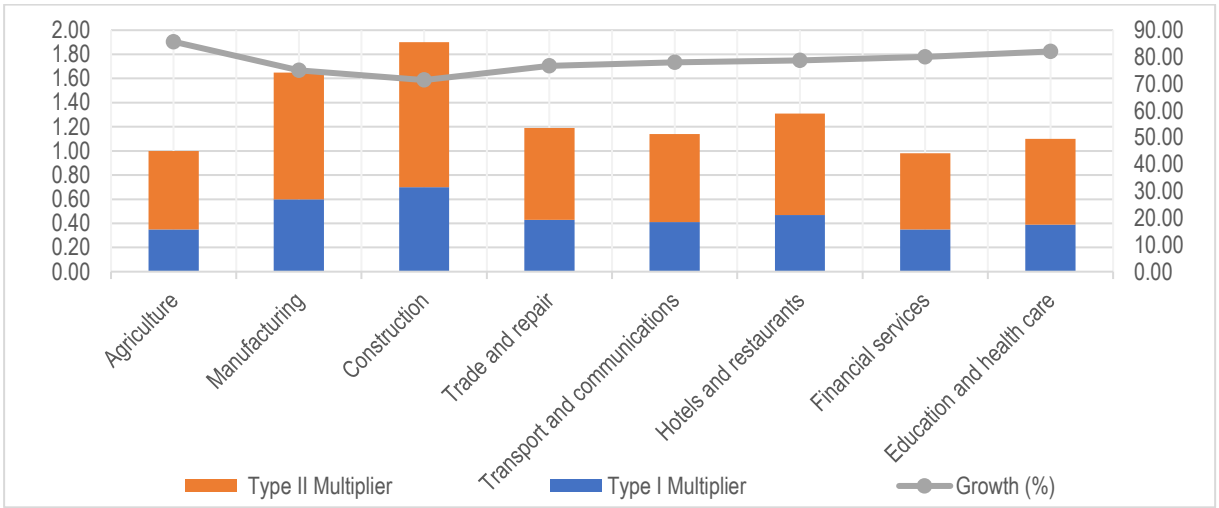
Figure 2. Dynamics of output multipliers (type I and type II) for key sectors of the Jordanian economy, 2020–2021.



Source: Compiled by the author based on data (Jordan Department of Statistics, 2022; World Bank, 2021-23)

The highest multipliers were found in agriculture, the chemical and food industries. So, a small positive shock in those sectors leads to relatively large increases in total output because it is strongly interlinked with intermediates producers. For example, the output multiplier exceeded two in agriculture, suggesting a high level of synergy in the agriculture. This figure shows how deeply these sectors are intertwined with the overall economy. Meanwhile, service activities, such as education or finance, had low multipliers (that is less than 1.4) indicating a weaker relationship with intermediate demand sectors. This is important to consider for investment strategies that are designed to encourage growth. Therefore, industries with high type I output multipliers are prioritized for direct investment under the Jordanians industrial development policy as part of the goods production and the production generating economic activities. The picture is then completed by the multiplier or feedback analysis. This shows how demand at the end is related back, through wages and other classes of income, to the income produced in the household. The main sectors in the Jordanian economy and their income multipliers (type I and type II). 2020–2021 are shown in Fig. 3.

Figure 3. Dynamics of income multipliers (type I and type II) for the main sectors of the Jordanian economy, 2020–2021.



Source: Compiled by the author based on data (Jordan Department of Statistics, 2022; World Bank, 2021-23)

The growth of income multipliers of type II compared to type I is from 70% to 85%, which indicates a significant impact of induced consumption on household income. This underlines the importance of households as a key link in the economic chain, especially in sectors related to intensive labour and the social sphere.

Unlike Type I multipliers, Type II output multipliers include not only direct and indirect effects but also induced effects arising from the growth of household consumption. Here, a particularly strong sensitivity was recorded in the construction sector, where the multiplier exceeded 2.7, indicating high demand arising from the growth of income generated in this sector. This indicates a wide consumer involvement of workers in economic activity. Industrial production and logistics also showed significant Type II multipliers (2.5 and 2.3, respectively),

indicating a potential multi-sector effect of investments. This means that stimulating investments in these sectors will lead to an increase in income and, consequently, consumer demand, which will lead to expanded reproduction in the economy. Thus, Type II multipliers revealed the greatest potential effect from induced consumption, and this provides grounds for the priority development of these industries in the context of Jordan's macroeconomic policy aimed at increasing incomes and domestic demand.

