Government Contractors Are Not Like Other Firms
(And Why This Selection Can Shape the Economy over Time)

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Even within narrowly-defined sectors of the US economy firms differ from one another. Some are large, some are young, some export their output. Some are government contractors. To better understand the role of government spending in shaping the US economy, I have begun merging the universe of US federal government contracts with US Census microdata. While we often model the household and the government consuming the same composite goods, US government contractors are a small share of all firms. Moreover, government contractors are, on average, larger, older, more productive, and more likely to engage in international trade.

This firm heterogeneity, combined with the government's sizable spending power, raises important questions about short-term stimulus: is a dollar of government spending equally effective across all industries? Does spending effectiveness vary with the age, the size, or the productivity of the contractor? Just as important are the long-term consequences of government spending: does the government pick 'winners," or might government contracts make "winners" over time? How do government purchases change the allocation of resources across firms and, consequently, aggregate productivity?

In what follows, I first describe a new establishment-level data set under construction and detail some preliminary work. I then present a brief road map for using this data set to better understand the government's role in reshaping the economy across time.

Federal Contracts and US Census Microdata

The Federal Funding Accountability and Transparency Act, signed into law on September 26, 2006, mandates full disclosure of all entities and organizations receiving Federal funds. As part of the law, the publicly-accessible website USASpending.gov provides access to federal contracts exceeding $3,000, as well as grants, loans, and other awards exceeding $25,000. Using names and addresses, I have begun matching USASpending.gov establishment-level contract recipients to the US Census Business Register. For matched establishments (covering roughly 75% of contractors' potential name-address combinations and 90% of contract value), the data cover industry codes, geographic location, employment, payroll, firm age, imports, and exports from the Longitudinal Business Database (LBD) and the Longitudinal Firm Trade Transactions Database (LFTTD). Currently merged data span fiscal years 2006 through 2011. The USASpending.gov data is available going back to 2000; and the National Archives have data on Defense Department contracts going back to fiscal year 1966.

*Disclaimer: The views expressed are those of the author and not necessarily those of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

Current Work: Short-Term Stimulus

Does it matter who receives a government contract? In a benchmark model of monopolistic competition with constant returns to scale, government spending is neutral with respect to firm productivity. A more productive firm might produce more output, but it does so at a lower price; a less productive firm produces less output at a higher price. The value of this additional output is the same for all firms. With this neutrality, it does not matter who receives a government contract.

One way of breaking this neutrality is to allow for variable return to scale. Indeed, a sizable literature, including Hall (1990), Basu and Fernald (1997), and Basu et al. (2006), has suggested that production functions differ across industries. These differences in returns to scale have implications both for industry-level and firm-level fiscal policy. The returns to scale parameter shapes the price elasticity of supply: the higher are returns to scale, the more responsive is the supply curve to changes in price. Provided prices are not perfectly sticky, a given shift in industry demand leads to a larger change in industry output when the supply curve is more elastic. In other words, a dollar of spending on a higher returns-to-scale industry should lead to a larger expansion in output than equivalent spending on a lower returns-to-scale industry. Using industry-level data from the NBER-CES database and military prime contracts, we corroborate these industry-level predictions.

Using microdata, I next plan to document the effects of government contracts on establishment employment and sales. I would then use these results to inform the choice of a data-consistent model of heterogeneous firms with which to study aggregate implications of government spending. Leveraging the tools of applied microeconomics, I plan to use matching and propensity scores to document different responses to stimulus by establishment size and productivity. The US Census microdata allows me to match contract recipients to detailed control groups based on size, age, industry, and geography; I can further supplement these covariates with information on local economic conditions and political representation. By matching on these observable characteristics, I can estimate average treatment effects for all government contractors, as well as for contractor subsets by size, productivity, or local economic conditions. These relative comparisons can help identify data-consistent model features with which to examine more aggregate implications of firm-level fiscal policy.

Proposed Work: Long-Term Effects

The average government contractor has 59 employees more than other establishments in the same industry, state, and year. With multi-factor measures of productivity, contractors are also more productive than their counterparts. Among other distinguishing features reported in Panel B of the supplemental table, a federal government contractor is 7.4% more likely to be part of a firm that exports. Does the government pick contractors because of their attributes, or do government contracts nudge firms upward in size and productivity distributions? Does the government contract with establishment already engaged in international trade, or do government contracts facilitate entry into international trade? Understanding the contracts' impact on firms (or the lack thereof) can shed light on existing procurement policies, and speak to the government's role in shaping

productivity and resource allocation.

