

Executive Summary

Government regulation of private actors can address market failures or respond to compelling public needs. Agencies analyze individual regulations' expected impacts before they are issued, but less is understood about the effect of regulations on economic growth. Numerous studies have attempted to examine this relationship, focusing on different economic indicators such as productivity, entrepreneurship, and innovation. However, the results are often inconclusive or directly contradictory to one another. In the agriculture sector, regulation may affect productivity growth through various channels, but empirical evidence is scarce. This report attempts to shed light on the relationship between regulation and agricultural productivity through both theoretical discussion and empirical analysis. In particular, the report highlights the importance of considering different *forms* of regulation—defined by the particular policy mechanisms adopted—in examining the impact of regulation. The report consists of four chapters.

Chapter 1 focuses on theoretical foundations for understanding the relationship between regulation and economic growth, with an emphasis on productivity growth in the agriculture sector. It presents the various mechanisms through which regulation can affect productivity growth, both in the economy generally, and in the agriculture sector. It finds that empirical research examining the impact of regulation on productivity growth is often hampered by the difficulty of measuring regulation in a meaningful way. Despite various attempts to measure regulation from different perspectives (e.g., page counts, agency budgets, etc.), empirical findings regarding regulatory impacts are inconclusive. More importantly, although there is widespread recognition that the form a regulation takes can affect its outcomes and costs, no studies have differentiated the economic effects of different regulatory instruments in a systematic way.

Chapter 2 presents a Taxonomy of Regulatory Forms that may help fill the gaps in the literature and enable more research to account for regulatory form when examining its economic impacts. The Taxonomy is designed to be a comprehensive catalogue of regulatory instruments that apply to regulations across areas. It contains three tiers of regulatory forms, from broad classification distinguishing economic, social, transfer, and administrative regulations, to a more detailed taxonomy of specific policy instruments, such as rationing and quotas, performance standards, labeling requirements, and monetary transfers. The chapter discusses the economic rationale behind each form, the characteristics that define them, and illustrative examples.

Chapter 3 applies the Taxonomy to regulations affecting the agricultural sector. As a critical part of the analysis, the research team at the GW Regulatory Studies Center implemented a rigorous coding procedure to classify more than 700 parts in the *Code of Federal Regulations* by the regulatory forms defined in the Taxonomy. The chapter presents a descriptive analysis of the coding results and examines trends and patterns across agencies and over time. It finds that command-and-control, transfer, and administrative regulations are the most prevalent forms of regulation in the agricultural sector. Among the agencies that issued the most relevant regulations, the U.S. Department of Agriculture relied on very different regulatory forms than the Environmental Protection Agency and Food and Drug Administration. During the period between 1970 and 2017, the reliance on different regulatory forms

presented different trends over time. In general, regulation increasingly relied on social regulatory instruments while decreasing reliance on transfer regulations.

Chapter 4 presents an empirical analysis that attempts to assess whether different forms of regulation have different effects on productivity growth in agriculture. Using the coding results of the relevant regulations and data from 25 agricultural industry segments for the 1971-2017 period, the chapter examines the relationship between growth in regulations that take different forms and growth in land productivity as measure by crop yield. The econometric findings suggest that growth in total regulation has a negative relationship with land productivity growth (i.e., yield growth), and the relationship differs depending on the form of regulation. Specifically, growth in command-and-control, administrative, and entry-and-exit regulations is negatively associated with yield growth. Under the command-and-control and entry-and-exit regulations, growth in monitoring, reporting and verification requirements, permitting, and certification has the largest negative relationship with yield growth. Meanwhile, growth in transfer and information-based regulations has a positive relationship with yield growth.

Annex I applies a useful innovation from machine learning techniques to verify the results from the econometric models in Chapter 4. It briefly explains the method and illustrates specific results. They support the conclusion that growth in some forms of growth is negatively associated with yield growth even when non-parametric methods and large model ensembles are used to avoid possible model specification errors and to assess model uncertainty. Annex II presents a list of the CFR parts examined in this research. It identifies regulations that are likely to affect crop and/or animal production based on different data screens.

This report provides preliminary evidence that different forms of regulation can have different effects on agricultural productivity. If increasing farm productivity is a goal of regulatory reform, decision-makers can most effectively accomplish this goal by focusing on the forms of regulation shown to have negative effects on productivity. Regulation could potentially be less burdensome on the economy, or even enhance economic growth, if regulators find ways to accomplish important public goals by replacing forms of regulation that diminish productivity with forms that have no effect or increase productivity. The Taxonomy of Regulatory Forms presented in the report enables classification of regulations in any area, so future research can extend similar analysis to sectors other than agriculture or other economic outcomes such as output growth and employment.