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Estimating economic multipliers for the screen industries in four Latin American countries

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Contents

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1. Introduction

The screen industries, covering TV and film making, generate wider economic impacts through their supply chain, which can be diverse and cover many sectors. These wider economic impacts are not widely reported so it can be difficult for the overall economic impact of the sector to be understood. This report estimates the supply chain impacts of spending by companies in the screen industries. This includes the:

- **Direct spending ("Direct")**: This is the impact on the direct suppliers of companies in the screen industries.
- **Supply chain impact ("Indirect")**: This is the impact on the suppliers of the suppliers of companies in the screen industries.
- **Expenditure of employees ("Induced")**: Increased spending and economic output from the initial spending in the screen industries should lead to an increase in household incomes. The induced impact is the impact of higher household consumption on goods and services as a result of increased incomes.

1.1. Using an Input-Output Model to estimate economic impacts

The total economic contribution from additional spending in an industry can be estimated using an Input-Output (IO) Model which is an established macroeconomic model that captures the relationships between different industries within an economy. It is commonly used to assess the total economic contribution associated with a change in industry output driven by additional spending.[1]

IO models assess how additional spending in one industry generates economic value across all other industries within the economy, in terms of expenditure, Gross Value Added (GVA), and employment. GVA is a commonly used indicator for economic impact and provides a measure of the return on labour (i.e. wages) and capital (i.e. profits) generated within the economy as a result of additional direct spending in an industry.[2] GVA is considered to be a more suitable indicator of economic impact than expenditure as it provides the value of goods and services already accounting for the cost of production inputs. The contribution to GVA of all industries equals the Gross Domestic Product (GDP) of a country (plus taxes minus subsidies on products).[3]

In addition, an IO model can estimate how many jobs would be created throughout the economy from an initial increase in expenditure. Employment outputs are usually measured in full-time equivalents (FTE) and can help policymakers understand whether an investment would create job opportunities.

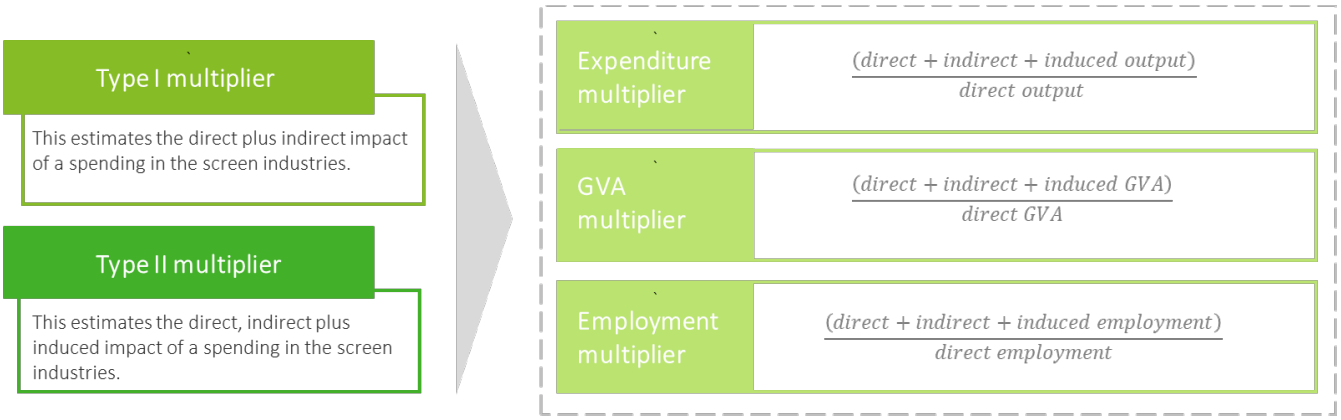
[1] EU Science Hub, 2022. "Input-output economics" - https://joint-research-centre.ec.europa.eu/scientific-activities-z/input-output-economics_en
[2] Scottish Enterprise Economic Impact Guidance, 2017. "Gross Value Added"
[3] Office for National Statistics, 2022. "A guide to interpreting monthly gross domestic product"- https://www.ons.gov.uk/economy/grossdomesticproductgdp/methodologies/aguidetointerpretingmonthlygrossdomesticproduct

1.2. Multipliers

Multipliers derived from IO tables can be used to assess the dynamic impacts of additional spending in the screen industries. They can be applied to the initial amount of spending to derive the direct effect of expenditure in the screen industries, the indirect effect on suppliers (for example, special effects suppliers, costume manufacturers, and music composers), and the induced effects from higher household income and consumer spending.

