Research Statement

There is a broad research agenda to better understand macroeconomic trends in productivity, markups, market concentration, and business dynamism. New technologies – such as information technology (IT) and cloud computing – are likely to play a crucial role, given the potential productivity gains and impact on workplace organisation. I am interested in understanding how emerging technologies affect firms, workers, and the aggregate consequences.

Returns to scale are an important factor in these discussions. Returns to scale mediate the relationship between markups and profit shares. More concretely, rises in markups will not feed through to profit shares if returns to scale also rise. This may deter firm entry, and affect which firms benefit from new technologies. Many explanations of rising market power, such as intangible capital, superstar firms, IT-investment, and regulatory barriers can be interpreted through returns to scale, either by affecting fixed costs or variable costs.

My job market paper investigates returns to scale, its relationship with productivity, and the drivers of this relationship. Crucially, the drivers of returns to scale have different aggregate implications. We present a general equilibrium model of heterogeneous firms engaging in imperfect competition, with endogenous returns to scale arising from labour-denominated overheads. We show that a flattening of the marginal cost curve (i.e. a rise in the 'span of control') can jointly explain a rise in returns to scale and slowdown in productivity growth in the UK. The mechanism for this relies on flatter marginal costs weakening firm selection, allowing low-productivity firms to survive.

I have three distinct projects which will be the focus of future research.

Technology Adoption

There has been a proliferation in the adoption of new technologies such as robotics, computer software, and cloud computing which should boost the ability to turn inputs into output (Acemoglu and Restrepo 2020; De Ridder 2019). The impact of such technologies on firm growth and employment is an active area of research.

I have two existing papers on this topic. The first studies the effect of robot purchases on labour markets in the UK. I estimate that higher robot use is associated with increased employment, contrary to evidence from other countries. The second analyses Italian firm adoption of 'automation' technologies, such as Artificial Intelligence and 3D Printing. I find causal evidence that adoption boosts employment, but only for skilled workers, suggesting technological complementarities.

I plan to investigate the relationship of technology adoption to changing patterns in returns to scale. Specifically I will look at computer software and robotics, which are likely to affect cost

elasticities in distinct ways. The difference between tangible and intangible technologies is likely to be important (De Ridder 2019; Crouzet, Eberly, Eisfeldt, and Papanikolaou 2022), and should be better understood.

I have started working on embedding the model of intangible capital of Crouzet, Eberly, Eisfeldt, and Papanikolaou (2022) in a neoclassical growth model with heterogeneous firms, to highlight how distinct technologies endogenously affect scale economies (Lashkari, Bauer, and Boussard 2019), and the subsequent implications for productivity and business dynamism.

Theory of Returns to Scale

Much of the theoretical work on returns to scale in my job market paper opened up new avenues for research. For example, the same model can be considered with output-denominated fixed costs, which would introduce new theoretical results (Savagar 2021). In addition, we assume perfect competition in the input market, but following Morlacco (2020) we have computed returns to scale with input market power, which introduces an extra wedge. This model will yield testable implications on the relationship between market power on either side of the market (input vs output).

Embedding the model from my job market paper into the framework of Edmond, Midrigan, and Xu (2015) will allow me to analyse several interesting aspects. Firstly, I can formulate the expression for aggregate returns to scale from the firm-level. Secondly, I can look at the role of overheads in misallocation. Finally, my initial work on this suggests that there is an additional channel that can reduce aggregate productivity, caused by non-optimal firm entry. In the context of slowing business dynamism (Sedlacek and Sterk 2017), this is an important topic for policy. Given the growing literature on the impact of markups on welfare, identifying the relative importance of this channel compared to other mechanisms would help narrow the scope of policy debates on this issue.

Finally, I would like to focus on the difference between internal and external returns to scale. The former has been the focus of my existing research, while the latter is related to agglomeration economies. Both are important, and have different roles in affecting macroeconomic aggregates. External economies of scale is an important parameter when thinking about mergers or break-ups of large firms. Estimation of industry-level production functions (as opposed to firm-level approaches) could help pin-down the parameter which governs external returns to scale.

'Green' Technologies

There is a tight two-way relationship between the changing climate and economic outcomes. Anthropogenic global warming is the scientific consensus, and there is plenty of evidence that greenhouse

gases (GHGs) and the corresponding higher temperatures affect agricultural output (Deschênes and Greenstone 2007), migration (Alvarez and Rossi-Hansberg 2021), industrial production (Hsiang 2010), labour supply (Zivin and Neidell 2014), and trade (Jones and Olken 2010). These macroeconomic outcomes are important, and policies to avert catastrophic climate change and the associated large economic losses are paramount.

Any environmental policy will affect firms. Standard neoclassical arguments might suggest that firms will pollute to maximise profits, to the extent this production externality is not priced. In practice, firms may face various incentives to 'go green': (1) cost-savings, if the marginal cost of abatement is negative (Gillingham and Stock 2018) (2) demand-side factors, to the extent firm climate choices affect reputation (Bachmann, Ehrlich, Fan, and Ruzic 2019), (3) dynamic innovation gains from shifting to new production processes (Porter and Linde 1995), (4) strategic considerations, such as entering a market with 'ethical' consumers (Aghion, Bénabou, Martin, and Roulet 2020), and (5) government schemes and restrictions (Martin, Muûls, Preux, and Wagner 2013; Gray and Shadbegian 2002).

I plan to study the effect of climate policy on economic decisions, and the role that 'green' technologies play in the structural transformation to improve environmental outcomes. I am in the early stages of a project which investigates the impact of the policy announcement of the London Ultra Low Emission Zone (ULEZ) on the adoption of electric vehicles. The identification approach hinges on the differential share of workers commuting into the ULEZ across postcodes, leading to a variation in exposure to the policy 'shock'. I also plan to investigate the effectiveness of the policy at reducing emissions, by leveraging the measured substitution channel towards electric vehicles and public transport. Finally, I want to look at firm adoption of 'green' technologies, and the subsequent effects on firm inputs and firm performance.