

Alcoa San Cibrao

Case study



SMART TIO

More Smart, more TIO

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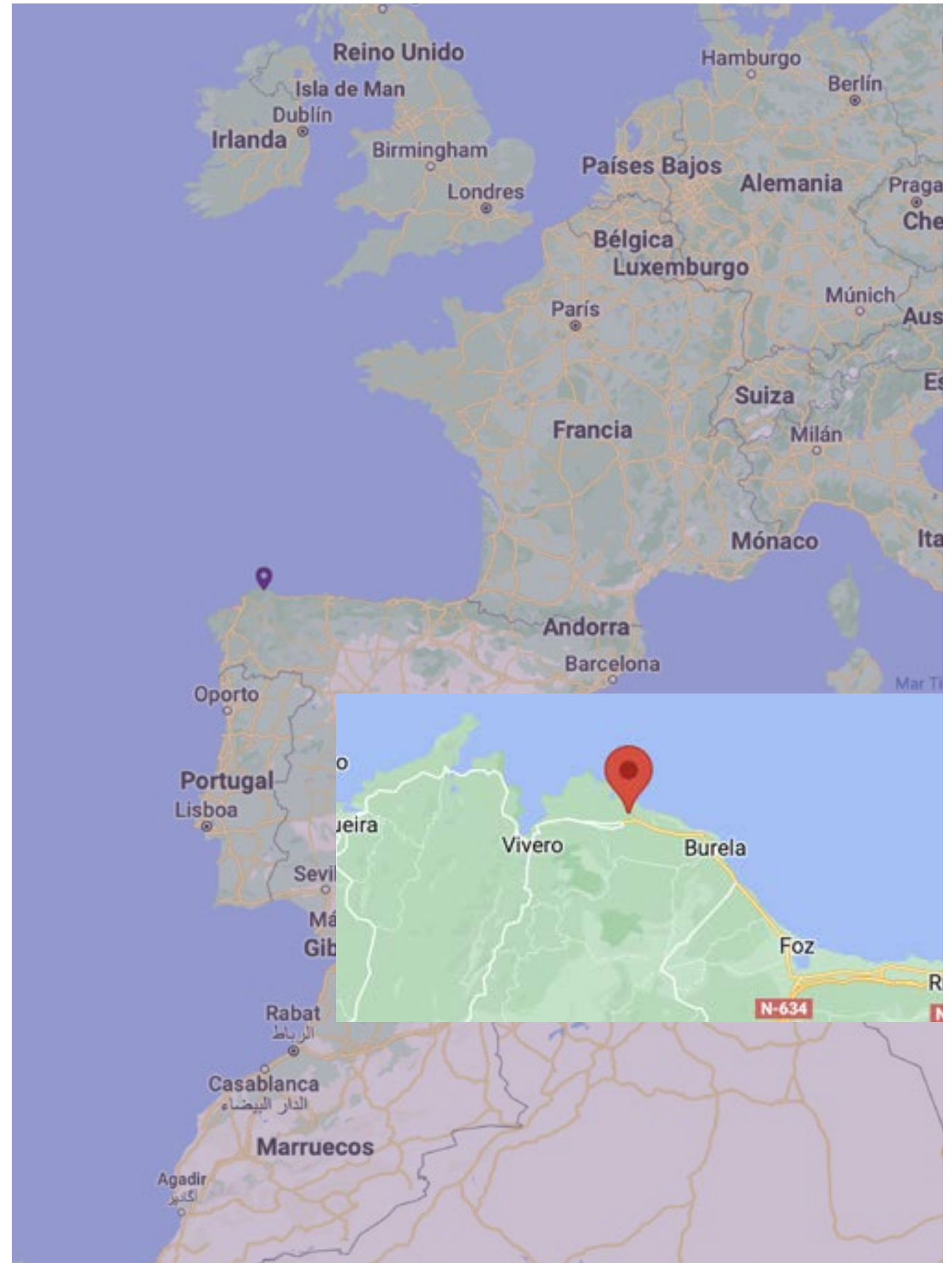
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Problem description

Alcoa San Cibrao, a bauxite, alumina and aluminium enterprise located in San Cibrao, a village on Galicia's north coast (Spain), announces its closure. In October 2018, this multinational company closed its plant located in A Coruña (Galicia) and Avilés (Asturias), and very recently, in May 2020, **the plan to close the San Cibrao factory was announced**. The main reason for closing this plant is to move the production to countries with cheaper energy, its most important input. This enterprise is located in the Mariña Lucense, the main economic driver of this area. Therefore, its closure could have disastrous consequences for the economy and society of the region. In order to have a better picture of the magnitude of the consequences of its closure, we use **Smart TIO** to **analyse the direct and indirect economic impact**. Additionally, we attempt to calculate the social impact measured in terms of employment in the area of the potential closure (Mariña Lucense) and how it spreads for the Galicia territory due to the sectoral interconnection.