Multipliers can be used to calculate the indirect, and induced expenditure, GVA, and employment impact associated with the direct activity of the industry arising from the additional spending by companies in this particular industry.

Figure 1: Description of Type I and Type II expenditure, GVA, and employment multipliers[4]



The size of the multipliers depends on the extent of linkages between industries. Industries with longer supply chains have larger multiplier effects.[5]

The multipliers calculated in this report estimate the indirect supply chain impact from expenditure by companies in the screen industries in the direct supply chain and the induced impacts from extra spending by supply chain employees.

1.3. When should Type II multipliers be used?

Type II multipliers, which estimate the induced impact associated with an additional spending in an industry, should be used with caution and should only be considered in the right circumstances.

[4] Note that this analysis focusses on the supply chain impacts of spending by companies in the screen industries rather than the impact on the screen industries itself

[5] Bess and Ambargis, 2011. "Input-Output Models for Impact Analysis: Suggestions for Practitioners using RIMS II Multipliers" - https://www.bea.gov/system/files/papers/WP2012-3.pdf

1.3.1. At the national level

Induced impacts may be unsuitable for analysis at a national level as impacts may not be additive and may therefore lead to double counting (GVA already accounts for private consumption). If induced impacts were calculated for every industry in the economy, the estimated total GVA impact would exceed the total GVA of the economy. For this reason, it is recommended that only Type I multipliers are used to calculate the direct and indirect economic impact of expenditure at the country level.[6]

1.3.2. At the regional level

Type II multipliers can be particularly useful for regional analysis when certain conditions are met. For example, induced effects can be reported when a new film production set or studio is built which is expected to create new jobs and when these jobs can be filled by workers from the local labour market. On the other hand, if the new production set or studio needed to draw on labour from other regions, using induced effects could lead to inflated results as only prices increase but no new jobs are created in the region.[7]

In general, Type II multipliers should only be used in regions where workers are expected to spend most of their earnings as applying them to other regions can lead to inflated estimates. Type II multipliers may be used to estimate the economic contribution of spending in the screen industries on regions with creative clusters (i.e. a regional concentration of film-related industries, suppliers, manufacturers, and distributors). A creative cluster would imply that relevant workers are available in a region and that additional earnings will be spent locally. However, additional tasks caused from higher industry demand may not lead directly to more employment and higher wages. In some cases, existing employees may perform additional tasks without an increase in wages. Moreover, it is likely that there could be a delay between an increase in demand and the resulting positive employment effects.

1.4. Regional Input-Output analysis

Regional analysis can help to identify areas where new investments would be most effective in delivering economic value and areas where the impacts would be relatively small. It can be used to assess the potential impact of spending decisions on job creation, wages, and industry growth within the region of interest and help with the formulation of regional development strategies.

Quantifying the economic contribution of regional spending can help to achieve several policy objectives, such as ensuring that money is kept in the local economy, increasing the overall quality of life within the region, expanding industry clusters, and developing new industry areas.

This report only estimates multipliers for the screen industries at the national level as comprehensive local data is limited. However, regional multipliers can be calculated with sufficient data on the regional industry mix. National IO tables can then be 'regionalised' by accounting for the region's industry mix and industry leakages (i.e. the proportion of

[6] Cambridge Econometrics, 2012. "Modelling the economic impact on the UK economy of UK-based academic social science research" - Assessing the Impacts of Academic Social Science Research (lse.ac.uk)
[7] Bureau of economic analysis U.S. Department of Commerce. "An essential tool for regional developers and planners" - RIMSII_User_Guide.pdf (bea.gov)

spending that will be generated outside the region). This requires local knowledge on the concentration of businesses within the industry (e.g. sector clusters), how much of each industry's inputs are obtained locally, and how much of each industry's outputs are exported outside the region.[8] A few academic papers such as 'Regional Input-Output matrices, an application to Manufacturing exports in Mexico'[9] and 'Interregional analysis using a bi-regional Input-Output matrix for Argentina'[10] have conducted regional impact analysis for some Latin American countries, but generally such estimates are not widely available.

