Comments on "Does the US Tax Code Favor Automation?" by Acemoglu, Manera, and Restrepo

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Acemoglu, Manera, and Restrepo provide a thought-provoking perspective on capital taxes and automation. The paper is clearly written and the model's logic is intuitive. I especially appreciate their careful attention to detail in mapping the model onto its empirical analogues in the U.S. tax system. My comments focus on capital tax questions and quibbles, both in mapping the model to the data and in applying the results to inform capital tax policy. To me, the question—where does automation rank relative to other considerations in evaluating tax policy?—remains open. But I suspect we have not heard the last from this team. In the words of a famous robot from popular culture, "[They'll] be back!"

Evaluating Key Capital Market Assumptions

The paper's primary contribution is a set of theoretical results on the potential for welfare-improving taxation of automated tasks or complementary capital. These results are then calibrated under certain assumptions to allow quantitative statements (1) on whether the tax code suboptimally favors automation and (2) on what optimal tax rates on labor and capital should be. Under the offered set of assumptions, the model's results hold. My first comment concerns which assumptions are important for the main results and whether these assumptions are suitably chosen. I focus on three parameters of interest: the elasticity of capital supply, the capital markets wedge, and the effective capital tax rate.

First, the model's results accord with a Ramsey-rule intuition that optimal taxes are inversely proportional to the elasticities of capital and labor supply. Thus, the relative elasticity of capital versus labor is crucial for the quantitative exercise. The paper's baseline parameterization sets the capital supply elasticity to 0.65, slightly below the labor supply elasticity of 0.7. The source for this assumption is recent quasi-experimental

research on wealth and savings taxes, for example, the recent paper by Jakobsen et al. (2020) that studies a recent wealth tax reform in Sweden.

I believe the conventional wisdom on labor versus capital remains that capital supply is more elastic than labor supply, so was surprised to see them calibrated to be about the same. Taking estimates from the wealth tax literature to this setting requires a nontrivial extrapolation, namely, that the local effects estimated for a small subpopulation can inform the aggregate capital supply elasticity.

Moreover, the wealth and savings tax literature are not the only useful sources for such estimates. For example, House and Shapiro (2008) use the first round of bonus depreciation incentives to estimate the elasticity of capital supply, subject to the assumption that demand elasticities for long-lived goods in response to temporary subsidies are infinite. Their capital supply elasticities range from 6 to 14, an order of magnitude larger than the assumed elasticity here. Of course, the tradition in theoretical corporate tax incidence going back to Harberger (1962) and Feldstein (1974) has been to permit the capital supply elasticity to approach infinity in the medium and long runs. While I believe finite capital supply elasticities are well justified and supported in the data, the bottom line is that the working assumption here appears to me to be non-standard, potentially controversial, and quantitatively relevant.

Second, the core theoretical results follow from the interaction between automation and the assumption of an unrelated labor market wedge that implies equilibrium employment is suboptimally low. Key here is that there is not a similar capital market wedge. Of course, there is a large body of research on capital market wedges, deriving from information asymmetries, agency problems, imperfect contractibility, and so on. An influential line of *Brookings Papers* going back to Fazzari, Hubbard and Petersen (1988), along with the entire field of corporate finance, seem to invite us to consider relaxing the perfect capital markets assumption. It might be worth generalizing the results to a setting with a capital market wedge and making statements a function of the relative wedges. I suspect some of the results on the interaction between capital taxes and automation policies depend on the assumption of no capital market frictions.

Third, the paper makes a tremendous and laudable attempt to calibrate the model to match the recent history and current level of effective labor and capital taxes. In modeling capital taxes, it accounts for the multitudinous idiosyncrasies of the American tax system, including depreciation incentives, business entity taxes across all corporate forms, payout

taxes, effective taxes on debt versus equity finance, and differences across structures, equipment, and software investment. I recommend any interested reader to spend time in the paper's tax appendix, which details these calculations and will be helpful to others working in this area.