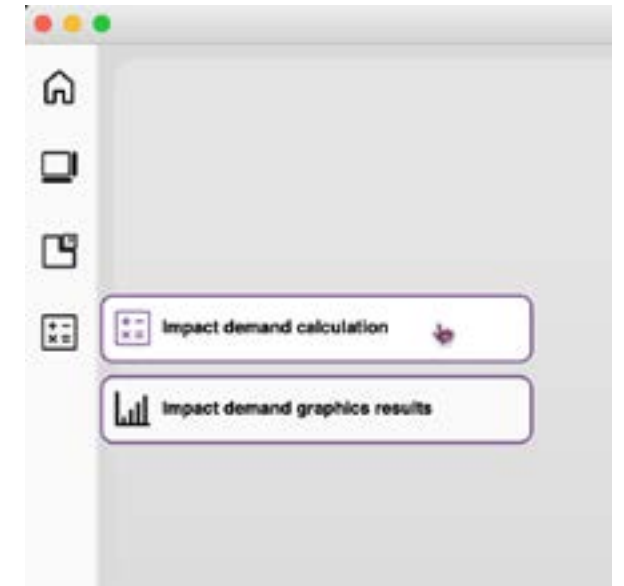


In addition to the direct impact resulting from the closure of the factory (number of job losses and production), Smart TIO calculates the indirect effects.¹ These effects correspond to the production and job losses for Alcoa suppliers since they will stop buying their products if Alcoa closes.

¹ Please, check the [methodological appendix](#) if you wish to know more about the methodology that Smart TIO uses for doing its calculations.

To calculate these 2 effects, direct and indirect, in Smart TIO, we need:

1 Going to “Impact demand calculations”



2 We **identify the sector that Alcoa’s product belongs to**, in order to be able to simulate the impact. Alcoa enterprise produces aluminum and this product belongs to the Basic Metals sector (ISIC 24).²

 A screenshot of the 'Impact demand using input - output model' interface. It features a table with four rows of ISIC codes and their corresponding values. The table has a 'Hide code' button above it and 'Import' and 'Reset' buttons to the right. The 'Basic metals' row (ISIC:24) is highlighted with a red box and a red arrow pointing to it.

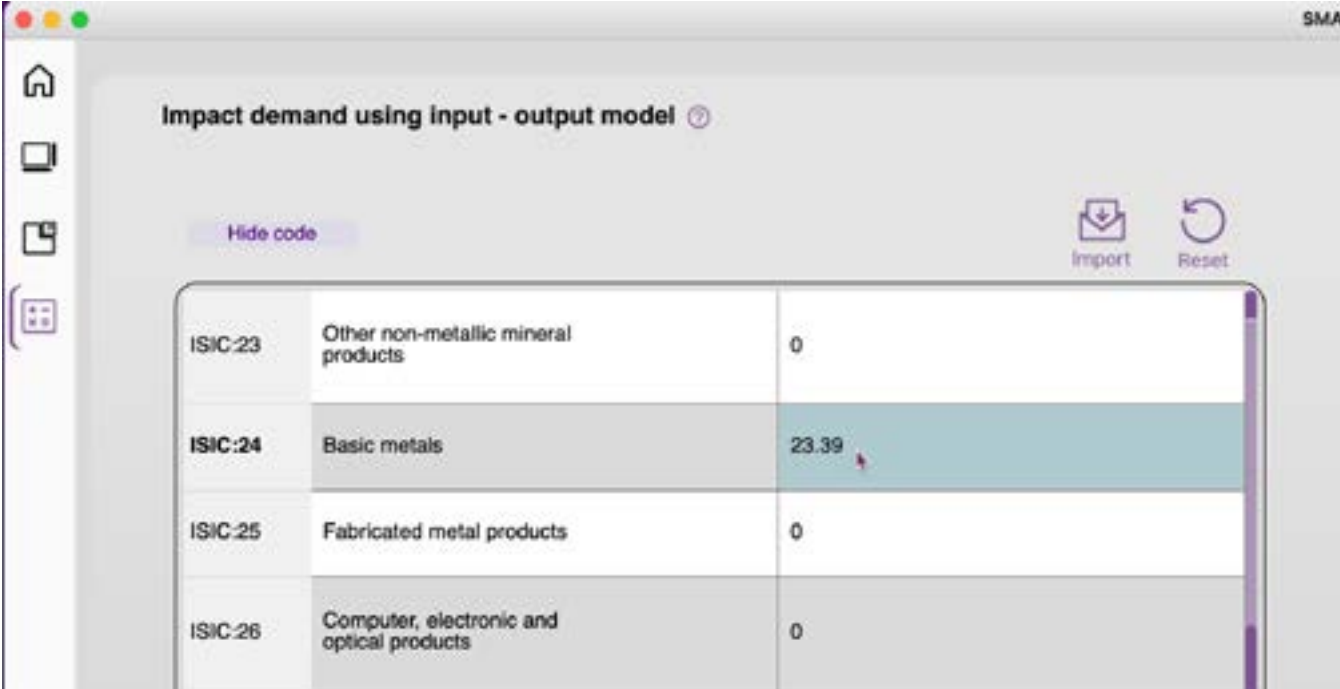
ISIC Code	ISIC Name	Value
ISIC:23	Other non-metallic mineral products	0
ISIC:24	Basic metals	0
ISIC:25	Fabricated metal products	0
ISIC:26	Computer, electronic and optical products	0

² Smart TIO Sectoral classification follows the International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4, if you need to identify the sector where a product belong to, please, check the statistical paper from United Nations, part 3 (page 63): [United Nations: Department of Economic and Social Affairs: Statistics Division. \(2008\). International standard industrial classification of all economic activities \(ISIC\), Rev. 4. United Nations Publications.](#)

3

Finally, we need to **identify the Alcoa's weight in the Basic Metals sector in Galicia**, both in exports and production, in order to know the share in which the production and exports would be reduced in the Smart TIO application. Thus, we need a data source that will provide information for any enterprise. We find this information for the firms in Galicia region, including Alcoa, in the SABI database ³, providing information on the total production of the company and of the sector Basic Metals in the region. This allows calculating the share of total production that will be decreasing in the Basic Metals Sector if Alcoa leaves. If we want to estimate the size of Alcoa over exports, we can use the data from the Galician Statistical Institute (IGE) for international trade and production since Alcoa is the only company that exports aluminum from the Lugo province. Thus, the exports of aluminum correspond with the exports of Alcoa. Once we calculate Alcoa's weight in the sector, we decrease the final consumption and exports for this value in the Galician input-output table of Galicia (from IGE) and we calculate the effect based on the Input-Output model. Thus, the share of final demand (internal demand and exports) from Basic Metals sectors that belongs to Alcoa is 23.39%.

