

# Rethinking economic growth and structural change

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# Valorization

*In accordance with article 23.5 of the “Regulation governing the attainment of doctoral degrees at Maastricht University” decreed by resolution of the Board of Deans, dated 3 July 2013, an addendum must be added about valorization opportunities presented by this PhD thesis.*

In recent years, there has been a renewed interest in industrial policy to face increasing competition and promote economic growth. The industrial policy of a country consists in its strategic effort to encourage the development and growth of all or part of the economy. Furthermore, the different activities that form the economy of a country are connected through inputs in terms of skills, technological capabilities and knowledge, input-output relations and value chains (either global or local). With this in mind, understanding the characteristics of such a system and the way its different parts interact and create synergies is essential. This is precisely the type of knowledge this thesis aims at providing. For obvious reasons, such knowledge is highly relevant to inform policy makers, both in the developed and developing world, in order for them to better shape their industrial policy. This thesis is also scientifically relevant in that it largely contributes to the literature on the economics of technological and structural change, on the economics of growth and to the methodology for input-output analysis. In particular, chapter 2 aims at redefining the boundaries of production/export empirically with a focus on economic activities rather than predefined sectors. This is done by diverting away from traditional economic analysis and adopting a network perspective. More specifically, I combine economic data with community detection to map clusters of products for several time windows. This exercise enables to identify bottlenecks and opportunities for economic development and its changes over time. In particular, results indicate that the formation of clusters do not always depend on the traditional divide between high/medium and low-tech products. Such patterns are strongly dependent on other factors such as the domain of knowledge and technology as well as value chains, the stage of production, the type of production process and product characteristics. As argued throughout the thesis, this is essential because the development is gradual and path dependent. A better characterization of the boundaries between economic activities informs policy makers of the bottlenecks that might arise in implementing a given industrial strategy.

In chapter 3, I adopt a measure of economic growth so as to capture medium-

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term growth rather than growth volatility that represent business cycles. This measure improves upon traditional measures in two ways. First, countries care about factors of *sustainable* growth rather than those making the growth rate vary from one year to the next. Second, structural change is a rather slow process and its effect on growth is only relevant when looking at medium-term growth. I innovate in adapting a semi-Markov model, which has been used so far in medical studies, to growth analysis. I also estimate an extension of this model using the Cox-proportional model to analyze the effect of the economic structure on growth transitions. This model improves upon the literature by focusing on growth transitions rather than simply on growth variation or on the probability to move towards a growth regime (logit or probit models). Furthermore, I find that the growth process is gradual and so a simple Markov model would be limited in terms of the information that it could provide (transition probabilities). Instead, in the semi-Markov model, transitions from one growth regime to another depend on the growth regime a country is in, the time spent in this state as well as the economic structure of the country (Cox-proportional model extension). Such an analysis provides information on the characteristics of *each* growth transition conditional on the time spent in a state and quantifies the effect of the economic structure on each of them. The definition of the economic structure relies on chapter 2, but focusing on manufacturing activities. The model is estimated in two-steps in order to test several measures of economic structure. I look at two dimensions of the participation of countries in each cluster: specialization and diversification. Results show that the way the economic structure is measured has different policy implications, i.e. being diverse in a cluster doesn't bring about the same changes as being specialized in the same cluster.

Lastly, the production of countries can be decomposed in terms of the destination of output: as input in the production (i.e. intermediary consumption), as investment or as final good ready to be consumed. Since intermediary consumption accounts for more than half of the value of total production in most countries (OECD), it is important to know how the value is distributed across the supply chain, especially when shocks arise. In particular, the increasing division of tasks within and across borders has contributed to a growing and more and more complex interconnectedness between industries. In this context, the answer to the question "How are shocks from one industry distributed throughout the economy?" is particularly relevant for industrial policy. While industrial policy usually targets a specific group of industries, its effect can be amplified since it can affect indus-

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tries outside of the targeted group through input-output linkages. In chapter 4, I improve upon the traditional methodology to estimate more accurately the output multiplier from the *demand* side, i.e. backward linkages, for each country in the sample including both developed and developing economies. The traditional measure of backward linkages relies on several strong assumptions. When an input-output link is present between supplier industry  $i$  and user industry  $j$ , the shock from user industry  $j$  is fully transmitted to its supplier industry  $i$ . That is, as long as there is a link, the shock is transmitted and the strength of this shock is proportional to the importance of the supplier industry for the user industry. In addition, it is assumed that a direct shock is considered to be as important as an indirect one. Otherwise said, the effect does not fade away along the supply chain. I modify the Leontief matrix in order to test the validity of these assumptions. This change is inspired by a well-known measure in network analysis, called Katz centrality. I extend it to adapt it the measurement of the output multiplier. The new measure enables to quantify the response to demand shock by industry and country (until now considered constant and equal to 1), by comparing estimated and actual output variation. I find that the assumptions are in many cases not valid. In particular, there are differences between sectors and between countries (especially between developed and developing countries). These results are critical when shaping an industrial strategy as it provides information on the *effective* possibility of a particular industry to disrupt the supply chain and thereby leads to a more accurate measure of the output multiplier.

As for the *outcome* of this thesis, it consists of three research papers that I aim at publishing shortly. These papers have also been presented in several international conferences and workshops including the workshop on The future of industrial work at UNIDO (Austria) in September 2019; The 3rd UNU-MERIT Internal Conference (The Netherlands) in June 2019; Druid Academy (France) in January 2016; the European Meeting on Applied Evolutionary Economics (EMAE): Globalisation, Innovation and Economic Change (The Netherlands) in June 2015; Conference on Governance, Innovation and Development (The Netherlands.) in November 2014 and the Conference on Micro Evidence on Innovation in Developing Economies - MEIDE (Chile) in November 2013.