Maxim Troshkin - Research Statement

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My research addresses the macroeconomics of public policies and seeks to advance our understanding of the complex interconnections between uncertainty, economic incentives, and social insurance. I develop theoretical frameworks, combined with frontier computational methods and disciplined by empirical data, to address the following questions: What are the mechanisms by which broad uncertainty can lead to market inefficiencies? Can these inefficiencies be addressed by designing macroeconomic institutions and policies that are robust with respect to ambiguous understanding of the stochastic processes in the economy? How do we best use tax and transfers systems, including pensions, to address secular socioeconomic trends like aging and growing inequality, while delivering optimal economic incentives for work, savings, and retirement?

I focus on three main areas: market outcomes and policy design in the presence of broader uncertainty, optimal dynamic taxation, and pension system reforms that account for retirement behavior responses.

Market Outcomes and Policy Design in the Presence of Broader Uncertainty

Modern approaches to fundamental questions in macroeconomics and public finance generally assume that the data-generating processes of the economy are common knowledge. This is clearly a strong assumption, especially when trying to understand what types of policies can be optimal, especially given their potential dynamic and general-equilibrium effects. This line of my research seeks to move forward from the assumption of common knowledge of the stochastic processes. One fundamental issue this enables me to address is whether competitive market outcomes are efficient in the presence of broader uncertainty, including both risk and ambiguity. An overarching goal is to characterize macroeconomic policies that are not only optimal, but are also robust to this broader uncertainty, that is, policies that perform well under all plausible data-generating processes.

In "*Implications of Uncertainty for Optimal Policies*" (working paper under review at *Econometrica*) with Todd Lensman, we develop a theoretical framework for studying market outcomes as well as optimal social insurance and redistribution in the presence of broader uncertainty. Our approach is general - it allows for a wide range of commonly used models of decision making under ambiguity, without altering general conceptual results. With the exception of broader uncertainty, we consider conventional, dynamic macro public finance environments, with heterogeneous agents who experience arbitrarily persistent idiosyncratic shocks. When the shocks are private, one of our key findings is that competitive equilibria in these economies are not generally (constrained) efficient. This implies a meaningful role for government provision of insurance beyond crowding out private insurance, unlike in conventional environments with a narrow view of uncertainty.

On the part of the government, an insight that emerges from our approach is that broader uncertainty manifests as endogenous lack of commitment. When cast in terms of fiscal policies, we prove that this leads to the optimality of simplified, not fully state-contingent policies

that are periodically reformed and at times lose full history dependence. The importance of this contribution is that it provides (i) a positive theory of the kinds of policies that are observed in reality, and (ii) a general normative approach permitting implementations by policy instruments that do not place unrealistic demands on commitment and complexity.[1]

More generally, tradeoffs between policy complexity and optimality are central to frontier applied macroeconomic and public policy research. We aim at advancing that frontier in "*Non-Robustness of Proportional Fiscal Policies*" by rigorously analyzing the robustness of a popular class of simple fiscal policies with respect to broader uncertainty. While implausibly extreme uncertainty may lead to the optimality of macroeconomic policies that distribute welfare proportionally, we show that even those cases cannot generally be implemented or approximated well with proportional fiscal policies. In particular, when the policymakers and agents lack certainty about the stochastic processes in the economy, linear income or consumption taxes (possibly supplemented with lump sum transfers) can be far from optimal without further restrictions like risk neutrality and inelastic labor supply.

We further characterize the limits of complexity of optimal policies in "*Complexity vs Progressivity*," a joint working paper with Jaden Y. Chen. Our key innovation is to study optimal income taxation without assuming that taxpayers have precise knowledge of the tax schedule they face, and considering taxpayers who are averse to this ambiguity as well as to risk stemming from idiosyncratic skill shocks. A contribution of the paper is to prove that sufficiently imprecise knowledge of tax schedules by taxpayers implies the optimality of progressive taxation throughout the income distribution.[2] We also demonstrate this in a quantitative version of the model parameterized to micro-level U.S. data, and compute the bounds on complexity of optimal income taxes.

I am also working further with Todd Lensman to develop a more general understanding of social choice in the presence of broader uncertainty. The main innovation in "*Dynamic Inconsistency of Social Choice: More Debt, Less Discipline*" is to derive general conditions on social choice functions and agents' conditional preferences under which social choice is dynamically inconsistent and flexible, despite dynamic consistency of agents' preferences. One issue we address is an explanation for why successive governments may find it optimal to continue increasing debt levels, while choosing not to impose fiscal discipline on future governments. For example, under some conditions successive governments exhibit present bias without seeking restrictions on the fiscal decisions of future governments (i.e., without exhibiting increasing patience as the decisions are removed further into the future).

Optimal Dynamic Taxation

Ultimately, many of the most important public finance issues are inherently dynamic and quantitative. These include the design of optimal social insurance, the level of optimal taxation of capital in the presence of stochastic shocks, the evolution of income taxation over the life cycle, taxation of bequests, subsidization of education, etc. This line of my

[1] For example, one methodological advantage of our normative approach is that optimal simplified policies can be characterized without complete backward induction to compute promised utilities when the time horizon is finite.

[2] This contrasts with commonly found U-shaped optimal marginal tax functions that imply regressivity at the bottom of the distribution.

research starts with a forthright acknowledgment that the effects of taxation are not limited to either static or steady-state outcomes and aims at advancing the new dynamic public finance toward more policy-relevant, quantitative insights.