³ SABI is a database from the Bureau Van Dijk that provides information for 2.900.000 Spanish and 900.000 Portuguese companies.

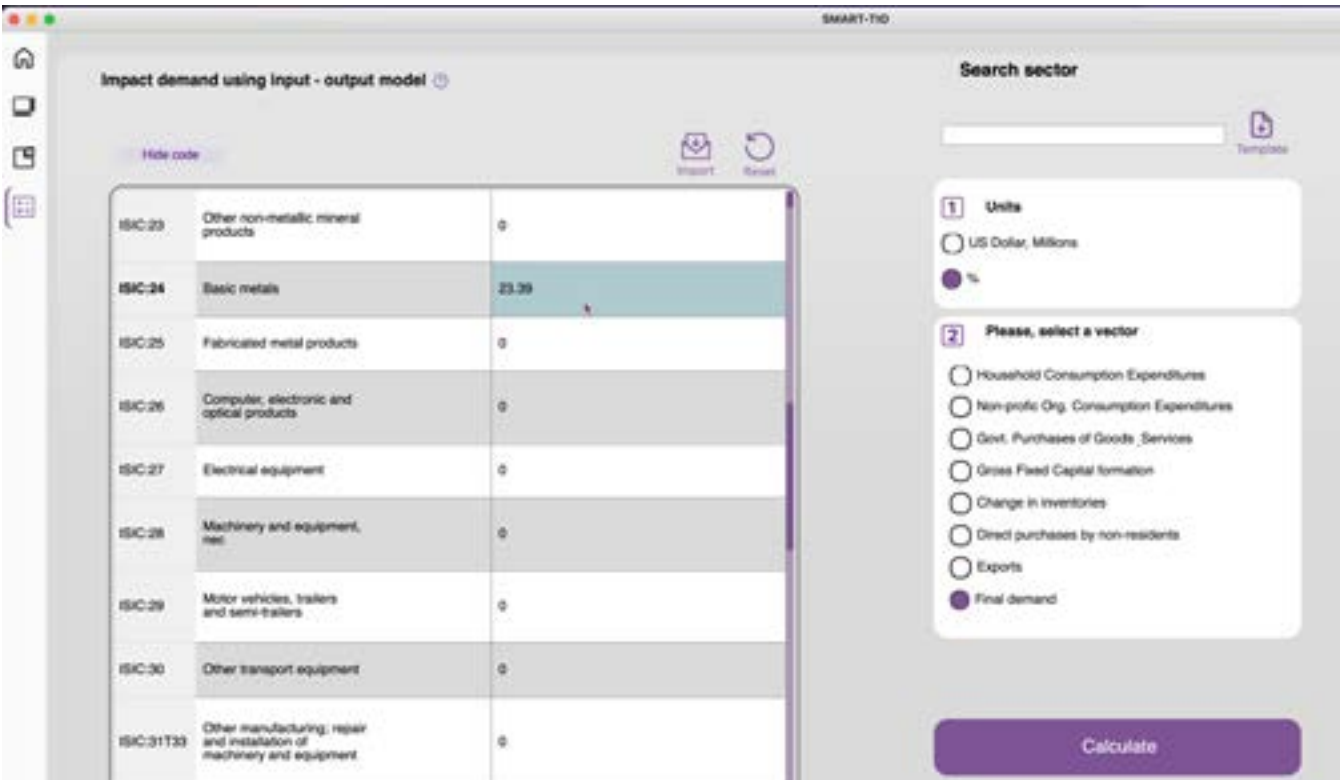


Impact demand using input - output model

Hide code

Import Reset

ISIC:23	Other non-metallic mineral products	0
ISIC:24	Basic metals	23.39
ISIC:25	Fabricated metal products	0
ISIC:26	Computer, electronic and optical products	0



Impact demand using input - output model

Hide code

Import Reset

ISIC:23	Other non-metallic mineral products	0
ISIC:24	Basic metals	23.39
ISIC:25	Fabricated metal products	0
ISIC:26	Computer, electronic and optical products	0
ISIC:27	Electrical equipment	0
ISIC:28	Machinery and equipment, nec	0
ISIC:29	Motor vehicles, trailers and semi-trailers	0
ISIC:30	Other transport equipment	0
ISIC:31T33	Other manufacturing, repair and installation of machinery and equipment	0

