Research Statement, Pascual Restrepo, April 2023

My research explores the **implications of technological change for inequality and productivity**.

One part of my research explores **the origins of technology.** why do we develop and adopt the technologies we have? Why are some jobs automated while others are complemented by technology? Is the process of development and adoption of technologies efficient? In my work with Daron Acemoglu (MIT), we have shown that part of the current wave of automation is due to adverse demographic trends, as aging countries such as Japan and Germany develop automation technologies optimized for their demographic structure and export them to the rest of the world.[1] Our work has also explored how tax systems and labor market distortions might generate incentives for excessive automation.[2]

The second branch of my research explores **the effects of technology on inequality and productivity.** In work with Daron Acemoglu, we have developed a *task framework* where automation technologies reorganize the production process and diminishes the role of workers with some skills at the same time as it generates new roles for capital and workers with other skills.[3] We have shown theoretically and documented empirically that this reorganization might contribute to inequality and stagnant wages, despite bringing small productivity gains.[4] Our framework also emphasizes that automation and other forms of technological change can coexist in the long run and generate balanced growth if the economy creates new tasks and roles for workers, as seen historically.[5] Finally, in recent work with Ben Moll (LSE) and Lukasz Rachel (LSE), we study how technology affects the dynamics of wealth accumulation. We show that automation technologies can permanently raise asset returns and via this channel have important distributional consequences, both for wages and capital ownership.[6]

My ongoing work extends this agenda in several directions:

1. The role of firms: The adoption of automation technologies concentrates in large firms. This uneven adoption affects the way in which these technologies contribute to aggre-

[1]Demographics and Automation, (*Review of Economic Studies*, 2022).

[2]Does the US Tax Code Favor Automation? (*Brookings Papers in Economic Activity*, 2020).

[3]Automation and New Tasks: How Technology Displaces and Reinstates Labor, (*Journal of Economic Perspectives*, 2019).

[4]Robots and Jobs: Evidence from US local labor markets, (*Journal of Political Economy*, 2019) and Tasks, Automation, and the Rise in US Wage Inequality, (*Econometrica*).

[5]The Race Between Man and Machine: Implications of Technology for Growth, Factor Shares and Unemployment (*American Economic Review*, 2018).

[6]Uneven Growth: Automation's Impact on Income and Wealth Inequality, (*Econometrica*).

gate productivity and shape market structure. In joint work with the US Census Economic Studies group, we designed a new module for the 2019 *Annual Business Survey* to gather data on the adoption of artificial intelligence, specialized equipment and software, and robotics for over 200,000 firms across all economic sectors. New versions of the technology module will be included in the ABS in 2024, providing the first comprehensive measurement of the adoption of advanced digital technologies in the US economy. Using these data, we plan to work on a series of projects studying the determinants and motivations driving the adoption of these technologies, as well as the bottlenecks limiting their use by smaller firms across a wider range of sectors.[7]

In ongoing work with Joachim Hubmer (Penn), we leverage these data to quantify the contribution of the uneven adoption of automation technologies to various trends in the US manufacturing sector: the rise in productivity dispersion; the expansion of large firms at the expense of their competitors; and the decline in the sectoral labor share that has coincided with rising labor shares for the median firm.[8]

2. The dynamics of adjustment: Globalization, economic reforms, and rapid technological change can bring large disruptions in the short run but benefit everyone in the long run. In work with Nils Lehr (PhD student from BU), we revisit the role of gradualism as a potential policy tool that might dampen the adverse distributional consequences of these transitions.[9] We show that there are welfare gains from inducing a more gradual transition via temporary taxes on trade and technology, and provide formulas for the optimal path for taxes. Our formulas account for the possibility that reallocation effort responds to policy, and for the existence of income taxes and assistance programs. Using these formulas, we compute the optimal temporary taxes needed to mitigate the distributional consequences of rising import competition from China and the deployment of automation technologies substituting for routine jobs. Our formulas can also be used to compute the optimal timing of economic reforms or trade liberalizations, and we apply them to study Colombia's trade liberalization in 1990—a prominent example where optimal policy called for a more gradual reform.

3. Automation and rent dissipation: In ongoing work with Daron Acemoglu, we study the effects of automation technologies in economies where labor market frictions gener-

[7]Automation and the Workforce: A Firm-Level View from the 2019 Annual Business Survey (prepared for the *NBER/CRIW conference on Technology, Productivity, and Economic Growth*, 2022)

[8]Not a Typical Firm: The Joint Dynamics of Firms, Labor Shares, and Capital-Labor Substitution (NBER Working Paper No. 28579, 2021).

[9]Optimal Gradualism (NBER Working Paper No. 30755, 2022).

ate wage dispersion among identical workers in the form of rents. We show that automation is directed at high-rent jobs or tasks, creating a new rent dissipation mechanism. This mechanism has three implications. First, among equal workers, automation reduces frictional wage dispersion, by pushing workers away from high-rent jobs. Second, due to the loss of jobs where they earned rents, groups of workers exposed to automation will see a bigger reduction in their relative wages than in a competitive labor market. Third, by pushing workers away from high-rent jobs where they also had the highest marginal product, automation worsens allocative efficiency. In a competitive economy, technology raises productivity and average wages even if it displaces workers from some of their tasks. When there are labor market distortions, automation will bring smaller or even negative changes in TFP and welfare by worsening allocative efficiency.

Using data for the US from 1980 to 2016, we provide empirical evidence consistent with the rent dissipation mechanism and its implications for group wages and within-group wage dispersion. We also show how the general equilibrium effects of automation can be estimated. Our results suggest that the baseline ("competitive") effects of automation account for 46% of the increase in between-group inequality in the United States since 1980, while the rent dissipation effects add another 20% to this number. We also estimate that automation brought almost zero TFP and (utilitarian) welfare gains on net since 1980, once changes in allocative efficiency are accounted for.