First, government rhetoric for procurement of goods and services often emphasizes a commitment to including small businesses in the procurement process. The narrative surrounding the Small Business Administration suggests government procurement as a growth opportunity. Provided government spending is not completely crowded out by private spending, a government contract should increase firm sales. In this respect, government contracts likely increase firm growth upon contract receipt. The more interesting question, however, concerns longer-term outcomes: do past contract recipients sustain this expansion in the future? If government contracts prompt increased investment or lead firms to overcome barriers to expansion, then they might spur future growth. On the other hand, if they provide only a transitory increase in demand, then contracts might have no lasting effects.

Second, the productivity of larger firms is more strongly reflected in measures of aggregate productivity. By increasing the relative size of specific firms, government demand can have an almost-mechanical impact on aggregate productivity today. The long-term consequences of this government-induced reallocation depend on the length of the contracting relationships, as well as the contracts' impact on future firm outcomes. If government contracts have non-transitory effects, then the contractor's future contribution to aggregate productivity can be affected by prior contract receipt.

Third, choosing contractors can change the allocation of resources across firms. As emphasized by the work of Hsieh and Klenow (2009), when equally-productive firms are different in size, they likely have different marginal products of their inputs. If marginal products are decreasing in input usage, then the economy's output and productivity could be higher if inputs are reallocated to equalize marginal products across firms. With a government contract that is not fully crowded out by private demand, the contractor might be disproportionately large and its marginal products disproportionately low relative to its industry counterparts. As a result, the allocations of capital and labor in the industry might deviate from their optimal distributions. Aggregate productivity might decline.

In short, government contracts shift demand towards specific firms. As such, they can effect change in the economy through two potential channels. Today, the contractors become more representative of the economy as a whole; tomorrow, the contractors might look different than previously identical firms. These two channels need not push in the same direction. As hinted above, contracts might adversely affect the allocation of resources today and dampen productivity, even as they spur some firms to innovate, grow, or enter international markets tomorrow. With the support of this fellowship, I would like to better understand these long-term consequences of government contracting.

Supplemental Table: US Federal Government Contracts, 2007-2010

Panel A: NAICS Manufacturing Industries, 4-digit

	Establishment Count	Contractor Count	Percent of Contracting Establishment	Percent of Workers Employed by Contracting Establishments
10th Percentile	12	0	0	0
Median	1419.5	62.5	3.69	6.96
90th Percentile	7018	409	10.97	22.71
Number of Industry-Years	424	424	424	424

Note: An observation in the table is an industry-year. For instance, according to the third column, 3.69% of the establishments in the median industry-year receive a federal government contract.

Panel B: NAICS Industries, 4-digit

	Emp.	(ln) TFP	Emp. Growth	Firm Age	Importer Status	Exporter Status
Contractors	59.363	0.025	0.071	4.441	0.059	0.074
vs. Non Contractors	(1.643)	(0.004)	(0.003)	(0.056)	(0.002)	(0.002)
Observations	1090400	230900	1171100	1090400	1090400	1090400
R-squared	0.059	0.328	0.027	0.109	0.126	0.136
Cluster Count	9768	7115	9779	9768	9768	9768
Manufacturing-Only Sample		YES				
Industry-Year-State FE	YES	YES	YES	YES	YES	YES

Note: An observation is this table is an establishment. All regressions include fixed effects for cells defined by the interaction of industry, year, and state. The standard errors, reported in parentheses, are clustered at the level of this triple-interaction term.

Variable Definitions
Contractors vs. Non Contractors: indicator variable for a contracting establishment
Emp: employment
(ln) TFP: residual-based TFP calculation using a constant returns-to-scale production function
Emp. Growth: employment growth based on a mid-point formula to allow for entry and exit
Firm Age: age of firm that owns the establishment
Importer Status: indicator variable for being part of a firm that imports goods
Exporter Status: indicator variable for being part of a firm that export goods

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RESEARCH FIELDS

Macroeconomics, International Trade, and Finance

EDUCATION

University of Michigan, Ann Arbor, MI
- Ph.D., Economics — Expected 2017
- M.A., Economics — 2014

London School of Economics and Political Science, London, UK
- M.Sc., Econometrics and Mathematical Economics — 2012

Harvard University, Cambridge, MA
- A.B., Economics — 2010

RESEARCH IN PROGRESS

[1] "Returns to Scale and the Effectiveness of Government Spending," (with Nitya Pandalai-Nayar), November 2016

[2] "Returns to Scale and US Manufacturing Misallocation," (with Sui-Jade Ho), October 2016