Search sector

Units

US Dollar, Millions

%

Please, select a vector

Household Consumption Expenditures

Non-profit Org. Consumption Expenditures

Govt. Purchases of Goods, Services

Gross Fixed Capital formation

Change in inventories

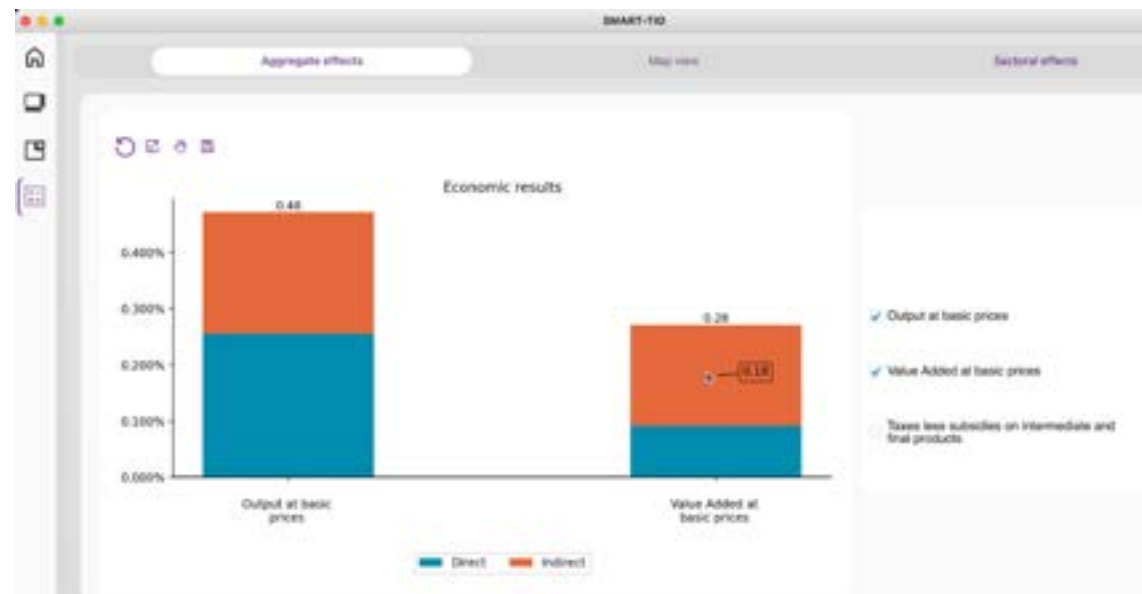
Direct purchases by non-residents

Exports

Final demand

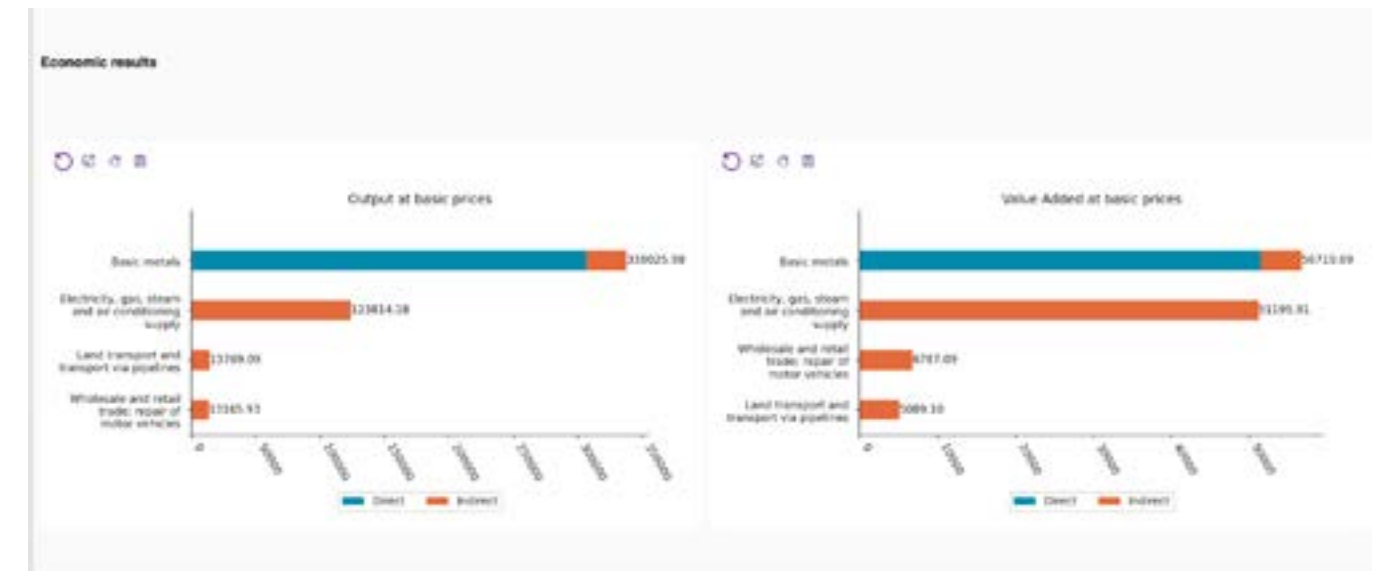
Calculate

Direct and indirect economic effects of the Alcoa closure in the Galicia region are shown in figure 1. Although aggregated effects on the Galician economy seem small (0.48% output and 0.28% value added), we should take into consideration that we measure only the closure of one company over the whole region, so the local effect will be much higher.



The economic impact varies significantly when we take into account sectoral disaggregation. In terms of output and value-added, the most affected sector is Basic Metals as it suffers the direct impact.