In the baseline calibration, the paper calculates an effective tax rate on capital in the 2010s of approximately 10%. I have one concern about this calculation, which pertains to the temporary nature of bonus depreciation. The main empirical inputs into these effective rates are NIPA aggregates for corporate tax revenues relative to gross operating surplus. These measures are poorly suited to capture the dynamic effects of bonus depreciation on effective tax rates. Tax revenues fall temporarily in stimulus years, but at the mechanical expense of higher taxes in the future. I worry that the current calculation of effective rates does not fully account for this dynamic. Nevertheless, it is relatively uncontroversial to claim that the tax burden on capital has fallen over time, which is the more important message of the paper.

My overall takeaway on these capital market assumptions is that defensible changes to them would quantitatively alter the paper's results. At the same time, the qualitative results are on firmer ground. Accounting for automation in considering tax policy changes could well be an important consideration going forward.

The Role of Bonus Depreciation

When I was on the job market presenting the results from Zwick and Mahon (2017), I had to work pretty hard to convince people that bonus depreciation had any effect on anything. Times have changed. The logic in the current paper implies that, not only does bonus depreciation matter for capital accumulation, it also materially biases the factor mix of production away from labor and toward automation.

How much does bonus depreciation distort investment and disfavor labor? Bonus depreciation accelerates the timing of deductions, but does not change their amount. Thus, in contrast to changes in the corporate tax rate or an investment tax credit, its value to firms is driven only by discounting.[1] When interest rates are low, as they have been

[1]My reading of the 1980s tax history is that the investment tax credit in the 1981–1986 period, when combined with the ACRS system and a more generous treatment of passive losses, was more generous to capital than recent changes to accelerated depreciation for equipment expenditures. Relative to this period, I am not sure that current capital taxes are significantly more favorable.

for the last decade, the effective subsidy is relatively small.[2] Accordingly, the aggregate effective tax rate shouldn't be very sensitive to bonus depreciation incentives. As a result, we likely need a very large substitution elasticity between labor and automation for bonus depreciation to be quantitatively relevant for aggregate automation trends.

This logic is also why the Joint Committee on Taxation and the Treasury Department do not score bonus depreciation incentives as being very expensive in the ten-year budget window. As noted above, this logic is also somewhat at odds with the paper's current approach to measuring the impact of bonus depreciation on effective tax rates without accounting for future tax payments.

It would be terrific to see additional empirical work evaluating the effects of bonus depreciation on labor markets. To date, we have seen work documenting that investment increases overall, and more so for firms valuing liquidity and immediate benefits (House and Shapiro, 2008; Zwick and Mahon, 2017). One labor market effect of greater investment demand is through output effects among capital suppliers, where we would expect to see *higher* employment.

Zwick and Mahon (2017) also present evidence that the wage bill increases at the firm level among firms buying more equipment due to bonus. This result has been confirmed at the local labor market level by Garrett, Ohrn and Suárez Serrato (2020) and Ohrn (2019). These latter papers also show that employment either remains unchanged or increases. In a fascinating recent study, Tuzel and Zhang (2019) find that, among firms buying more equipment in response to depreciation incentives, skilled labor increases while unskilled labor falls.

Taken together, the existing evidence points toward potential complementarity between labor and capital demand induced by bonus depreciation. In the terminology of Acemoglu and Restrepo (2018), it is possible the productivity effect dominates the displacement effect. More work is needed to establish the robustness of these results and to investigate the extent to which such investment incentives promote automation.

A Task-Specific Tax in Practice?

The paper highlights the theoretical appeal of an *automation task*, described as "an additional task on the use of capital in tasks where labor has a comparative advantage." The

[2]Zwick and Mahon (2017) argue this may not be the case for firms facing financial frictions.

intuition for this result is clear: such a tax has a first-order benefit in increasing labor demand away from its inefficiently low level, and only a second-order cost because so-so automation is only so-so. But what are the practical policy implications?