[3] "The Volkswagen Emissions Scandal and the Economics Consequences of Reputation," (with Rüdiger Bachmann and Gabriel Ehrlich), September 2016

RESEARCH AND TEACHING EXPERIENCE

University of Michigan
- *Research Assistant*, Research Seminar in Quantitative Economics — 2014–
- *Research Assistant*, Andrei Levchenko — 2013–2014
- *Research Assistant*, Linda Tesar — 2013
- *Graduate Student Instructor*, Intermediate Macroeconomics (Rating 4.80/5.00) — 2012–2013

World Bank, Washington, D.C., USA
- *Short Term Consultant*, Research Department — 2013–2014

Harvard University
- *Research Assistant*, Andrei Shleifer and Rafael La Porta — 2010
- *Samuels Family Research Fellow*, Weatherhead Center for International Affairs — 2009–2010

FELLOWSHIPS & HONORS

University of Michigan
- Jean Monnet Graduate Fellowship — 2014
- Department of Economics Tuition Fellowship — 2013–2014
- Shapiro/Malik/Forrest Award — 2012, 2013, 2014

Letter of Commendation for Excellence in Teaching 2013
Summer Research Award 2012, 2013
Ryoichi Sasakawa Young Leaders Fellowship 2011–2012

Harvard University
Magna Cum Laude, with high honors in Economics 2010
Franklin Ford Prize: "scholarly interest... intelectual ability, and dry wit" 2009

PROFESSIONAL ACTIVITIES

Department Service
Graduate Admissions Committee, University of Michigan 2012–2013
Graduate Program Committee, University of Michigan 2013

Referee
American Economic Journal: Economic Policy, *European Economic Review*

PERSONAL

Date of Birth: May 9, 1988
Citizenship: USA, Serbia
Languages: Serbian (Native); English, French and Spanish (Fluent);
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01 December 2016

Selection Committee
Post-Doctoral Fellowship Program on Long-Term Fiscal Policy
National Bureau of Economic Research

Dear Selection Committee,

I am writing to enthusiastically support **Dimitrije Ruzic**'s application for the Post-Doctoral Fellowship Program on Long-Term Fiscal Policy. Dimitrije is an advanced graduate student in the Economics Department at Michigan, on track to complete his dissertation in the summer of 2017. I know Dimitrije very well. He took my International Trade PhD course, has worked for me extensively as a research assistant, and I have followed his thesis research closely throughout. I am his main advisor.

Dimitrije is an exceptional candidate for the fellowship. First, he is pursuing a ground-breaking research agenda squarely in the theme of the fellowship. Second, the projects contain multiple elements likely to make it highly successful: original theoretical insights; new data; and a top young scholar to put it all together. Dimitrije is ambitious, creative, extremely hard-working, and highly technically capable.

Dimitrije's research agenda focuses on the nature and consequences of government spending. The data contribution of the project is to combine the data on the universe of US government contracts with the US Census. This would allow Dimitrije, for the first time, to examine the characteristics of US government contract recipient firms and compare them to the rest of the universe of US firms. Preliminary results already show that government contract recipients are indeed different from the rest of the economy: they are larger, more productive, and more likely to engage in international trade.

The finding of systematic differences between government contract recipients and the rest of the firms in the economy opens up many questions about the consequences of this heterogeneity. Dimitrije has identified two, but I am sure more will follow. The first starts with the well-documented observation that firms and sectors differ in their returns to scale. In the presence of returns to scale heterogeneity, fiscal stimulus will have a different impact depending on whether firms receiving contracts have higher or lower returns to scale than the rest of the economy. The intuition is quite simple: giving a fixed amount of spending to a firm with strongly diminishing returns to scale will lead to less additional output than giving it to a firm with increasing returns to scale. This insight has potentially far-reaching implications for the efficacy of fiscal policy. It remains to be determined whether government contracts are channeled to firms with disproportionately higher or lower returns to scale. Finding this out would let us understand how

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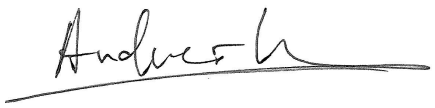
far the existing pattern of government spending is from the optimal, and how much fiscal multipliers can be increased simply by rearranging a fixed amount of spending across firms.