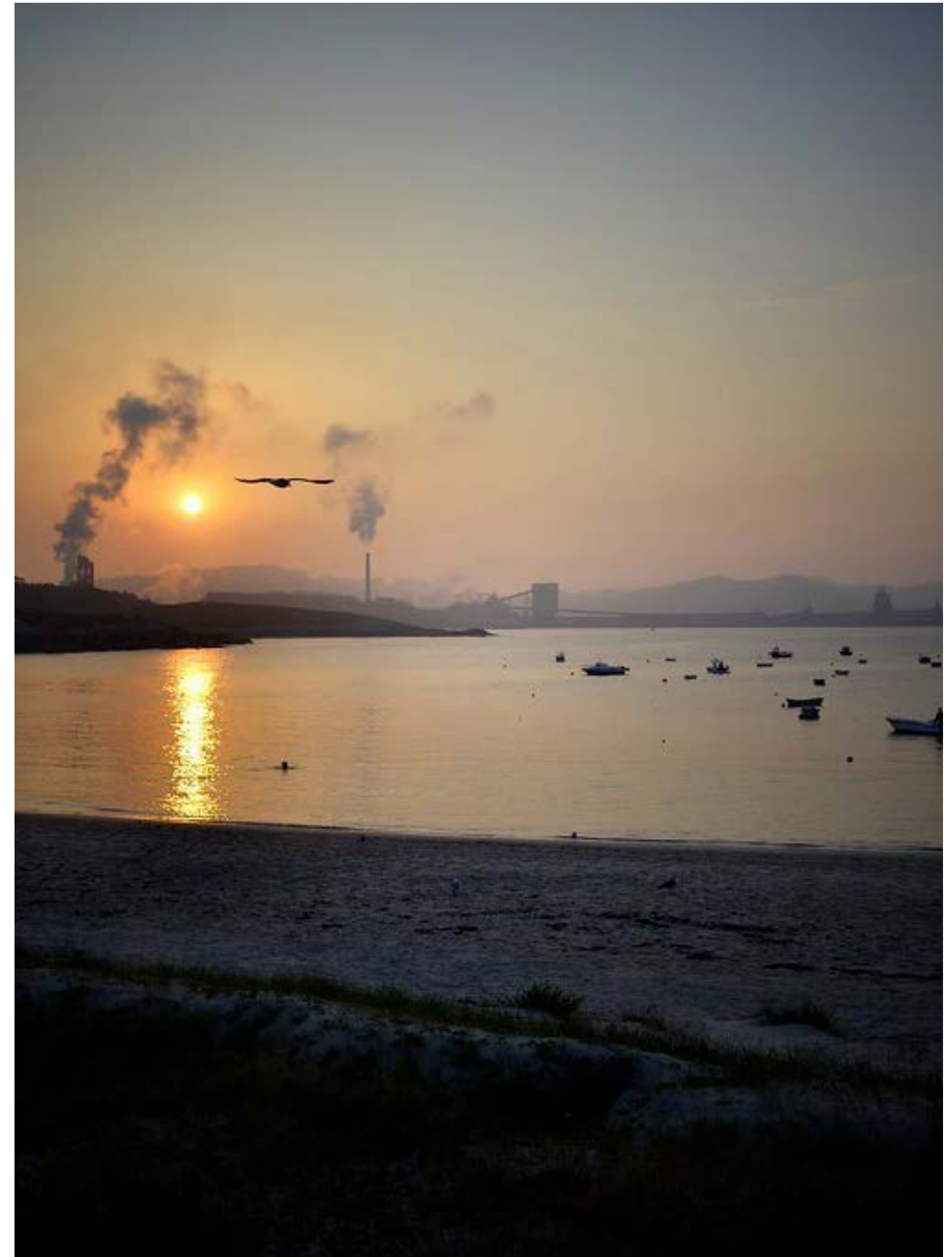
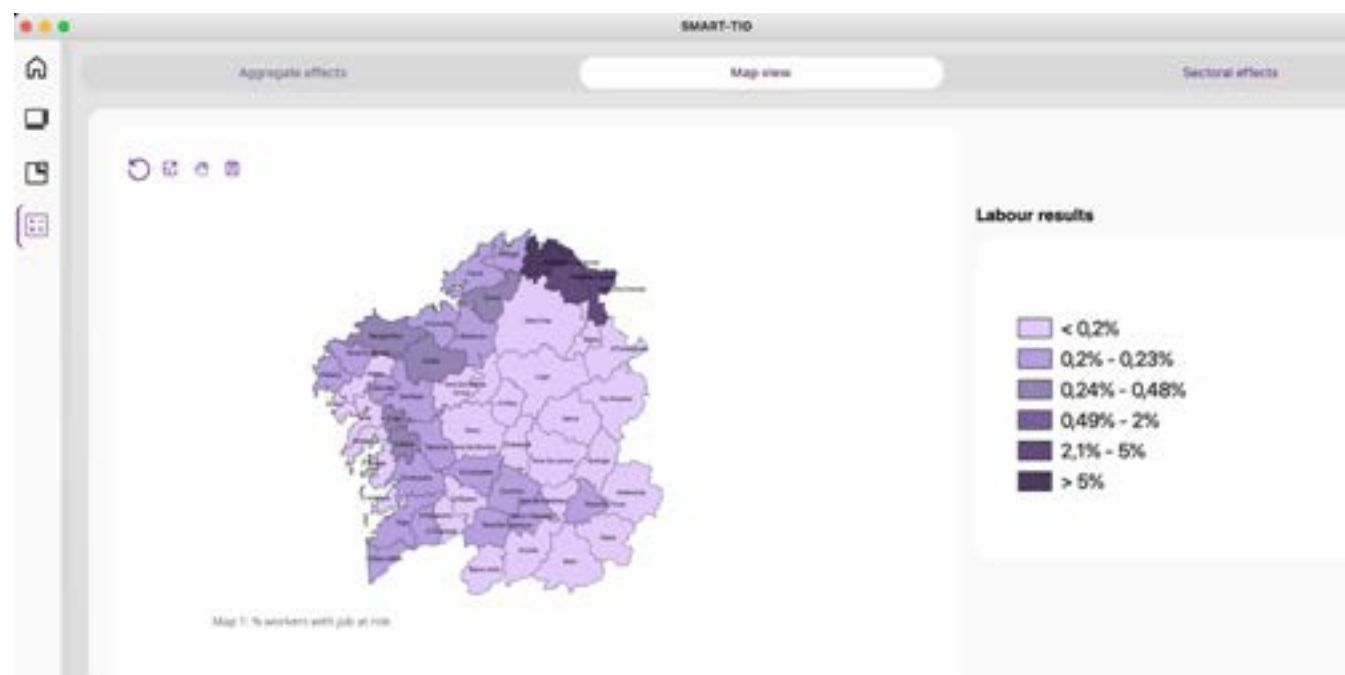
The associated loss for this sector is estimated at 9% of production and 17% of value added. We can also highlight the impact on the energy sector (Electricity, gas, steam and air conditioning supply) due to the important demand for energy in this industry, with a decrease of about 2% for both production and value-added.



