Breaking down sectors:
A novel approach to disaggregating Input-Output Tables

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Abstract: This paper presents a new methodology for disaggregating input-output (IO) tables to uncover hidden heterogeneity in industry structures, trade patterns, and supply-chain dependencies. Conventional IO tables aggregate sectors at a high level, masking critical differences among sub-industries. Our three-step approach (i) compiles high-granularity production and trade data for disaggregated sectors, (ii) estimates and balances IO flows through econometric techniques, and (iii) validates the resulting tables against established industry benchmarks. The framework is illustrated with a case study of the European Union automotive sector, which we split into electric vehicles (EVs), internal-combustion-engine vehicles (ICEs), and vehicle-parts manufacturing. Results show that foreign-input dependence differs markedly across vehicle segments: EVs exhibit a 29 % foreign share, compared with 13 % for ICEs. Further decomposition attributes 80 % of this gap to global value-chain strategies and 20 % to technology gaps. Regional extensions reveal substantial heterogeneity across EU economies in their reliance on the Single Market versus non-EU partners. The study underscores the policy relevance of fine-grained IO analysis for enhancing competitiveness, supply-chain resilience, and targeted industrial strategy. The proposed methodology is flexible and can be transferred to other sectors, offering researchers and stakeholders a robust tool for detailed economic and trade assessments.

Keywords: Input-Output analysis, global value chains, trade dependence, automotive sector, electric vehicles.

Introduction

Input-output (IO) tables are an important tool for analysing the structure of economies, understanding industry relationships, and conducting trade analysis. However, traditional IO tables often aggregate industries at a high level, hiding crucial sectoral differences that can have significant implications for policy and decision-making. Consider, for instance, the automotive industry, where many IO tables typically aggregate internal combustion, hybrid, and electric vehicles within a single sector, thereby obscuring the structural transition from ICEs to HVs and EVs Consequently, such aggregation precludes rigorous analysis of how electrification alters firms' input sourcing

patterns or of the differential effects of policy interventions (e.g., subsidies targeted at EVs) on ICE and EV production, as well as on upstream industries (batteries, steel, etc.).

This paper proposes a novel methodology for disaggregating IO tables and then an application to the EU automotive industry to separately assess technological differences and foreign dependencies for ICEs, EVs, and vehicle parts. Our analysis reveals that EVs rely more on foreign components than ICEs, mainly due to global value chain (GVC) strategies rather than domestic technological shortcomings. Overall, these results emphasise the importance of accounting for sectoral differences in production and trade patterns.

Methods

This paper proposes a new methodology for disaggregating IO tables. Building on Wolsky's distinguishing parameters approach [1] and its subsequent generalisations [2], we developed a novel methodology to disaggregate IO tables with minimal data requirements. It only requires production and trade data at the desired level of disaggregation. The identification strategy for the econometric model used to estimate technical coefficients for the subsectors relies on the temporal and spatial variation in the disaggregated industry's production and trade data.

Our methodology can be summarised in three main steps. First, we collect and integrate detailed production and trade data for the disaggregated sectors of interest. Second, we build on IO insights and apply econometric techniques to estimate and balance IO flows across disaggregated sectors. We estimate the unknown technical coefficients for the disaggregated sectors using a constrained ordinary least squares (OLS) regression, where the coefficients represent the average subsector composition when the production structure remains constant over a selected time period. To address potential negative coefficients in the OLS regression, we define an algorithm that iterates over the set of possible combinations of zero coefficients and selects the combination that minimises the regression residuals. Third, we validate the disaggregation by comparing estimated results with available industry benchmarks. Our methodology enables a detailed analysis of the production structures and supply chain dependencies of the disaggregated sectors.

Results

We apply this methodology to the EU automotive industry (using data classified under code C29 "Manufacture of motor vehicles, trailers, and semitrailers" in the FIGARO IO tables together with PRODCOM and COMEXT data). The EU automotive industry is facing challenges as Chinese EVs are increasingly gaining market share due to lower prices and

perceived higher quality. However, in the last decade, the industry's reliance on foreign components has increased slightly (from 8% to 11%), masking the heterogeneity of EV and ICE manufacturing. In this context, the distinction between EVs and ICEs is particularly important for understanding the economic effects of the transition from ICE to EV production and analysing the strategic dependency for inputs in which the EU lacks a comparative advantage, such as batteries.