The second insight combines the question of fiscal stimulus with the notion of misallocation across firms. Recent research has shown that misallocation of resources across firms results in lower aggregate productivity. Government contracts, since they are applied unevenly across firms, reshuffle resources across firms. It is an open question whether the observed government contracts redistribute resources in such a way as to reduce or increase misallocation. The findings, whatever they will be, will have important implications both for understanding the sources of observed misallocation, and for the efficacy of fiscal policy in both the short and the long run.

In sum, I enthusiastically recommend Dimitrije for the fellowship. He has identified a set of ingredients for a groundbreaking research agenda into the effects of government spending. He is well on his way to realizing the potential of this agenda, and would make the most of the tremendous opportunity afforded by the fellowship. I should add that Dimitrije is a terrific colleague. He is a dynamic and inquisitive researcher, an active participant in the intellectual life of the department, and a very genuine, friendly person.

Please do not hesitate to contact me with any questions.

Sincerely,



Andrei Levchenko

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Matthew D. Shapiro
Lawrence R. Klein Collegiate Professor of Economics
Research Professor, Institute for Social Research

December 12, 2016

FELLOWSHIP RECOMMENDATION

Dear Colleagues:

I am delighted recommend **Dimitrije Ruzic** for the **NBER Post-Doctoral Fellowship Program on Long-Term Fiscal Policy**.

I have known Ruzic since he took my second-year PhD course in macroeconomics. Since then, he has been consulting with me on his research. I co-chair his dissertation committee with Andrei Levchenko. Ruzic is on track to complete his PhD dissertation in the summer of 2017. He is not on the assistant professor job market this year, but is instead seeking post-doctoral opportunities with the plan to be on the market in 2017/2018. As I will describe, his dissertation involves non-public Census data. Given lags in access and disclosure, he was sufficiently out-of-sync with the job market that deferring to next year was optimal. Accordingly, the post-doc would a first-best outcome rather than a fallback.

Ruzic's dissertation is on the macroeconomic effects of government contracts. In particular, he is studying how establishment-level output, employment, productivity and other outcomes are affected by the award of a government contract. The empirical work is based on matching contract awards from the public USASpending database to the non-public Census Business Register. That match allows analysis of the effect of awards at the establishment level within the Census Research Data Center.

The thesis analysis started as a relatively straightforward, reduced-form econometric analysis. After preliminary consideration of the results and an attempt to make sense of their implications for aggregate activity, Ruzic's research evolved systematically to creative economic modeling. He started from two empirical findings: (1) that Federal contracts are very concentrated among a small set of firms and (2) that the contracts tend to go persistently to larger and more productive firms. A naïve interpretation of this empirical results is that multipliers are high: since the government contracts go to high productivity firms, contracts are especially stimulative. Using a benchmark model, Ruzic shows that this intuition is wrong. Indeed, he derives an invariance/neutrality result: the distribution of contract awards across firms has no effect on the multiplier. The intuition for this result is simple: the lower prices received in equilibrium by the higher-productivity firms offsets that they sell more.

Ruzic takes this very intriguing finding into a number of quite interesting directions. Most significantly, he is working on modeling and estimation that breaks the invariance result via variability in the returns to scale parameter.

I have been very impressed in my interactions with Ruzic. He thinks quite hard about modeling as well as estimation. He thinks critically about finding in the literature. He works efficiently and thoughtfully. I expect the dissertation to have impact on both the literatures on fiscal stimulus and on heterogeneity in firms' productivity.

This work on short-run fiscal policy will be largely completed prior to starting a fellowship appointment. During the fellowship, Ruzic has a proposal to work that fits well with the fellowship's emphasis on longer-run fiscal issues. Specifically, he will lever his finding that there are strong systematic patterns in government contract awards to pursue several ideas related to firm dynamics and the steady state distribution of firms. First, he will examine the implications contract awards for long-run growth due to the fact that awards go to older and larger firms. Second, he will pursue ideas owing to Hsieh and Klenow as to how contract awards can improve or worsen the allocation of resources. I expect this work to be carried out via a combination of empirical work using the Census data and analytic work. He is in the preliminary stage of working out these ideas, but based on his work on short-run stimulus, I have high expectations of what this line of work will deliver.

Overall, Ruzic is a very promising student for this fellowship. He works effectively and independently, so I expect he could make very good use of the time. He is an interesting and engaging individual, so I would expect him to be a valued participant in the broader intellectual life at the Bureau. After the post-doctoral fellowship, I would expect that he would be in contention for excellent academic positions. Accordingly, I recommend him very strongly and without reservation.

Please do not hesitate to be in touch with me at shapiro@umich.edu or 734 764-5419 if I can provide further information.

Sincerely,

Matthew D. Shapiro

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