Social impact can be measured in terms of people at risk of losing their job or full-time equivalent job losses, i.e. jobs adjusted per the number of hours. Using Smart TIO, we also get the direct and indirect effects of Alcoa's closure on employment. Of course, the highest number of employment lost are in the Basic Metals sectors, where the direct effects take place. Indirect effects are also important in Wholesale trade, Enterprise Auxiliary activities and Transportation. Since the energy sector is capital-intensive, it doesn't show a significant impact on the number of jobs in spite of having an important effect on production, and these other sectors are much more affected.

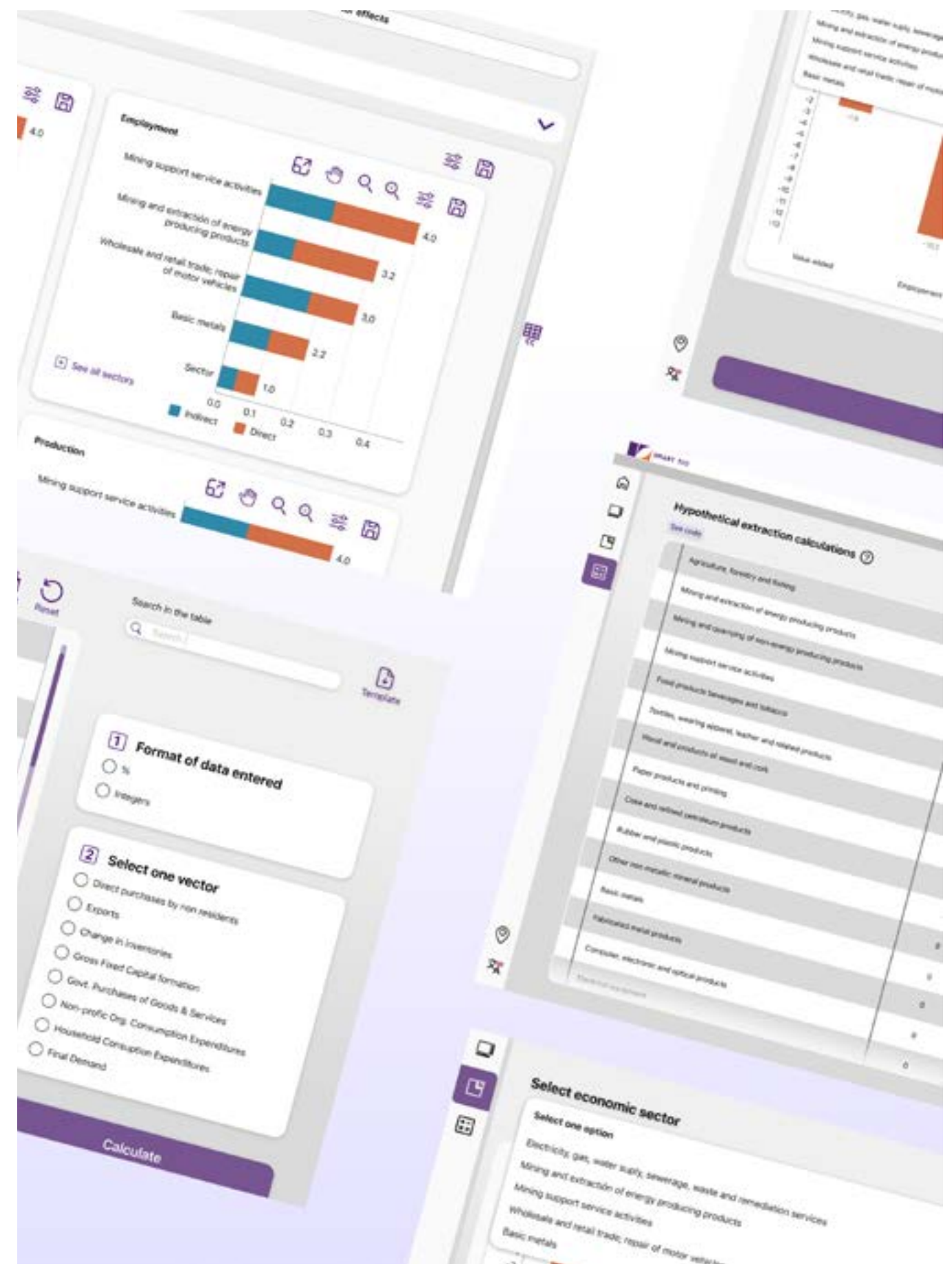


The loss of employment derived from the direct effect of Alcoa's closure would occur mainly in the Mariña Lucense districts since Alcoa workers, who would lose their job, live in this area. Secondly, the workers affected would be the ones working for the suppliers of Alcoa, as their production might be reduced after Alcoa's closure. The most affected sectors taken into account these indirect effects would be Land transport, Auxiliary Services to companies, Wholesale Trade and Machine Repair. Therefore, the most affected districts, in this case, would be the ones where these sectors are more important. The induced effect, the consequence of the loss of purchasing power of households, would occur mainly in the place of residence of these households. The most affected sectors would be especially services such as restaurants, health, education and retail trade. If we add up the number of workers who could potentially lose their job due to those three effects per district and divide this amount by the total employment per district, we will obtain the share of workers at risk of losing their job (Map 1). The risk of losing a job due to the closure of Alcoa can affect the whole Galicia, especially the districts of production of the services and products required for Alcoa's manufacturing, such as Land Transport, Auxiliary Services, etc. Notwithstanding, all of these districts show an effect under 0.3%, with the exception of Mariña Lucense districts. The share of workers with jobs at risk of redundancy is 2.2% in Mariña Oriental, 3.7% in Mariña Central and 7.3% in Mariña Occidental, where Alcoa is located. This means that the effect of Alcoa's closure will be very concentrated in the Mariña districts since this sector is especially important in the area.