Perhaps I have read too many Joel Slemrod papers, but I couldn't help imagining the various strategies that firms and their consultants could devise to avoid such a tax. The literature on automation has attempted to identify those occupations that face automation risk, but we are very far from being able to codify such a system into policy. Were we to take on such a challenge, we would surely face the implications of what I call the *Slemrod conjecture* (see, e.g., Slemrod and Kopczuk (2002)): tax avoidance is weakly increasing in the number of tax instruments.

This risk has been realized in the case of bonus depreciation, arguably a much easier policy to implement and enforce, as it builds upon preexisting rules. Subsequent to bonus depreciation's enactment, a new consulting service called "cost segregation" has grown in popularity. These consultants advise companies on how to adjust their accounting to relabel ineligible investment expenditures (for example, fixed internal features of new buildings) as shorter-lived expenditures to be depreciated under bonus. This industry has even spawned an organization of cost segregation experts, the American Society of Cost Segregation Professionals, who have developed standards, educational material, and even a code of ethics. While we can debate the likely employment effects of an automation tax for workers, I am more confident (and also concerned) that such a tax will help promote the full employment of accountants.

Revisiting the Labor Share's Decline

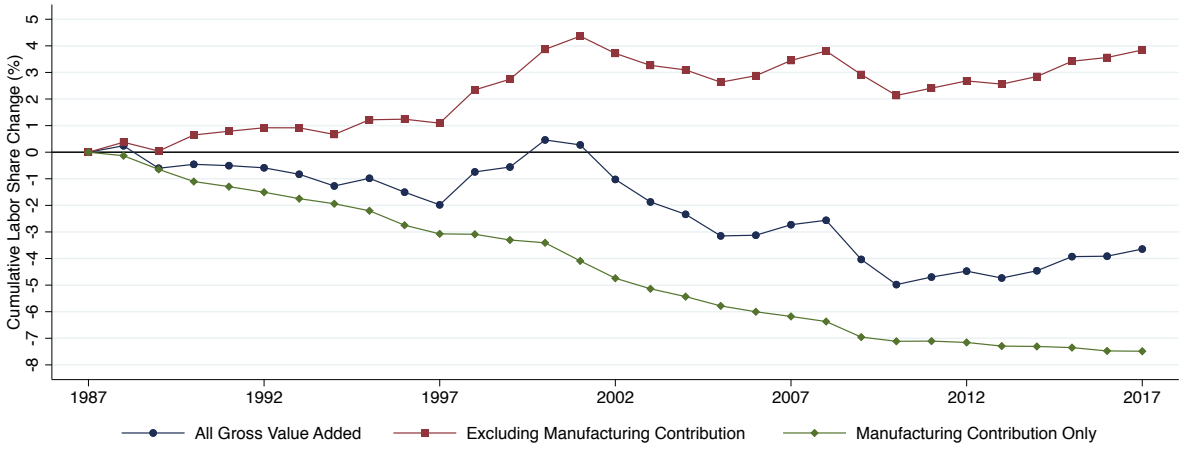
My final comment concerns the paper's broader motivating question, which has animated research in macroeconomics over the last five to ten years: what is driving the decline in the labor share? A more specific version of this question concerns the role of tax policy in the labor share's decline.

As a starting point, let us remind ourselves that manufacturing is the most quantitatively important sector of the economy for understanding the labor share's trend since the 1980s. This fact is reasonably well known but sometimes underemphasized (Figure 1).[3] Less well appreciated is that this secular decline in the manufacturing sector's con-

[3]For example, both Karabarbounis and Neiman (2014) and Autor et al. (2020) emphasize the broad-

tribution to the labor share was offset—fully until 2000 and partly since then—by a rise in the contribution from services. To see this, it is important to recognize evolving tax incentives to characterize owner-manager payments as labor versus profits in the skilled service sector (Smith et al., 2019).

