

Research Summary and Statement of Research Agenda

My research has focused on studying various issues in optimal fiscal and monetary policy using the Ramsey framework, building on the traditions of Lucas and Stokey (1983) and Chari, Christiano, and Kehoe (1991). An important idea articulated in this approach is that fiscal pressures can have important consequences for monetary policy. Specifically, the source of fiscal pressure on monetary policy in the Ramsey framework is the consolidated fiscal-monetary budget constraint. A notion of a consolidated government budget constraint is likely to be important for understanding many issues in the conduct of monetary policy, as first brought to the profession's attention by Sargent and Wallace (1981), but is abstracted from in much of the current literature studying monetary policy. Much of my research has concentrated on the volatility and persistence properties of optimal monetary policy, specifically on the optimal degree of consumer price stability, in such a framework. My work has shown that the dynamics of inflation are importantly affected not only by relatively reduced-form sources of frictions (such as "sticky prices" and "sticky wages") but also, perhaps more importantly, by deep-rooted non-Walrasian features in key markets (such as labor search frictions and money search frictions).

In "Optimal Fiscal and Monetary Policy with Sticky Wages and Sticky Prices," I studied the effects of nominal rigidities in wage-setting, a friction thought by many central bankers to be crucial to understanding labor markets, on optimal policy. The main finding here was that even if goods prices are flexible and it is just nominal wages that are sticky, optimal policy calls for very stable inflation in the face of business-cycle magnitude shocks. The reason for this is that it enables the Ramsey government to engineer a nearly-efficient and stable path for *real* wages. Thus, in this environment, getting real wages "right" is a much more important goal of optimal inflation policy than is using inflation to help finance the government budget.

In new work, "Optimal Fiscal and Monetary Policy with Costly Wage Bargaining," (joint with David M. Arseneau) we re-examine the same issue – the optimal degree of price stability in the face of nominally rigid wages – in a richer model of the labor market. In Walrasian markets, "costly wage renegotiations," which is what typical formulations of sticky-wage models are meant to represent, may be hard to understand because the very notion of a worker-firm pair is ill-defined, and thus so is the notion of a "contract" that is costly to renegotiate. Models featuring labor search and matching frictions provide a more precise articulation of the notion of jobs and thus costly wage renegotiations. To enhance comparability with my previous work, we use a similar modeling device to stand for costly wage negotiation, but push it to the level of the bilateral interaction between a firm and a worker. Results from this new project show that when firms and workers explicitly bargain over nominal wages, the optimal policy calls for *highly volatile* price inflation in the face of business-cycle magnitude shocks. This result is consistent with a hallmark result in the Ramsey monetary literature – namely, that surprise movements in the price level are an efficient way for the Ramsey government to respond to shocks to its budget. The

implication of highly-volatile price inflation in this environment is highly-volatile real wages; in this class of models, however, realized real wages do not affect allocations as critically as they do in standard Walrasian models. Because the result is directly opposite to that reached in my previous work, at what level sticky nominal wages are modeled clearly matters for policy prescriptions. Thus, incorporating deeper descriptions of labor markets may be a crucial new direction for the study of optimal fiscal and monetary policy.

Some of the groundwork for studying optimal policy in environments where non-Walrasian frictions are treated seriously was laid out in “Ramsey Meets Hosios: The Optimal Capital Tax and Labor Market Efficiency.” Our focus there was just on optimal fiscal (not fiscal and monetary) policy, specifically the optimal use of the capital income tax when labor markets feature search and matching frictions. The main result of this project was that even under a well-known parameterization of labor search models that typically delivers efficiency (the Hosios condition), efficiency in the number of jobs is generally not attained when the government must rely on proportional labor taxation to finance its spending. This inefficiency then permits an auxiliary role for non-zero capital taxation to mitigate the problem. What is particularly important about this result is not just that the capital tax can be used as an indirect means of addressing an inefficient margin in the economy (in this case, the extensive labor margin), but that it stands in contrast to a previous result in the literature (Domeij (2005)) that suggested that whenever the Hosios condition is satisfied, there is *never* any beneficial role for non-zero capital taxation. The difference in the results is due to the presence of welfare heterogeneity between unemployed and employed individuals (a natural statement about the world that seems worthwhile to try to capture in a model) that our model allows. Indeed, the results we obtain nest those in the previous literature if we assume that unemployed and employed individuals are just as well off as each other in utility terms.

Another potentially important new direction for the study of Ramsey policy is to consider environments in which money is not simply assumed to be valuable (as in typical monetary models), but rather endogenously has value because it is the only asset that expands the set of feasible trades relative to a non-monetary equilibrium. In “Optimal Fiscal and Monetary Policy When Money is Essential,” we study the canonical Ramsey problem using a search-based model of money. The main findings from this project were that the Friedman Rule of a zero net nominal interest is *not* optimal and inflation is very stable over time despite the fact that all prices and wages are fully flexible. Both these results stand in marked contrast to the benchmark results in the literature, demonstrating that deeper models of money may be important for (re-)understanding basic issues in monetary policy and, even more broadly, macroeconomics.