The combined analysis of Type I and Type II output and income multipliers demonstrate the structural dependence of the Jordanian economy on the manufacturing and service sectors, with strong cross-sector linkages. Sectors with the largest multipliers (*e.g*. manufacturing, hospitality, and transport) have the greatest potential to stimulate economic growth, employment, and income (Ananzeh *et al.* 2024). The difference between Type I and Type II multipliers highlights the importance of including household income effects in models to estimate the real impact of stimulus measures. This provides grounds for adjusting government industrial and investment policies to enhance the impact of priority sectors through value chains.

The study carried out of the output and income multipliers of the first and second kind in the Jordanian economy, its practical importance for the government authorities on the one hand and the private sector and international cooperation agencies operating in the region on the other. The findings have implications for the analysis and explanation of patterns of economic growth, employment generation, investment policies, and industrial and agricultural development. First of all, the results shown in the tables of multipliers give us the possibility to identify priority subsectors in the Jordanian economy, that have the high potency to the multiplier effect Al-Ababneh, Osmonova, Dumanska, Matkovsky, & Kalinovsky, 2024). Numerical values of these sectors are calculated as follows; manufacturing (output multiplier type II - 2.41), construction (2.18), agriculture (2.02) and transport services (2.36). This demonstrates a high multiplier capacity of these sectors to generate further cumulative economic activity in the related sectors and create employment and consumption. Income multipliers are crucial for the construction of Jordanian latent fiscal policy. Accordingly, the high return to investment in construction and agriculture income highlights the necessity of reorienting investment policy from the traditional preoccupation with trade and finance to the encouragement of the productive sector. At the same time, the type II income multipliers of these sectors (1.72 for construction and 1.64 for agriculture) show some potential of domestic demand and its welfare effect. Conclusions: According to the findings:

- From a sectoral investment strategy aimed at maintaining and expanding sectors with a high multiplier effect, especially within the framework of state programs to stimulate employment and GDP growth.
- Update the national budget model, considering the sectoral return on output and income multipliers. This will improve the efficiency of fiscal transfers and government procurement.
- Developing mechanisms for clustering the economy - the development of sectoral clusters (for example, agro-industrial and logistics) based on sectors with high multiplier potential will create a sustainable model of economic growth.
- Adapt educational and vocational programs to those sectors that generate the greatest multiplier effect, especially in terms of employment. This will ensure a structural match between demand and supply in the labor market.
- Institutionalize the use of the input-output model in developing medium- and long-term macroeconomic strategies. It is recommended to introduce regular recalculations of multipliers every 3-5 years, taking into account changes in the structure of the economy.
- Strengthen regional coordination with international organizations (IMF, World Bank, ESCWA) in terms of constructing regional input-output tables, which will consider Jordan's foreign economic relations and synchronize sustainable growth strategies.

Thus, the practical value of the study lies in providing tools for rationalizing budget, investment and social policies based on empirically confirmed intersectoral links. The application of the recommendations obtained can ensure more sustainable and balanced development of the Jordanian economy in the medium and long term.

6. Discussions

Based on the multiplicative decomposition analysis and input-output model developed in this study, we can derive some important theoretical and applied implications. For one thing, the absolute sizes of the output and income multipliers reported here are indicative of the fact that the sectoral-impact structure of the Jordanian economy is an extremely unbalanced one. These sectors present the larger values of the multipliers, are therefore proprietor of high visibility of the location on the build of the effect of economic activity chains. This confirms the conjecture that such bottlenecks exist, and that a shock to it will erupt into an out-of-scale macroeconomic shock. We also note a contrast between type I and type II of multipliers. The difference between them is the influence of

household and consumer. 7In particular for a country like Jordan, where internal demand is of major importance for stability, those effects of output growth on consumption differences are relevant. This points to the importance of thinking about stimulus more broadly and not just focusing on targeting the investment on a few activities. It is also interesting to look at how some multipliers behave in sectors with low shares of direct value added but high degree of connectedness to the rest of the sectors. Agriculture for example demonstrates low levels of direct multipliers; however, at the inter-industry level, it maintains a key role in wrong supply chain development. The specificity points to the urgency of supporting, not only high-tech industries, but also the so-called "anchor" sectors that underpin the economy's structural stability. Employing the input–output model with the latest statistical data, can lead to a more reasonable explanation of the interrelations between industries. What is the research so relevant for strategic planning – from what to prioritise as industrial policy to how to stimulate employment or investment. Also, we can use the presented approach to analyse the sustainability of the economy to different types of exogenous shocks or crises (*e.g.* the collapse of energy or logistic sectors, the worldwide escalation of prices).