Figure 1: Cumulative Labor Share Decline with and without Manufacturing



Source: See Figure 5 in Smith et al. (2019). The data come from the BEA's industry statistics.

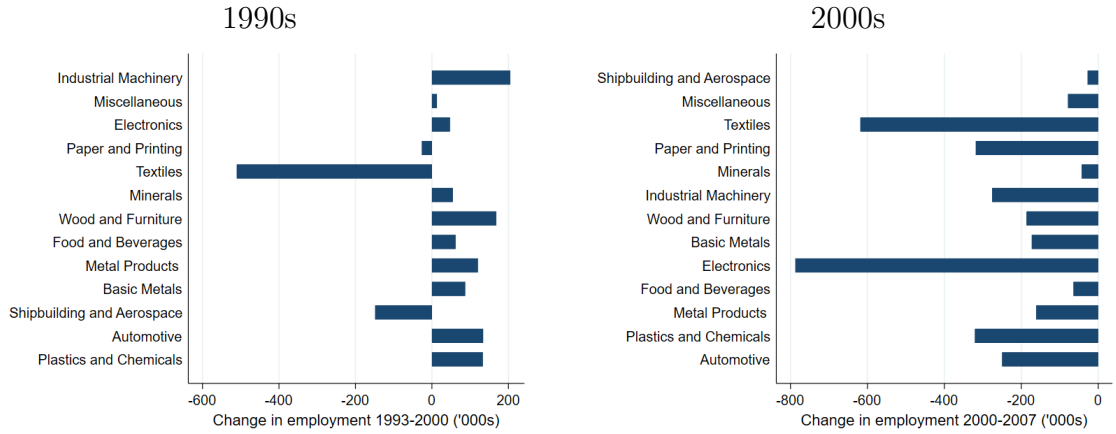
These facts are useful for the automation story, because manufacturing is one of the sectors most exposed to the rise of robots and other process automation (Acemoglu and Restrepo, Forthcoming). Perhaps automation induced by recent changes in tax policy is an important driver of labor share declines, especially in manufacturing?

Figure 2 takes a closer look at the trends in employment within manufacturing over the two time periods of study in Acemoglu and Restrepo (Forthcoming), where we have sorted the industries in each time period from lowest to highest in their exposure to automation.[4] In the 1993–2000 period, only textile manufacturing and aerospace manufacturing contribute to employment declines, with textiles accounting for most of the decline. In the 2000–2007 period, the decline in manufacturing employment is broad-based and especially large in electronics, but also continues for textiles. Notably, the

based nature of declines in the labor share. See Charles, Hurst and Schwartz (2019) for a recent survey with new facts.

[4]While it would be ideal to look at contributions to the aggregate labor share directly, mapping industries to the broader BEA sectors is nontrivial. Employment declines likely offer a useful and policy-relevant view into understanding labor share trends.

Figure 2: Employment Declines Sorted by Automation Exposure



Source: Author's calculations combining manufacturing employment statistics from the Census with automation exposure from Acemoglu and Restrepo (Forthcoming). The industries are sorted from lowest to highest in terms of automation exposure. This measure differs across the early and later periods, hence the difference in industry ordering.

within-manufacturing correlation between employment declines and automation exposure is present in the later period (consistent with Acemoglu and Restrepo (Forthcoming)) but not especially pronounced.

In contrast, the evidence on the aggregate role of trade exposure and offshoring for the decline in employment and the labor share is well established and quite strong (Elsby, Hobijn and Şahin, 2013; Autor, Dorn and Hanson, 2013; Pierce and Schott, 2016). An open question concerns whether tax incentives amplify these forces. Federal tax policy up to and including the most recent round of tax reforms features strong incentives to locate both profits and real activity offshore. One could argue that bonus depreciation, by prioritizing capital expenditures within the U.S., leans against these incentives. I would love to see more research in this area.

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