Determinants of Firm Entrants: Dynamics of the Manufacturing Industry

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I. Introduction

As the world's third largest manufacturer the United States has a vested interest in keeping its manufacturing industry competitive. While this goal has persisted, the strategies and policies implemented by federal and state governments have often diverged. This has resulted in industry-wide restructuring as these differences at the state level cemented themselves over time. An analysis of this variation should provide a rich evaluation of manufacturing competitiveness. One hallmark of market competition is business entry. The decisions of individuals to found businesses coalesce in a robust business cycle necessary to support the livelihoods of millions. Therefore a causal review of various macro-level influences on manufacturing firm entries across the United States ought to serve as an advising guide for policymakers.

Traditional macroeconomic theory would suggest that the government's subsidization of industry creates what is commonly referred to as a "crowding-out" effect. With respect to the study of firm entries, this extends to the expectation that it is the existing businesses which capitalize on the available subsidies. Thus subsequently preventing smaller business start-ups from accessing these subsidies, and further entrenching the barriers to entry. This theory is reinforced in existing literature which contends that these "industrial policies (subsidies to incumbent R&D, incumbent operating costs or entrants) are either ineffective or tend to reduce growth and welfare" (Acemoglu et al., 2018). Though as is the case with many economic theories, there is little intrinsic merit without the support of empirical analysis.

This study will attempt to provide greater context of the mechanisms which motivate manufacturing firms to enter or exit the industry across the United States. Regression analysis will be the chief tool utilized to separate the impacts of fiscal policy, monetary policy, demographic change, international trade, and the fixed-effects of time and state. More

specifically, ordinary-least-squares (OLS) regression will be employed. This will enable the support of claims about the existence of causal relationships between firm entries and the aforementioned independent variables. The details of these relationships will hopefully prove an accurate reference for related research and ongoing policy analysis.

II. Sample

The sample for this paper includes annual data on all fifty U.S. states within the years 1999 to 2019. This sample is composed of multiple datasets from the Census Bureau, Federal Reserve Economic Data (FRED), and the Council of State Governments. From the Census Bureau the Business Dynamics Statistics (BDS), Annual Survey of State Government Finances, and Current Population Survey (CPS) were collected. From FRED data on manufacturing exports, labor force participation rates, manufacturing employees, manufacturing wages, consumer price index, and effective federal funds rate were collected.

Within the BDS data, a parent firm is equal in age to its oldest underlying establishment. A firm with age zero indicates that all of its underlying establishments were entrants in that year, or in other words the firm was an entrant. Furthermore, establishments that shutdown temporarily were removed from counts of establishment openings and closings by the maintainers of the dataset. The term manufacturing industry refers to the definition outlined in the North American Industry Classification System (NAICS). All data collected was organized with NAICS industry codes by the original maintainers of each respective data series. Thus all the manufacturing data present in the sample refers to the same set of businesses.

III. Dependent Variable

Ln of Manufacturing Firm Entrants (State Level)

The count of manufacturing firm entrants is defined as the number of firms with age zero in a given year. Data on manufacturing firm entrants is available at the state level annually. The source of this variable is the annual Business Dynamics Statistics maintained by the US Census Bureau.

IV. Independent Variables

Effective Federal Funds Rate (Federal Level)

The annual effective federal funds rate will serve as an indicator variable for the influence of monetary policy. This is the interest rate at which depository institutions trade balances held at Federal Reserve Banks with each other overnight ("Federal Funds Effective Rate"). The target federal funds rate set by the Federal Open Market Committee influences other interest rates such as those pertaining to credit ratings, mortgages, loans, and savings. "The FOMC has indicated that, going forward, adjustments in the federal funds rate will be the primary way of changing the stance of monetary policy" ("Monetary Policy Principles and Practice"). The source of this variable is the St. Louis Federal Reserve's FRED. It is hypothesized that the federal funds rate will correlate inversely with the dependent variable.

Ln of Total Expenditure Per Capita (State Level)

The annual expenditure per capita of each state is a direct measurement of the spending behaviors of each respective government. This will serve as an indicator variable for the fiscal policy pursued in each state by analyzing changes in spending over time. The source of this variable is the Annual Survey of State Government Finances conducted by the Census Bureau. It is hypothesized that expenditure will correlate positively with the dependent variable.

Labor Force Participation Rate (State Level)

"A state's labor-force participation rate is the number of all employed and unemployed workers divided against the state's civilian population" ("Labor Force Participation Rate for Florida"). This represents the percent of the population participating in the workforce annually for each state. Changes in the labor force participation rate will serve as an indicator of demographic change. The source of this variable is the St. Louis Federal Reserve's FRED. It is hypothesized that labor force participation will correlate positively with the dependent variable.