Taken out

Smart TIO can not give a solution to avoid the closure of Alcoa, either its associated economic and social impacts. However, it gives information that can be useful to design policies to alleviate the effects. Of course, Basic Metal will be the most affected sector and where more jobs will be lost. So, subsidy policies to mitigate production loss, or to give skills capacitation to help workers to find new jobs in other sectors will be focused on this sector. Nevertheless, it is essential to understand which other sectors are affected to do a more effective policy, both in production and in jobs lost. Anticipating policies in the sectors indirectly affected will be useful to alleviate the effects, and it is a different scenario since factories are still open, so policies can be fostering exports or making changes in the demand for these products. It is also important to take into account that, as we have seen, the indirect effects are different in production and in job losses so it is key to distinguish if the policy is targeting industry or workers. Note also that in this case the energy sector, which is the most affected one in production, is not affecting many jobs. This can give the opportunity to have more energy available in a context where the energy prices in Spain are rising due to the Russian-Ukrain conflict or move the energy sector to the use of more renewable energies.



El cierre destruiría 3.000 empleos en toda Galicia

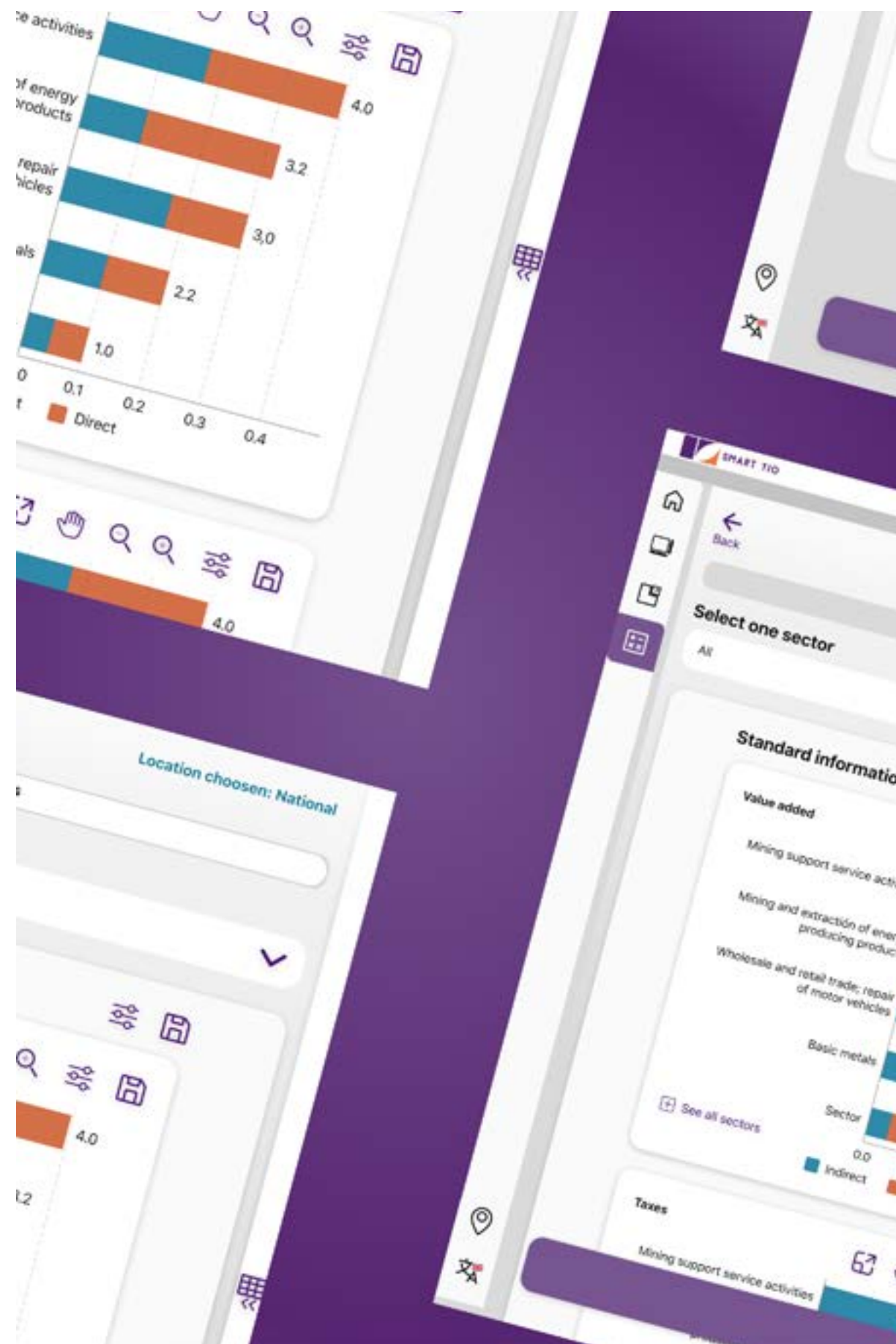
AYeconomics es el nombre de una empresa surgida al abrigo de la Universidad de Santiago, que utiliza su tecnología para llevar a cabo estudios sobre la economía gallega. Ahora, en colaboración con el **Grupo de Análisis e Modelización Económica (GAME)**, de la misma universidad, andan inmersos en un análisis sobre el impacto que tendrá sobre la comunidad el posible cierre del complejo industrial de Alcoa en San Cibrao, y ya han llegado a unas conclusiones preliminares.

