

Green Transitions of Regional Economies: A Multiregional Input-Output Analysis of the European Steel and Metal Industry

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INTRODUCTION

In the transition towards a more sustainable economy, the steel and metal industries are pivotal. These sectors are not only integral to numerous modern economic and technological infrastructures, but also play a crucial role in driving the shift to a greener future. Their significance is twofold: first, these industries are key in enabling the development of greener alternatives across various sectors, including wind turbines, electric vehicles, and railways, all heavily reliant on steel and metals. Second, the challenge for these industries lies in their high energy consumption and substantial emissions, both of which must be significantly reduced to align with environmental goals. A transformation of the steel and metal industry is therefore essential in the transition to a greener economy for both upstream and downstream value chains.

In Europe, several regions are distinguished by their large steel and metal industries. Notable examples include the Ruhr area in Germany, Sheffield in England, Piedmont in Italy, Wallonia in Belgium, and Bergslagen and Norrbotten in Sweden. In these regions, the steel and metal industries are fundamental to local economies, serving as key drivers of job creation, technological innovation, and economic growth.

The steel and metal industries currently face significant challenges, including emissions, environmental impact, energy consumption, and increased global competition. To maintain their relevance and effectively contribute to the green transition, these industries must adapt by transitioning to more sustainable production methods. This project aims to analyze and offer insights into these challenges and transitions, highlighting the industries' impacts on regional economies and their roles in broader environmental and economic contexts.

SCOPE AND PURPOSE

The purpose of the study is to analyze the dynamics of these industries, with a particular emphasis on their vital role in regional economies and integration into global value chains. As these industries are essential elements of a broader shift affecting both upstream and downstream processes, a comprehensive understanding of their complexities is crucial.

The aim of the study is to:

- Analyze how traditional production centers within the steel and metal industry are integrated into their regional economies and embedded in internationally fragmented value chains.
- Examine the consequences of changing competitiveness in the steel and metal industry across these regions.

The central question addresses how regions with a dominant steel and metal sector are affected by changes in global demand, technological changes, and how diversification impacts the regions' resilience and adaptability to new business conditions.

The study will explore: (i) the regional economic impacts of the steel and metal sector; (ii) the role of government and regional support measures in enhancing the sector's capacity to address emerging economic and environmental challenges; and (iii) the potential regional outcomes associated with a decline in the sector's competitiveness.

METHODOLOGY

The study uses a multiregional input-output (MRIO) analysis to investigate the interactions among various sectors within an economy, focusing on the interconnectedness of different industries and regions. The MRIO tables provide insights into the economic relationships between sectors and regions, illustrating how changes in one regional sector can affect others. For example, an expansion in one sector not only generates direct demand for its products but also creates indirect demand in other regional sectors that supply input goods. This method is based on the availability of MRIO tables that depict how outputs from one regional sector become inputs for another. The analysis is further enriched by international IO tables from the OECD and regional IO data, providing insights into the upstream and downstream links of the steel and metal industries.

Additionally, MRIO tables are utilized to study import, export, and trade between regions as further components of the economy's input-output structure. Understanding the dependencies among various sectors and regions enables us to form a comprehensive picture of the consequences of changes in demand, new regulatory frameworks, and government interventions like subsidies and other support measures.

In this project, data from three sources are used:

1. International IO tables from the OECD (TiVA tables) provide an overview of the upstream and downstream links of the steel and metal industry (SN2007: 25, steel and metal industry) and foreign trade (import/export) for a selection of countries with significant metal industries (OECD, 2020; 2023).

2. Regional IO data (MRIO tables) for a selection of European regions with substantial steel and metal industries (data from JRC, developed by Professor Mark Thissen) are used. This IO database includes about 330 regions and covers interregional links, indicating that all European regions (and the rest of the world) are interconnected through interregional trade flows, input usage, and the supply of goods in the form of regional trade matrices (PBL-EUREGIO, 2010; 2017).

3. Furthermore, microdata from IFDB (Statistics Sweden) are employed to detail the economic activities of steel and metal companies, including the environmental and energy consumption usage by these industries, underscoring the need for sustainable production methods. By utilizing microdata from Statistics Sweden IFDB and potentially the Raps system, the project offers a detailed view of the economic activities of steel and metal companies, including energy usage. The Raps system may also be used to generate a forward-looking view of the economy of steel and metal regions for the upcoming period (see Anderstig, et. al., 2022).

The study follows four steps:

Step 1: Develop a framework for analyzing and comparing the structure and trade within and between steel and metal regions using MRIO data.

Step 2: Collect and compile IO data and other relevant data to develop the model structure for IO analysis. Special detailing is done with microdata and/or detailed Swedish regional data and scenarios for the Swedish steel and metal sector for each region.

Step 3: Analyze key questions using MRIO data. How does Swedish steel production differ from that in other regions? How could Swedish steel production be affected by changes in production technology?

Step 4: Compile the main results and conclusions of the study. Compare Swedish results to results from the international literature.

The study starts with the development of an analytical framework based on MRIO data, followed by data collection and model structure development. It then analyzes key questions using the MRIO data, culminating in a comprehensive report detailing the regional economic impacts of the steel and metal sector, the effects of state and regional support measures, and potential consequences for the regions of diminished competitiveness within the sector.

CONCLUSION

The study provides important insights into the complex dynamics of the steel and metal industries and their significant influence on regional economies, technological progress, and economic growth. It underscores the importance of these industries in both the

economic and environmental health of many European regions. By analyzing the integration of traditional steel and metal production centers into regional economies and their roles in fragmented international value chains, the study identifies linkages between different regions and sectors that sheds light on the need for sustainable growth strategies in these sectors. Furthermore, it evaluates the impact of shifting competitiveness within these industries across different regions and sectors. The findings highlight the necessity for these industries to adapt to sustainable production methods, considering their substantial emissions and high energy consumption. The research is crucial for developing comprehensive strategies that align with environmental goals while maintaining regional economic viability, thereby contributing to a broader sustainable transformation in society.

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