Ln of Exports of Manufactured Goods Per Capita (State Level)

Exports of manufactured goods per capita measures the monetary value of goods manufactured within each state and sold internationally. The total value for a given year was then divided by the state's population in that year. Sales to Canada were excluded from the series by its compilers. Change in the total value of exports indicates the influence of trade policy on firm behavior in each state respectively. The source of this variable is the St. Louis Federal Reserve's FRED. It is hypothesized that exports will correlate positively with the dependent variable.

Ln of Labor Costs Per Employee (State Level)

Labor costs measure the wages per employee paid in the manufacturing industry in each state for a given year. This variable was created by dividing the total amount of manufacturing wages paid in each state divided by the total amount of manufacturing employees in each state. This will capture the influence of differences in the cost of labor across states on the decision of firms to enter the industry in said states. The source of data on manufacturing employees and wages is the St. Louis Federal Reserve's FRED. It is hypothesized that labor costs will correlate inversely with the dependent variable.

Corporate Tax Rate (State Level)

Corporate Tax Rate measures the median corporate tax rate corporations pay in each state annually. Differences across states in the rates present in a given year will indicate state level variations in tax policy. The source of this data is the Book of the States, an annual report produced by the Council of State Governments. It is hypothesized that corporate tax will correlate inversely with the dependent variable.

Union Coverage (State Level)

The Union Coverage variable measures the percent of manufacturing workers whose wages are covered by a collective bargaining agreement in each state annually. Varying levels of manufacturing union influence across states could influence the entry decisions of firms. The source of this data is the Union Membership and Coverage Database from the Current Population Survey. It is hypothesized that union coverage will correlate inversely with the dependent variable.

State

The state indicator variable will enable the separation of fixed effects specific to geographic location. This will capture the impacts of policy differences between all fifty states on the dependent variable. The source of this variable is the annual Business Dynamics Statistics maintained by the US Census Bureau.

Year

The year indicator variable will enable the identification of differences in the influences of other independent variables on the dependent variable depending on the given year. This will enable the capture of differences over time. The source of this variable is the annual Business Dynamics Statistics maintained by the US Census Bureau.

V. Summary Statistics

Table 1: Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Max
Firm Entries Per Capita	1,050	0.046	0.017	0.012	0.111
Exports Per Capita	1,050	0.172	0.100	0.013	0.644
Expenditure Per Capita	1,050	4.857	1.421	2.817	12.797
Labor Force Participation Rate	1,050	65.836	4.222	53.258	75.333
Labor Cost Per Employee	1,050	42,075.940	7,139.879	27,210.830	67,285.020
EFFR	1,050	1.936	1.941	0.088	6.237
CorporateTaxRate	1,050	6.014	2.583	0.000	10.500
UnionCoverage	1,050	11.516	6.224	0.000	35.200

Notes: Dummy variable coefficients for states were excluded in the presented table.
The following variables are per capita: Firm Entries, Exports, and Expenditure.
Monetary values are measured in thousands for Exports and Expenditure.
UnionCoverage is the percent of manufacturing workers covered by a collective bargaining agreement.
EFFR stands for Effective Federal Funds Rate.

VI. Regressions and Results

Table 2: Regression Results

	Ln of Firm Entries			
	(1)	(2)	(3)	(4)
Constant	-2.848***	-2.905***	-3.024***	-3.341**
	(0.117)	(0.127)	(0.138)	(1.557)
Ln of Expenditure Per Capita	-0.191**	-0.185**	-0.172**	-0.187**
	(0.082)	(0.082)	(0.082)	(0.088)
EFFR	0.037***	0.037***	0.038***	0.037***
	(0.004)	(0.004)	(0.004)	(0.004)
Lagged EFFR	0.011**	0.010**	0.010**	0.010**
	(0.004)	(0.004)	(0.004)	(0.004)
Corporate Tax Rate		0.007	0.008	0.008
		(0.006)	(0.006)	(0.006)
Ln of Exports Per Capita			-0.048**	-0.048**
			(0.022)	(0.022)
Labor Force Participation Rate				0.002
				(0.005)
Ln of Labor Cost Per Employee				0.021
				(0.149)
Union Coverage				-0.001
				(0.002)
Trend	-0.020***	-0.019***	-0.018***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.002)
Observations	1,000	1,000	1,000	1,000
R^2	0.847	0.847	0.848	0.848
Adjusted R^2	0.838	0.838	0.839	0.839
Residual Std. Error	0.148 (df = 946)	0.148 (df = 945)	0.148 (df = 944)	0.148 (df = 941)
F Statistic	98.744*** (df = 53; 946)	96.984*** (df = 54; 945)	95.675*** (df = 55; 944)	90.477*** (df = 58; 941)

Notes:

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Dummy variable coefficients for states were excluded in the presented table.