In "*Redistribution and Social Insurance*" (published in the *American Economic Review*, 106(2): 359-386) with Mikhail Golosov and Aleh Tsyvinski, we study optimal redistribution and social insurance provision in a life-cycle environment with private idiosyncratic shocks. Our contributions are to characterize Pareto optima, show the forces determining optimal labor distortions, and derive closed-form expressions for their limiting behavior. An important innovation here is to construct a quantitative model calibrated using newly-available estimates of idiosyncratic shocks, exploiting high-quality U.S. administrative data, and to demonstrate that optimal labor distortions are U-shaped, while the savings distortions are generally increasing in current earnings.

We further explore the properties of optimal dynamic policies in *"Optimal Dynamic Taxes*" (*NBER Working Paper* No.17642) and derive conditions under which labor distortions tend to zero for high enough incomes. We also generalize the savings distortion to non-separable preferences. The key innovation of our approach is to show and exploit a tight connection between the recursive formulation of dynamic optimal taxation problems and a static Mirrlees model with two goods. This allows us to derive, for instance, expressions for dynamic policies that are based on estimable elasticities, analogously to the micro (atemporal) approach to optimal taxation. The foundations of our approach are laid out in "*Optimal Taxation: Merging Micro and Macro Approaches*" (*Journal of Money, Credit, and Banking,* 43(5): 147-174). The contribution of this paper is to suggest that a close connection to the data, similar to that in atemporal (micro) approaches, is possible for the inherently dynamic (macro) questions. By juxtaposing the micro and macro literatures, we argue that both deliver important insights that are often complementary to each other, and that combining the elements of the micro approach with macro settings can advance our understanding of redistribution and social insurance and deliver implementable policy recommendations.

One of the most actively debated, specific issues in optimal dynamic taxation has long been the treatment of wealth and capital income. Joint also with Matthew Weinzierl, in "*Preference Heterogeneity and Optimal Capital Income Taxation*" (*Journal of Public Economics*, 97(1): 160-175) we examine a prominent justification for capital income taxation that goods preferred by those with high ability ought to be taxed. The key innovation here is to calibrate the model to the evidence on the relationship between skills and preferences and extensively examine the quantitative case for taxes on future consumption (i.e., on savings). Two of our main insights are that while the intertemporal elasticity of substitution has a substantial effect on the level of optimal capital taxation, in all cases that we consider the welfare gains of using optimal capital taxes are small. In "*Wealth and Income Inequality Dynamics and Optimal Policies*," I am working with Yu She on also quantifying counterfactual consequences of optimal dynamic taxation for wealth and income inequality, using a computational model that matches the evolution of wealth and income distributions in the U.S. over five decades.

Efficient numerical algorithms are some of the main technical innovations advancing the frontier of dynamic quantitative analyses like the ones above. I explore computational recursion in "*Doomsday Comes? Non-Recursive Analysis of the Recursive Towers-of-Hanoi Problem*" (published in *Focus, 95(2): 10-14*). A key insight is that it is possible to construct

computationally non-recursive solution algorithms even to classic examples of intrinsically recursive problems. One example of such an algorithm is based on exploiting Markov properties of policy functions to avoid computational recursion, while still taking advantage of the tractability of the recursive formulation of the problem. As a result, the algorithmic complexity is shown to be reduced from exponential to polynomial.

Reforming Pensions, Accounting for Retirement Behavior Responses

The Social Security system and more generally pension systems in virtually all of the developed countries are undergoing or are projected to undergo serious financial strains due to long-term changes in labor participation, demographics, and related secular socioeconomic trends. There is no shortage of proposed reforms aimed at maintaining solvency. In one form or another, almost all of the proposed reforms involve changes to the ages at which people retire, for example by mandating increases in pension-claiming ages, or by increasing incentives to stay in the labor force longer. This line of my research combines applied mechanism design with computational methods to determine what patterns of retirement ages are optimal and how to design pension systems that can deliver those patterns.

We analyze optimal pension systems relying on simple policy instruments in "*Optimal Pension Systems with Simple Instruments*" (*American Economic Review*, 103(3) P&P: 502-507) with Mikhail Golosov, Ali Shourideh, and Aleh Tsyvinski. Our key innovation is to consider individual decision problems that admit endogenous decisions of how much to work as well as when to stop working and retire. Specifically, we consider a model in which both the intensive and extensive margins of labor supply are meaningfully active. To achieve the full optimum in such an environment, policy-relevant implementations involve nonlinear history-dependent income taxes and retirement benefits that change with the actual retirement age. We instead take the existing US retirement benefit function and compute its optimized version by altering its parameters. That is, we determine the optimum with restricted, simple instruments. The large resulting welfare gains we find with the extensive margin responses are of the same order of magnitude as in the studies that account for permanent, persistent, and temporary shocks with private information.

In "*Incentives and Efficiency of Pension Systems*" (under revision for the *Journal of European Economic Association*) with Ali Shourideh, we characterize optimal social insurance and redistribution in the presence of endogenous retirement decisions. Our contribution is to characterize information-constrained Pareto optima, show the forces determining optimal retirement ages, and derive the properties of optimal retirement distortions. A general insight that emerges is that it is optimal for a pension system to reward later retirement, regardless of whether the efficient retirement age increases or decreases with productivity. We calibrate individual heterogeneity and the parameters of status-quo policies to U.S. income taxes, Social Security taxes and benefits, individual earnings, hours worked, and actual individual retirement ages. The simulated optimal pension systems generate not only significant welfare gains but also aggregate output gains.