Granular Instrumental Variables*

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Abstract

In many settings, there is a dearth of instruments, which hampers economists’ ability to investigate causal relations. In this paper we propose a quite general way to construct instruments: “granular instrumental variables” (GIVs). In the economies we study, a few large firms or countries account for a large share of economic activity. As they are large, their idiosyncratic shocks affect aggregate outcomes. This makes those idiosyncratic shocks valid instruments for the aggregate shocks. We provide a methodology to extract idiosyncratic shocks from the data, this way creating GIVs. Those GIVs allow us to then estimate parameters of interest, including causal elasticities.

We first illustrate the idea in the basic supply and demand framework: we achieve a novel identification of supply and demand elasticities, based on idiosyncratic shocks to supply or demand. We then show how the procedure can be adapted to handle many enrichments.

We illustrate the procedure in detail with a few applications. First, we measure how shocks to domestic banks causally affect sovereign yields. We document how negative shocks to Italian banks adversely affect Italian government bond yields, and vice-versa. This gives the first causal measure of the “doom loop” between banks and sovereign yields. Second, we study the impact of mega-firms on aggregates, such as aggregate competition (as idiosyncratic shocks to large firms change concentration ratios). This allows us to find a causal relationship between the rise of mega firms and lower investment. Third, we estimate supply and demand elasticities in the oil market. Our estimates match well existing estimates that use much more complex and labor-intensive (e.g., narrative) methods.

Lastly, GIVs allow for a resolution of the still-open question of how to go from “micro-elasticities” to “macro-elasticities”. We study a simple model multi-region model with consumption linkages and pricing frictions. We find that, under some plausible conditions, macro-elasticities are the micro elasticities times the “GDP spillover” $M$ (which indicates how much growth in one region affects growth in other regions), which our GIV method estimates to be about 1.5. Hence, the typical micro-elasticities need only to be multiplied by this $M$ to become macro-elasticities.

We conclude that the GIVs are a good candidate to supplement the empirical economists’ toolbox.

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