Industries that produce most of their outputs in the region and purchase inputs locally will have larger multipliers and will therefore generate greater economic benefits for the region. In general, larger regions tend to have higher multipliers as they usually satisfy more regional demand, whilst smaller and more rural areas tend to have lower multipliers as less can be produced locally (i.e. leakages to other regions will be higher). For this reason, national multipliers should not be used to estimate the economic contribution of spending in smaller regions, as the results would likely overestimate the actual economic impact.[11]

For policymakers interested in introducing policies impacting a local area or a creative cluster in a region, estimating multipliers may give a more accurate estimate of policy impacts.

2. Methodology applied in the study

2.1. Multipliers for Argentina, Brazil, Colombia and Mexico

The economic impact of additional spending in the screen industries is estimated using an IO model for four Latin American countries (Mexico, Argentina, Brazil, and Colombia). The study estimates three types of impacts: direct, indirect, and induced supply chain impacts. It uses the most recent publicly available IO tables produced by the OECD database in 2018 (and published in 2021)[12] and by national statistical authorities, including the Instituto Brasileiro de Geografia e Estatistica (IBGE) and the National Institute of Statistics and Geography (INEGI). The model also uses employment data by industry from the OECD (2018), foreign exchange rate data from the International Settlements (2021), and GDP market price deflator data from the OECD (2021).

The direct impact captures the immediate first-order impact of additional spending in the screen industries across all other industries within the economy in terms of expenditure, GVA, and employment. The direct impact on expenditure is calculated by multiplying the additional spending in the screen industries with its expenditure ratio across all industries in the IO table. As the screen industries are combined with publishing, programming, and broadcasting activities in the OECD IO tables, this analysis used a more granular IO table

[8] Economic Modelling Specialists Inc, 2009. "Input-Output Guidebook – A practical guide for regional economic impact analysis" - https://www.economicmodeling.com/2009/04/02/input-output-guidebook-a-practical-guide-for-regional-economic-impact-analysis/

[9] Chiquiar at al., 2017. "Regional Input-Output matrices, an application to manufacturing exports in Mexico" - (PDF) Regional Input-Output Matrices, an Application to Manufacturing Exports in Mexico (researchgate.net)

[10] Mastronardi et al., 2022. "Interregional analysis using a bi-regional input-output matrix for Argentina" - Interregional analysis using a bi-regional input-output matrix for Argentina | Request PDF (researchgate.net)

[11] Economic Modelling Specialists Inc, 2009. "Input-Output Guidebook – A practical guide for regional economic impact analysis" - https://www.economicmodeling.com/2009/04/02/input-output-guidebook-a-practical-guide-for-regional-economic-impact-analysis/

[12] OECD Input Output tables 2021 edition - https://stats.oecd.org/Index.aspx?DataSetCode=IOTS_2021

from Brazil, available at the Brazilian Institute of Geography and Statistics (IBGE). This has been applied for all selected countries (Brazil, Argentina, Colombia, and Mexico) assuming the expenditure ratio is similar across all all of the four countries. The Brazil IO table was used for the analysis as it provides the most recent IO table with detailed industry classifications, with a specific sector for the screen industries which can be mapped with the OECD industry classifications. The direct impact on expenditure is then multiplied with the GVA-to-output ratio to get the direct impact on GVA, and further multiplied with the Employment-to-GVA ratio for the direct impact on employment.

For indirect and induced impacts, the analysis uses IO modelling techniques to estimate the wider impacts of additional spending across all other industries and their supply chains by calculating Type I and Type II multipliers. The Type I multiplier considers activities among suppliers to the screen industries including activities in the wider supply chain supporting the first level of suppliers. Hence, it encompasses interlinkages between suppliers to the screen industries and other companies that provide inputs such as cameras, through to the more distant relationships with suppliers of raw materials for equipment used in making shows. The Type II multiplier calculates not only the direct and indirect impacts across all industries, but also the induced impacts due to an increase in household spending.

The IO framework assumes fixed and linear assumptions between activity in different sectors (i.e. no change in productivity) and that the resources used would not otherwise be employed. It is therefore best used to understand the total economic contribution of the screen industries.

Type I multipliers are calculated as follows:

Step I: IO coefficients are calculated by dividing each entry in the IO table by the corresponding column total. Each entry can be interpreted as the share of costs of inputs in total output. This matrix is called matrix A.