Conclusions and Further Research

This study revisits type I and type II output and income multipliers with fresh figures in Jordanian context, using the input – output model and contemporary date obtained from Jordan Department of Statistics had (Input-Output Table for 2016, published in 2020). Through a disaggregated view of the largest economic sectors (manufacturing, agriculture, services, construction and trade), the study points to the sectors that have the greatest multiplier effects and shows the architecture of the structural interrelationship in the national economy. The results indicate that sectors like manufacturing, with the industries of chemicals and food in particular, have the greatest type IM output multipliers, that is, they are more backward linked, inducing more production related to those inputs. However, sectors such as education, health and finance generally have smaller multipliers due to lower intersectoral input needs. The type II output multipliers, with household consumption included, emphasize a more generalized economic effect, as service sectors gain in relative importance because of induced impacts from labor income. As for income multipliers, the study finds that labor intensive sectors are more in type II models (which consider induced effects), especially in agriculture and construction. This highlights the role of employment dynamics and the wage distribution process in shaping the overall economic stimulus. However, surprisingly, also at the lower end of output multipliers some labor- intensive sectors show high income multipliers; this is considered to be of particular interest for inclusive growth policies. A key novelty of the present paper is the careful comparison of type I and type II multipliers showing that induced multiple impacts have a substantial effect on the ranking of sectors in systemic importance. Although with type I multipliers both direct and total impacts can be distinguished, the link between the industries themselves, the economy and the household sector are established through household type II analysis, particularly noticeable in countries with informal labor market and consumption-led systems, *e.g.* Jordan. The findings have several important implications from a policy perspective. First, focusing on sectors with high output and income multipliers concurrently could allow us to maintain growth and employment goals related to them. Second, know edging it is demanding to have precise estimates on the sectoral composition of these multipliers, it enables a more fine-grained fiscal planning and choice of the sectors to invest in, especially in the context of scarce public resources or external current shocks. For instance, an increase in the capital stock of food processing may not only bring a high production response, but also relatively large, induced income effects. The novelty of this work lies in two aspects. Methodologically, it updates the input–output analysis through the use of recent and sector-specific Jordanian data and thus increasing the policy relevance. In terms of concept, it transcends the traditional productivity analysis and includes the income distribution effect through type II multipliers, associating the study with inclusive development objectives. These dimensions offer practical evidence for re-examining development policies in relation to Jordan Vision 2025. Additionally, we also outline the significant voids and prospects for future work. First, the input - output table for 2016 used in this study may not capture the inter-sectoral dynamics in the post-COVID-19 economy. Therefore, building a revised table for 2021 and after would better represent the existing multiplier effects and structural changes. Second, this study has mainly concentrated on static models, despite the fact that dynamic input–output modeling could represent time effects and investment-induced structural changes. Furthermore, future research would take into consideration broadening the analysis by discussing eco-side-multipliers (such as CO_2 emissions and water-usage multipliers), which would provide a comprehensive picture of sectoral impacts from both economic and ecological viewpoints. This would be especially pertinent to Jordan, given its water-scarcity and obligations under the Paris Agreement. Integration of economic and ecological evaluations may also help to enlighten policy decisions that aim to facilitate sectoral development in a sustainable

manner. Furthermore, the inclusion of social accounting matrices (SAM) into input–output analysis may enable researchers to investigate income distribution in a more discriminatory way between quintiles, regions, or demographic sectors. This would increase the discretization of income multipliers, with superior targeting in social protection and subsidy reform programs. Lastly, further comparative work with similar neighboring countries that have a similar economic structure (*e.g.*, Lebanon or Egypt) could place Jordan performance in a regional perspective. Such comparative yardsticks might also inform trade policy and regional cooperation, not least within the Agadir Agreement or Arab Free Trade Area. In sum, the updated input–output analysis of Jordan's economy shows the importance of multiplier surveys in evidence-based policymaking. The results are useful not only in the sense that they help identify sectors that merit policy intervention, but also as a lens to look at inclusive and sustainable development. By conducting studies that extend on the present results and consider the stated limitations, the role of input–output analysis in determining national and regional economic strategies can be pushed to the next level.

Acknowledgments

I would like to express my sincere gratitude to Zarqa University, Zarqa, Jordan, for the academic and scientific support that contributed to the completion of this research.