Parenthesis contain standard errors.

Across all models the monetary policy indicators, effective federal funds rate and lagged federal funds rate, remained statistically significant. This significance supports the hypothesis that a causal relationship between manufacturing firm entries and the policy pursued by the federal reserve exists. The fiscal policy indicator, ln of expenditure per capita was also significant across all four models at the 5 percent level. The tax policy indicator, average corporate tax rate, remained insignificant across all four models. This differs from the proposed hypothesis that state tax regimes would be influential in firm entry decisions. The trade policy indicator, ln of state exports of manufactured goods, was statistically significant in models (3) and (4). With respect to the remaining labor policy indicators, state labor force participation rates, ln of state labor cost per manufacturing employee, and union coverage were all insignificant. The intercept, or constant, was significant at the 1 percent level for models (1) (2) and (3) and the 5 percent level in model (4). The trend variable was significant at the 1 percent level across all four models with a negative coefficient. Goodness of fit, residual standard error, and the F statistic remained generally constant with the exception of model (4) which had a slightly lower F statistic. Discussion of coefficient interpretations in the following paragraphs will refer to model (3) as it includes the greatest number of statistically significant independent variables while minimizing decreases in the F statistic.

Ln of total state expenditure, the fiscal policy indicator, was statistically significant in all four models with a negative coefficient. This is in contrast with the originally proposed hypothesis that state expenditure and firm entries would correlate positively. In model (3), for every one percent increase in state expenditure per capita there is an expected 0.172 percent decrease in the number of manufacturing firm entrants. This corroborates the traditionally held

belief that “industrial [spending] policies … tend to reduce growth and welfare” (Acemoglu et al., 2018). Further suggesting that public spending tends to “crowd-out” private investment in the manufacturing industry..

The effective federal funds rate (EFFR) was statistically significant at the 1 percent level for all models with positive coefficients. These results differ from the originally proposed hypothesis that the EFFR and firm entries would correlate inversely. In model (3), for every one unit increase in the EFFR there is an expected 3.8 percent increase in the number of manufacturing firm entrants. At face value, this suggests that when capital is less accessible individuals are more likely to start manufacturing businesses. The explanation for this odd result may stem from the reactionary nature of changes to the EFFR. Since hikes to the federal funds target are typical following periods of economic expansion, the positive coefficient could be a product of the underlying economic environment in which individuals would be more likely to start businesses. Furthermore, the impact of rising costs of capital on entry decisions likely consolidates some time after the costs have risen.

The lagged EFFR was statistically significant at the 5 percent level across all four models with positive coefficients. In model (3), for every one unit increase in the EFFR there is an expected 1 percent increase in the number of manufacturing firm entrants in the following year. This is in contrast to the hypothesis that the EFFR and firm entries would correlate inversely. With respect to the claim made previously about the delayed impact of changing costs of capital, one year may be too great a period to capture this change. Additional refinement of the lag interval will hopefully yield a more accurate coefficient in future models.

The ln of state exports of manufactured goods was only statistically significant in models (3) and (4). Furthermore the coefficients were negative, differing from the proposed hypothesis

that exports per capita would correlate positively with firm entries. The following note from the curators of the data series at FRED raises additional concerns: “In some cases considerable manufactured exports are attributed to states that…have little manufacturing capacity. One reason is that commodities produced by out-of-state suppliers can be shipped from in-state distribution centers. Another factor is shipments of manufactured commodities from in-state warehouses and other distribution centers that are arranged by exporters located out-of-state. In both cases, manufactured exports from the non-industrial state are magnified in the OM series” (“Description of the International Trade Statistical Program”, 2019). Therefore the coefficient likely overstates the true treatment effect.

The state labor force participation rate was statistically insignificant across all models. In theory, higher rates of labor force participation should indicate a more attractive business environment with a larger pool of potential employees. The insignificance of the variable suggests that with respect to firm entrants the explanatory power of differential labor availability is lacking. Since the majority of manufacturing jobs are held by men, the male labor force participation rate may be more representative. This refinement could offer greater insight into labor availability's role in entry decisions.

VII. Appendix

The following changes were made during the processing of the raw data. Averaging was used to aggregate some FRED data from quarterly to annual levels. Missing values were treated in two ways. If a value for some variable were missing in a given year but data was available for the preceding and following years, then the missing value was replaced with the average of the preceding and following year. If data on either the preceding or following year was also missing, then the weighted average of percent change over the last known five years was used to estimate the missing value. Specific to the Corporate Tax Rate variable, the median rate was found across tax brackets for a given state and year. Finally, units were standardized across monetary variables, in thousands, and then adjusted for inflation with base year 2000 using consumer price index data collected from FRED. To generate the composite dataset, state level variables were joined by state and year while federal level variables were joined on year.

Works Cited

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