The Employment Effects of Corporate Tax Shocks: New Evidence and Some Theory*

Andrea Colciago†
De Nederlandsche Bank & University of Milan - Bicocca

Vivien Lewis‡
KU Leuven & Bundesbank

Branka Matyska§
KU Leuven

November 13, 2017

— preliminary and incomplete —

Abstract

A substantial amount of job creation and destruction is associated with firm entry and exit. This paper asks whether corporate tax changes affect employment through firm turnover. We first identify the effect of a corporate income tax cut on net business and job creation in US data, using a narrative approach. We find a significant positive, though delayed, impact on job creation through firm entry and an immediate reduction in job losses through lower firm exit rates. Wages of new hires rise significantly, while aggregate wages fall in the wake of the policy change. Second, we develop a general equilibrium model of the business cycle to account for this new propagation channel uncovered in the data.

JEL classification: E22, E24, E32, E62.
Keywords: corporate tax shocks, job flows, job creation, job destruction, employment, firm entry and exit.

*Thanks to Ferre de Graeve, Peter Karadi, Benjamin Moll, Frank Smets, Harald Uhlig, Jo van Biesebroeck, Roland Winkler, Raf Wouters and seminar participants at Goethe University Frankfurt and Belgian Macro Workshop '17 (University of Namur) for useful comments. This research has received funding from the Fund for Scientific Research - Flanders (FWO) under project grant number G062617N. This paper represents the authors' personal opinions and does not necessarily reflect the views of Deutsche Bundesbank or De Nederlandsche Bank. All errors are ours.

†University of Milan - Bicocca and De Nederlandsche Bank. A.Colciago@dnb.nl.

‡Department of Economics, KU Leuven, Naamsestraat 69, 3000 Leuven, Belgium, vivien.lewis@kuleuven.be, http://sites.google.com/site/vivienjlewis.

§Corresponding author. Department of Economics, KU Leuven, Naamsestraat 69, 3000 Leuven, Belgium, branka.markovic@kuleuven.be.

> 'CUT, cut, cut! That is what President Donald Trump wanted to name an eagerly awaited Republican proposal for reforming America's tax code. He vows that slashing the rate of corporate tax will create millions of jobs.'
>
> *The Economist, 9th November 2017.*

1 Introduction

The US Administration's planned tax reform is set to reduce the rate on companies from 35% to 20%.[1] Many expect that reducing the tax burden on firms will spur job growth by boosting economic activity. In this paper, we seek to estimate and model the impact of a fiscal stimulus package, in the form of corporate tax cuts, on employment through firm entry and exit. The answer to this research question is central to the design of fiscal policy; yet it has received surprisingly scant attention in the academic literature. Moreover, in an environment of very low interest rates constraining monetary policy, it is all the more important to understand the transmission of such measures and to gauge their effectiveness.

The debate on the size (and even the sign) of fiscal policy effects revolves to a large extent around output multipliers. The ability of fiscal policy to stimulate net job creation, which is arguably more important for policy makers, is an under-researched topic. Previous literature has focused mainly on estimating output and unemployment multipliers of government spending and average marginal income tax changes, see e.g. Monacelli, Perotti and Trigari (2010).[2]

A substantial amount of job creation and destruction is associated with firm turnover. Davis and Haltiwanger (1990) attribute 25% of US annual job destruction to firm exit and 20% of annual job creation to entry, while Spletzer (2000) reports roughly one fifth for these two measures. We thus wish to investigate to what extent job gains occur through new openings in response to tax incentives. Is this margin relevant, or are established firms the ones that matter more for job creation? Similarly, to the extent that corporate tax

[1] See, for instance, the Financial Times of 27th September 2017.

[2] Lewis and Winkler (2017) study the effects of government spending expansions on net business formation.

reductions save jobs, we want to know whether existing firms shed fewer jobs or are jobs saved mainly through a reduction in closings?

We then develop a dynamic stochastic general equilibrium (DSGE) model as a laboratory to study the effects of tax shocks on both business and job creation. Key features of our model are, first, imperfect competition between firms and endogenous entry and exit, which implies time variation in the number of producers; second, labor market search, which endogenizes the unemployment rate, and third, distortionary corporate income taxation.