La investigadora **Yolanda Pena Boquete** es la directora científica de esa iniciativa empresarial o *spin-off*. Avanza que una primera estimación calcula en unos **tres mil los empleos que se perderían con la posible desaparición de la empresa**. En esa cifra se contabilizarían unos 1.500 puestos directos e inducidos (no solo de las auxiliares de Alcoa, también de proveedores como los transportistas, por ejemplo), más otros tantos de negocios minoristas en los que ahora gastan su dinero los trabajadores y sus familias.

[Alcoa desoye los llamamientos a retirar los 534 despidos y dar marcha atrás al cierre de la última planta de aluminio.](#)

Voz de Galicia, 04 jun 2020

“AYeconomics es el nombre de una empresa surgida al abrigo de la Universidad de Santiago, que utiliza su tecnología para llevar a cabo estudios sobre la economía gallega....andan inmersos en un análisis sobre el impacto que tendrá sobre la comunidad el posible cierre del complejo industrial de Alcoa en San Cibrao....Avanza que una primera estimación calcula en unos tres mil los empleos que se perderían con la posible desaparición de la empresa. En esa cifra se contabilizarían unos 1.500 puestos directos e inducidos (no solo de las auxiliares de Alcoa, también de proveedores como los transportistas, por ejemplo), más otros tantos de negocios minoristas en los que ahora gastan su dinero los trabajadores y sus familias.”



ABOUT SMART TIO

Smart TIO is a **software created to facilitate economic decisions** by helping to perform impact calculations in a simple, fast, precise and, ultimately, efficient way. Smart TIO saves time by calculating simulations based on input-output models adjusted to your own economy. Smart-tio allow to simulate the introduction of a policy, or the impact of global trends (covid-19, war etc.). You can type data easily to do the simulations or use your on csv or xlxs file by using the import feature. It includes results on economic, labour and environmental variables ensuring more sustainable decisions. Results are shown using figures to visualice the results easily and fast. You can download the figures as well as a pdf report to have a better understanding of the main results.

Types of events and economic shocks:

- New policy introduction:
 - sectoral subsidies, tax simulations, employment measures, environmental policy.
- Size and importance of a sector in the economy (direct and indirect):
 - Health, design etc.
- Impact of global trends:
 - Environmental crisis, social inclusiveness, COVID

Impact calculations

Smart-TIO impacts are calculated based on input-output model developed by Leontief. The input-output table (IOT) shows the productive intersectoral relations of an economy in a particular moment in time, usually a year. These intersectoral in the economy can be express based on the Leontief model which shows the interdependeces among sectors to satisfy the final demand of an economy. Thus, we will get a system of equations that can be expressed using matrices:

$$x = [I - A]^{-1}f$$

Where the production of a country or region (x), can be calculated based on the final demand (f) and the intermediate inputs requirement from other sectors (A). Thus, a technical coefficient (a_{ij}) from the matrix A, shows what the sector i needs to produce a unit of product of sector j.

When we calculate the demand effect, by changing f.

Updating results

For updating results to the current year we use Path-RAS. Path Ras is an algorithm that allows us to provide updated impact evaluation analysis even if there is a scarcity of information. It has been published in Revista Portuguesa de Estudos Regionales.

[López, X. P., Incera, A. C., & Fernández, M. F. \(2013\). Advances in updating input-output tables: Its relevance for the analysis of regional economies. Revista Portuguesa de Estudos Regionais, \(33\), 3-12.](#)

Regionalization

For regionalizing the national input-output tables and being able to get the regional results based on regional tables we are based on the 2D-LQ algorithm.

[Pereira-López, X., Carrascal-Incera, A., & Fernández-Fernández, M. \(2020\). A bidimensional reformulation of location quotients for generating input-output tables. Spatial Economic Analysis, 15\(4\), 476-493.](#)

Sectoral disaggregation

Sectoral disaggregation is done with a AYeconomics and USC algorithm that balances input-output tables using iterative proportional fitting techniques can be prevented due to conflicting information. Our algorithm ensures economically meaningful solutions, avoiding unsought sign flips and respects all macroeconomic aggregates to get accurate results.

It has been accepted for publication in Economic System Research

[de la Torre Cuevas, F., López, X. P., & López, E. \(2023\). A new alternative for matrix balancing under conflicting information. Economic System Research , DOI: 10.1080/09535314.2023.2170217](#)

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