Step II: The Leontief matrix, denoted as the matrix (I-A), is calculated by subtracting the matrix of coefficients, i.e. matrix A from a matrix with ones on the main diagonal and zeros elsewhere (the identity matrix I). In the diagonal entries of (I-A), the net output for each sector is given. These coefficients are positive and represent the revenues of the sector. On the off-diagonals, the entries represent input requirements (costs) and have negative coefficients. The inverse of this matrix, (I-A) inverse, highlights the direct and indirect requirements for intermediates.

Step III: The (I-A) inverse matrix is multiplied by direct impacts across sectors to estimate total economic impacts including both the direct and indirect effects.

The above steps are repeated for Type II multipliers after including the final consumption expenditure of households as an additional column and compensation of employees as an additional row in the IO table. This captures the induced effects of household spending in the economy. Hence, the Type II multiplier gives the total economic impacts including direct, indirect as well as induced impacts of additional expenditure in the economy.

3. The economic impacts of spending in the screen industries

3.1. Impact using the Brazil spending ratio for the four countries

The results in Table 1 show the various multipliers to estimate the wider economic impacts of spending in the screen industries. These results show that for every dollar spent in the screen industries direct supply chain, a total of US$1.6 to US$1.9 is spent in the overall supply chain.

Table 1: Economic multipliers for the screen industries

	Expenditure multiplier		GVA effect	GVA multiplier		Employment effect	Employment multiplier	
Country	Type I (indirect)	Type II (induced)	GVA per unit of local currency	Type I (indirect)	Type II (induced)	Per X of local currency units	Type I (indirect)	Type II (induced)
Argentina	1.859	2.959	0.495	1.888	3.027	0.00002 per ARS100	1.731	2.869
Brazil	1.769	2.935	0.547	1.702	2.742	0.0009 per BRL100	1.538	2.492
Colombia	1.734	2.747	0.576	1.700	2.621	0.018 per COP1m	1.489	2.227
Mexico	1.635	2.188	0.618	1.599	2.109	0.0001 per MXN100	1.661	2.120

Figure 2 shows an illustrative analysis of the impact of an increase in spending by the screen industries of ARS950m (US$10m) in the Argentine screen industries. An illustrative increase in spending of US$10m was chosen as this reflects the cost of a low to mid-budget film or TV production. According to a study by Olsberg SPI (2020)[13], a low to mid-budget film costs around US$6 to US$20m, and mid-budget TV series around US$13m.

Illustrative outputs:

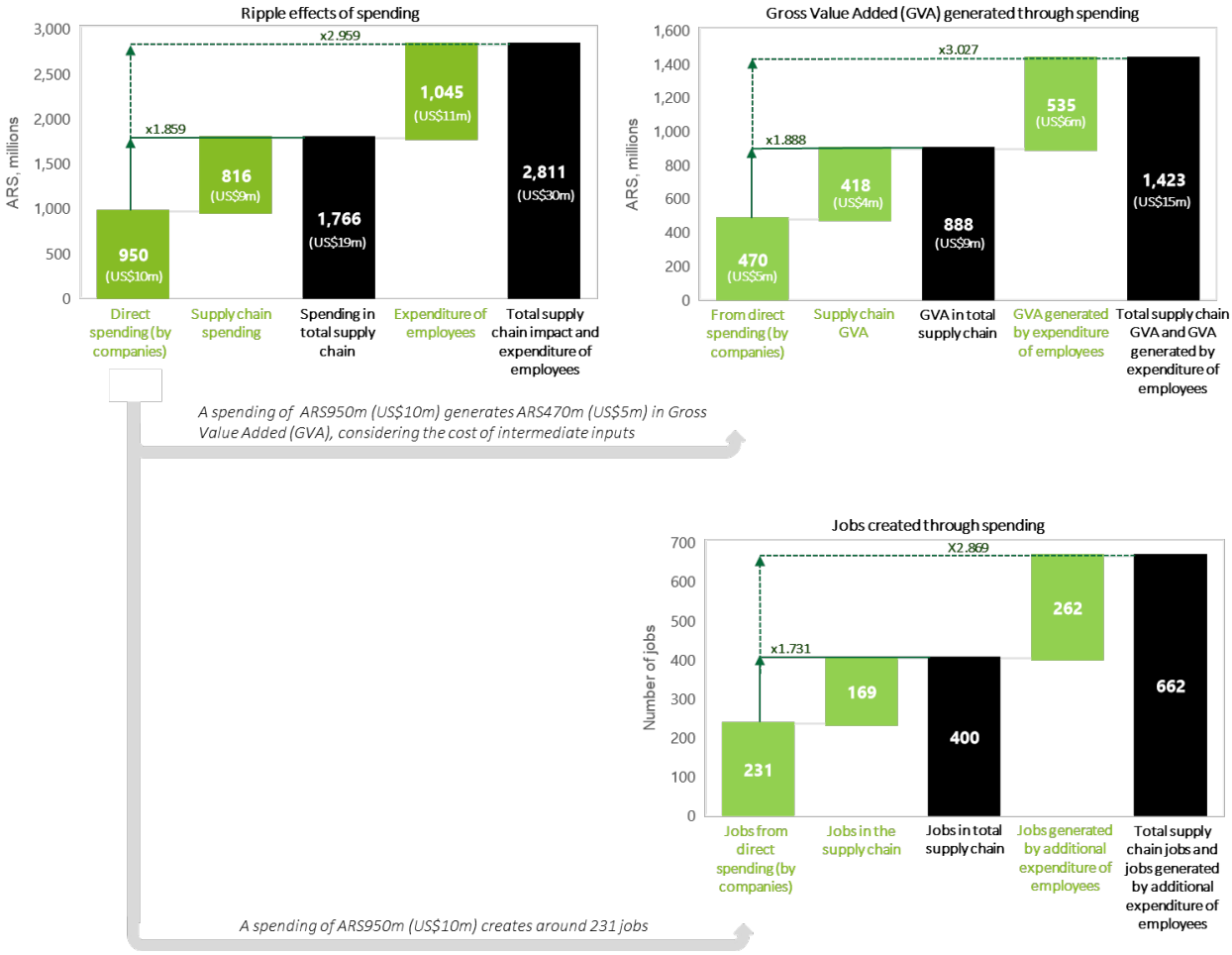
- **Spending in the total supply chain**: an illustrative increase in spending of ARS950m (US$10m) by companies in the screen industries generates a total supply chain impact of ARS1,766m (US$19m) after considering the impacts further down the supply chain (Type I multiplier of 1.859).
- **Total supply chain impact and expenditure of employees in the supply chain**: an illustrative increase in spending of ARS950m (US$10m) by companies in the

[13] Olsberg SPI, 2020. "Global Screen Production – The impact of film and television production on economic recovery from COVID-19" - Global-Screen-Production-and-COVID-19-Economic-Recovery-Final-2020-06-25.pdf (squarespace.com)

screen industries generates a total impact of ARS2,811 (US$30m) considering the supply chain impacts and the expenditure of employees due to an increase in household income (Type II multiplier of 2.959).

- **Gross Value Added (GVA) and employment:** a spending of ARS950m (US$10m) by companies in the supply chain generates around ARS470m (US$5m) in GVA, considering the cost of intermediate inputs, and creates around 231 jobs in the direct supply chain.

Figure 2: Impact of a ARS960m (US$10m) expenditure by the Argentine screen industries



The magnitude of impacts will vary by country, impacted by factors such as the size and structure of the screen industries and country. However, the pattern of impacts for Brazil, Colombia, and Mexico are similar to those shown for Argentina in Figure 2.

3.2. Sensitivity analysis of the results

In addition to the Brazilian IO table used in the analysis, a detailed IO table for Mexico, available at the National Institute of Statistics and Geography (INEGI), was used to calculate the expenditure ratio of the screen industries across all industries. This was then mapped to OECD industry classifications. However, Mexico's expenditure ratio has not been used in the analysis as the latest IO table is available for 2013 and the spending ratios across sectors are not consistent from alternative data sources.

To test the sensitivity of the outputs to the IO table used for direct expenditure, the results using the Mexico IO table are presented below. The above steps are used to calcultate multipliers to estimate the economic impact of additional expenditure in the Mexican screen industries.

Table 2: Economic multipliers for the Mexican screen industries using the Mexico IO tables (2013)

	Expenditure multiplier		GVA effect	GVA multiplier		Employment effect	Employment multiplier	
Country	Type I (indirect)	Type II (induced)	GVA per unit of local currency	Type I (indirect)	Type II (induced)	Per X of local currency units	Type I (indirect)	Type II (induced)
Mexico	1.703	2.276	0.608	1.630	2.166	0.0001 per MXN100	1.449	1.831

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