Sparked in part by these results that suggest that search-based models may have some genuinely new things to say about classical questions in macroeconomics, a new project, “Search and Business Cycles” (joint with David M. Arseneau and S. Boragan Aruoba), aims to study business cycle dynamics in a model featuring both labor search and money search

frictions. The literature studying business cycle dynamics has seen a trend towards ever-bigger dynamic, stochastic, general equilibrium (DSGE) models. For example, Christiano, Eichenbaum, and Evans (2005) – CEE – incorporate, among other features, variable capital utilization, sticky wages, sticky prices, and habit formation. The frictions introduced by CEE and others are into otherwise Walrasian markets. One of the lessons learned from 20 years of business cycle modeling, including the recent evolution of these medium- and large-scale DSGE models, is that the basic RBC model on which such models are built is so perfect that lots of rigidities are needed in order to enable them to match moments of interest and/or make welfare costs of business cycles “large.” In this project, we go in a different direction and study business cycles using key markets that are non-Walrasian. Money markets and labor markets have long been held to be important in understanding business cycles. Given recent advances in both monetary theory and labor market theory – in particular, their successful, but independent, integration into standard DSGE models – the time seems ripe to measure business cycle dynamics and their costs using a model that embeds deeper frictions in both of these two key markets and little else in the way of rigidities or frictions. Our model is thus at once more parsimonious than and in some sense deeper than the latest generation of medium- and large-scale DSGE models; we think it holds the promise of providing a solid alternative core model with which to study business cycles.

Of my work in Ramsey monetary models, a primary focus has been on the volatility properties of the optimal inflation rate. Another feature of Ramsey inflation dynamics that has been noted as a “shortcoming” of the baseline model is that inflation has virtually zero persistence. While it is not clear simply because inflation persistence is observed in the data that inflation *should* be persistent, my work “Optimal Inflation Persistence: Ramsey Taxation with Capital and Habits” shows that if one wants a Ramsey model to predict highly persistent inflation, two well-understood mechanisms that are absent from basic Ramsey models – capital formation and habit persistence in preferences – easily deliver it. The economics behind the results here are particularly clear: capital and habits either allow consumers larger consumption-smoothing opportunities or make consumption-smoothing more desirable. With the desire for and/or the opportunities for consumption-smoothing enhanced, the real interest rate is more persistent relative to a model with neither capital nor habits. Ramsey allocations respect equilibrium, including the Fisher relationship. Thus, with the equilibrium real interest rate made more persistent due to capital or habits, Ramsey-optimal inflation becomes much more persistent than in basic models as well.

Ramsey policy is a benchmark optimal policy. In reality, we likely cannot move to a fully-Ramsey policy, for a host of reasons: political impediments, information problems, etc. Nevertheless, it is important to know how much in terms of welfare is being left on the table by not conducting policy in the fully-optimal way. If this number is judged to be small, then incremental progress towards a Ramsey policy may be deemed not worth the costs. On the other hand, if this number is judged to be large, then marginal progress in that direction may be able to bring about sizable gains. In a new project, “Measuring the Gains from Ramsey Reform,” I address this question from a new perspective, that of the Ramsey allocation

problem as predicting “optimal wedges” in various margins. Using as a basis the business cycle accounting decomposition of Chari, Kehoe, and McGrattan (2006), I measure the welfare loss of not having implemented the Ramsey-optimal static and intertemporal wedges, given a process for technology and government spending. Preliminary results suggest the welfare loss could be as high as 10 percent of steady-state consumption, certainly noticeable.

Ramsey policy is a benchmark in another sense as well. A recent development in the dynamic optimal taxation literature emphasizes heterogeneity and private information as the important tensions in the conduct of macroeconomic policy. This new dynamic public-finance literature builds on the tradition of Mirrlees (1971). This new approach to optimal taxation is an attractive one. However, in such rich environments, it is not even a priori clear what types of tax instruments one might want to allow the government to be able to use (the general approach is to assume arbitrarily complex, non-linear tax schemes). The Ramsey framework can be informative in this regard because it sheds light on untapped rents that a policy-maker would like to be able to tax. Tapping rents is optimal because it is a non-distortionary means of taxation; the well-understood Ramsey framework is a powerful tool for uncovering the rents in the ever-more complicated models that populate the macroeconomics profession. As such, it is likely to continue being informative for the new dynamic public finance literature; the Ramsey and Mirrleesian optimal taxation frameworks will likely co-exist in the macroeconomics literature because they complement each other.

In short, my work focuses on the optimal conduct of fiscal and monetary policy in the face of frictions that policymakers think are important – such as nominal wage rigidities and capital formation – as well as deeper descriptions of trading environments than exist in typical macroeconomic models. While not novel from a historical perspective, the explicit consideration of fiscal pressures in shaping optimal monetary policy departs from the dominant stand of the current literature on monetary policy. I look forward to continuing to try to contribute to the macroeconomics profession as well as continuing to learn.

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