We disaggregate the automotive sector to separately estimate the production technology and foreign dependence of the following subsectors and technologies: ICEs, EVs, and vehicle parts. On the technological side, our results reveal substantial production differences between EVs and ICEs, with EVs exhibiting a greater reliance (in value) on batteries and electric components and services, while requiring fewer manufacturing inputs compared to the ICE segment. Moreover, we find that in EU production, EVs display significantly higher foreign dependency (29%) than ICEs (13%). The higher dependence on Chinese inputs in EV production (11%) compared to ICE (2%) is prominent (Figure 1). Together, these results emphasise the importance of accounting for sectoral differences in production and trade patterns.

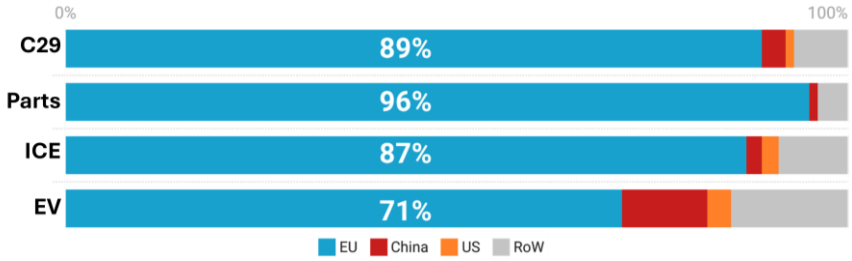

Figure 1. EU value content by industry segment (2022)

A counterfactual exercise shows that this disparity is primarily (80%) due to more aggressive Global Value Chain (GVC) strategies for EVs, and to a much lesser extent (20%) due to a technology gap in EV production. This fact highlights the importance of GVC shifts in driving the EU's higher foreign dependence in EV production. We extend the EU-level analysis to countries and regions, showing heterogeneity in EU economic structures and their reliance on the Single Market relative to non-EU economies.

A comparison with the US automotive industry reveals similar challenges. Our results demonstrate that in the US, 82% of inputs for ICE manufacturing come from domestic sources, compared to 74% for EVs (Figure 2).

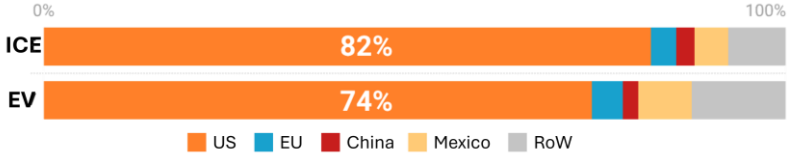

Figure 2. EU value content by industry segment (2022)

While these figures mirror the EU case, there are significant differences in the sourcing strategies. The US sources approximately 1.6 times more intermediate inputs from Mexico for EV production (7%) than for ICE manufacturing (4.5%). At the same time, reliance on China remains similar across vehicle types (2% for both ICE and EV).

Conclusion

Our paper contributes to the existing literature on IO analysis by providing a flexible, easy-to-implement methodology applicable across sectors and technologies that enables cross-country and regional comparisons. By enabling more granular, tailored analysis, our approach can inform evidence-based policy actions to address competitiveness and technological gaps, mitigate sovereignty risks, and promote resilience. The methodology's versatility and accessibility make it a valuable tool for policymakers, researchers, and industry stakeholders seeking to understand complex production systems better and inform strategic decision-making.

The EU automotive sector is currently facing increasing dependencies and an ongoing transition from ICEs to EVs. Therefore, this sector provides a good case study to test our methodology. Our analysis reveals that EVs rely more on foreign components than ICEs (29% vs 13%, respectively). We find that this disparity is largely attributed to global value chain (GVC) strategies, rather than a domestic technological shortfall. These findings underscore the need for EU-wide policy initiatives to reduce outsourcing through GVCs and boost European competitiveness in EV manufacturing.

References

[1] Wolsky, A. M. (1984). ‘Disaggregating Input-Output Models’. The Review of Economics and Statistics, 66(2), 283–291. https://doi.org/10.2307/1925829

[2] Lindner, S., Legault, J., & Guan, D. (2012). ‘Disaggregating input–output models with incomplete information’. Economic Systems Research, 24(4), 329-347. https://doi.org/10.1080/09535314.2012.689954