Digital Innovation and the Distribution of Income

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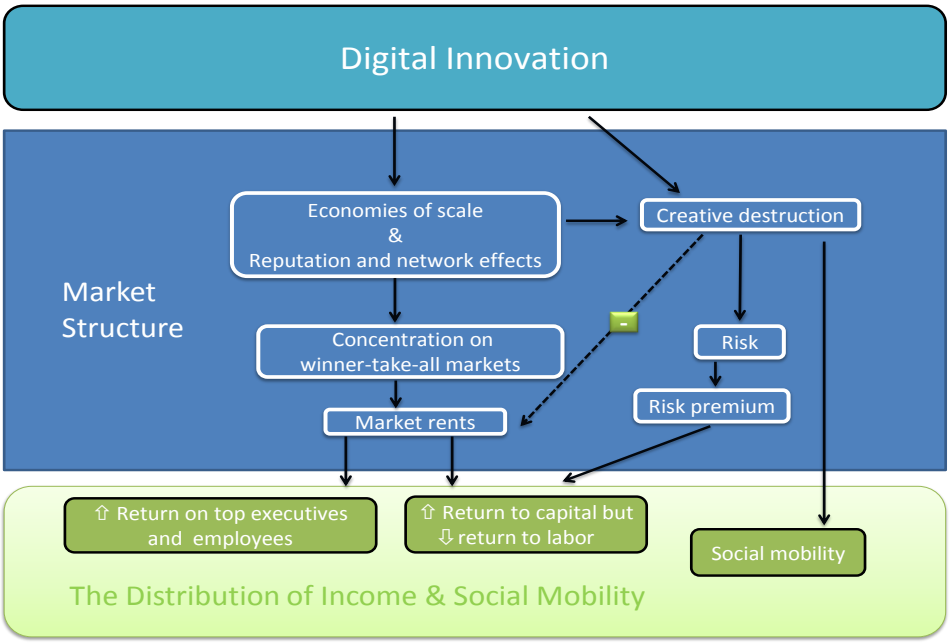
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Extended Abstract
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Income inequalities have increased in the United States and in most OECD countries over the past two to three decades; particularly the income share of the top 1% has soared (OECD, 2015).[1] In this paper we argue that the increasing importance of digital innovation - which is made of software code and on data - throughout the economy has magnified rents for innovators and resulted in both higher rewards to top income groups, including investors and leading executives, but also more opportunities for upward social mobility. These changes affect the allocation of benefits from innovation-driven growth.

The impacts of digital innovation on the income distribution through the labor market ("skills biased technical change") have been well documented. But it is only one impact channel: we focus here on the impacts through product markets. Figure 1 summarizes these mechanisms. Traditionally, each new product is made of an innovative, knowledge component ('the idea") and other, tangible ("material") components. A car, for instance, embodies both new ideas (e.g. a new carburation system) and hundreds of kilograms of steel, plastic etc. The economics of ideas and the economics of steel differ, and the dynamics of new products depend on the relative importance of intangibles and tangibles in total product value. With digital innovation the intangible component becomes dominant, sometimes exclusive, and the dynamics of innovation changes accordingly: well-known characteristics of innovation-driven markets, like a tendency towards stronger market concentration but also more creative destruction, are magnified.

Figure 1: Graphical outline of the impacts of digital innovation on the distribution of income



[1] OECD (2015), "All on Board: Making Inclusive Growth Happen", OECD Publishing, Paris.

Since knowledge is non-rivalrous - i.e. one piece of knowledge can be used simultaneously by any number of users at any scale - the costs of new ideas arise mainly in their development – typically through R&D, design and market research – while the costs of implementing and diffusing them are much lower or even nil. This feature of knowledge gives rise to increasing returns to scale which, in turn, favor market concentration, even "winner take all" ” i.e. markets akin to tournaments in which the best offer wins the race and captures most (if not all) of the product's market (Rosen, 1981).[2] These changes affect the distribution of income because rents from concentrated markets accrue mainly to shareholders, managers and leading employees; hence, they boost the rewards to top income groups.

Opportunities of scaling favor creative destruction among top products and producers: new products of even marginally higher quality can quickly take over the entire (often global) market. Faster creative destruction also offers more opportunities for upward social mobility and, consequently, allows for turnover at the top (among leading firms and their stakeholders), reducing inequalities in income over time as the gains obtained by those at the top are shorter-lived.

This paper offers descriptive and econometric evidence on the impacts of digital innovation on market structure and the distribution of income as outlined in its framework. It draws on industry- and firm-level evidence for the United States and leading OECD countries where digital innovations have become most important. The analysis proceeds in two stages: First, we document the relation between digital innovation intensities across industries and winner-take-all market concentration and creative destruction. Second, the analysis documents how digital innovation, via its impacts on market structures, affects the rewards to leading executives and the returns to capital relative to labor to identify the impacts on the distribution of income.

In our analysis, we explore novel industry metrics that give a better account of digital innovation compared to the more traditional innovation measures, such as R&D expenditure and/or simple patent count data. This includes data on the sourcing of products from IT-producing industries from input-output tables, on the shares of software patents in total patents and of software engineers in total occupations as well as data from firm-level information on the relative importance of intangible to tangible investments (to proxy for the relative importance of knowledge).

We draw on diverse data sources at firm-, industry- and country level to provide evidence on the different dimensions of the framework. These sources include firm-level data from the Compustat database for the United States for the 1979-2015 period and from the world's top R&D investors globally from the EU R&D Scoreboard for the years 2000 to 2014. We extent our analysis to a wider group of leading OECD countries by employing industry- and country-level data from various OECD databases as well as from the EU KLEMs.

In conclusion, the point of the paper is to emphasize that digital innovation has led to more concentrated market because of strong scale economies digital innovations allow for. Higher rates of creative destruction together with concentrated markets increase market risks. This development generates market rents and has implications on the distribution of income: leading executives and investors increase their income as they share the rents. The average worker benefits less relative to leading executives and investors. Upward social mobility, however, is higher with digital innovation due to creative destruction. The link between market structure and income inequality means that innovation policies influence on the distribution of income. Policies for inclusive growth need to reflect on needed changes of policy developed for the manufacturing but not the digital age. While policy in this context should still aim to stimulate innovation, which drives improved welfare for all, it should also attempt to mitigate its impact on income inequality. This requires markets for digital innovation are open to new comers while incumbents' market power does not result in excess rents.

[2] Rosen, S. (1981), "The economics of superstars", *The American Economic Review*, Volume 71(5), 845-858.