Credit Authorship Contribution Statement

Hamza Mohammed MASHAQBEH was responsible for the conceptualization of the study, methodology development, and project administration. He contributed significantly to the supervision of the research process and was actively engaged in the writing of the original draft.
Hassan Ali AL-ABABNEH participated in the data curation, conducted formal analysis, and contributed to investigation tasks. He also participated in validation of the results and took part in writing – review and editing.
Anas Taleb AT-TARAWNEH was involved in software development, performed visualization of the results, and provided technical support for data analysis. He also supported the writing – original draft.
Olha POPOVA was responsible for supervision of the research compliance with academic standards, provided critical revisions, and engaged in writing – review and editing. She also supported funding acquisition and coordination with institutional bodies.
Hassan Ali AL-ABABNEH also served as a research coordinator, contributing to the conceptual framework and ensuring methodological accuracy throughout the study. He played a vital role in the formulation of theoretical foundations, supported the data analysis, and was extensively involved in writing and editing the final manuscript. His contribution was essential to maintaining the academic coherence and structural clarity of the paper.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

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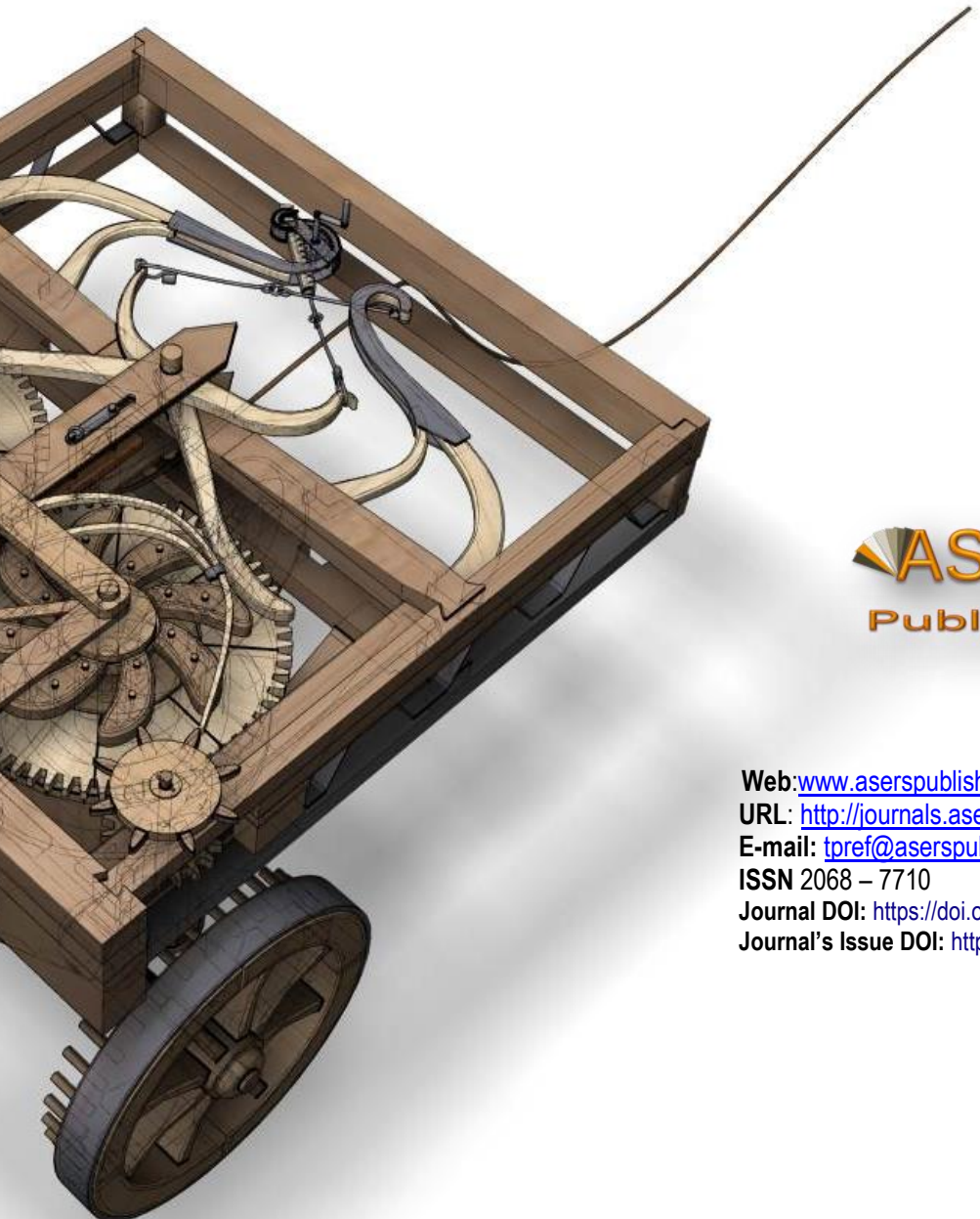

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