In the literature on endogenous firm entry, unemployment is typically not analyzed.[3] Recent advances in modelling job flows and firm dynamics jointly have been made by Colciago and Rossi (2012), who show that the extensive margin of job creation due to firm entry amplifies the response of labor market variables to technology shocks. There is now widespread agreement on the view that labor markets are imperfectly competitive. A consensus model, the search-and-matching framework, has emerged that builds on work by Mortensen and Pissarides (1994). That framework captures rents of an employment relationship, hiring costs by firms, and bilateral wage bargaining between firms and workers.

The paper proceeds in two steps. First, it provides empirical evidence on the transmission of corporate income taxes to macroeconomic aggregates and to the labor market in a vector autoregression (VAR) framework. In particular, we estimate the effect of temporary corporate income tax shocks on firm entry and exit dynamics, job flows and credit costs. Second, we provide a theoretical framework building on Colciago and Rossi (2012), that captures our empirical results.

The remainder of the paper is structured as follows. Section 2 details our empirical analysis comprising aggregate as well as state-level econometric evidence for the US economy. Section 3 develops a model that is meant to capture our main empirical findings. Finally, Section 4 concludes.

[3]See, for instance, Bilbiie, Ghironi and Melitz (2012), Colciago and Etro (2010), Lewis and Poilly (2012), Lewis and Stevens (2015).

2 Empirical Evidence

In the following, we provide empirical evidence on the transmission mechanism of corporate tax shocks to firm dynamics and the labor market. The first subsection employs structural vector autoregression (VAR) analysis to identify corporate income tax shocks in aggregate US data, while the second subsection estimates reduced-form effects using panel regressions estimated on US state-level data.

2.1 Aggregate US Evidence

Our first econometric approach estimates structural VARs on a mixture of macroeconomic, financial, labor market and fiscal policy variables for the aggregate US economy.

2.1.1 VAR Specification

In our *baseline specification*, we include a fixed set of five core variables, more specifically: (1) the average corporate income tax rate, our policy variable, (2) corporate profits, (3) real output, (4) employment, and (5) the excess bond (external finance) premium developed by Gilchrist and Zakrajšek (2012) to capture financial frictions that affect firms' borrowing costs. Then, we estimate a number of *augmented VAR specifications* by appending, in turn, one additional variable to the vector of baseline variables. In particular, we consider three sets of additional variables.

First, we add establishment entry and exit as measures of expansions and contractions in the economy's productive capacity along the extensive margin. The corresponding impulse responses could provide a first indication of whether significant job flows can be expected at the extensive margin. Second, we analyze employment changes in more detail by estimating, separately, the responses of job creation by establishment births and job destruction by establishment deaths to corporate tax cuts. Third, we use both aggregate wages and wages of newly hired workers, since the latter variable is more sensitive to aggregate labor market conditions as shown by Haefke, Sonntag and Van Rens (2013). We explore how these wage

measures respond to tax cuts, the idea being that wage increases, especially those of newly hired workers, might stand in the way of new job creation.

2.1.2 Method

To identify corporate income tax surprises, we use the external instrument estimation strategy developed by Mertens and Ravn (2013). In a nutshell, the method exploits the attractive features of both structural vector autoregressions and the narrative approach. Identification is achieved by imposing the restrictions that narrative measures of exogenous tax changes correlate with the structural tax shock but are orthogonal to other structural shocks. There are no timing restrictions. The procedure has three stages. In the first stage, we estimate a reduced-form VAR by ordinary least squares. The second stage consists in regressing the VAR residuals of the policy indicator on the nonpolicy indicator by using narratives as instruments (two-stage least squares). In the third stage, we impose the covariance restrictions and compute impulse responses. We elaborate on the econometric framework as follows.

Consider a standard structural vector autoregression model. Let Y_t be a vector of n economic variables observed at time t, p the number of lags, A a nonsingular $n \times n$ matrix, B_i an $n \times n$ coefficient matrix with $i = 1, 2, \dots n$, and ε_t an $n \times 1$ vector of uncorrelated structural shocks with zero mean and unit variance,

$$AY_t = B_1 Y_{t-1} + B_2 Y_{t-2} + \cdots + B_p Y_{t-p} + \varepsilon_t. \tag{1}$$

Pre-multiplying both sides of equation (1) by the inverse of A, we obtain the reduced form specification

$$Y_t = C_1 Y_{t-1} + C_2 Y_{t-2} + \cdots + C_p Y_{t-p} + u_t, \tag{2}$$

where $C_i = A^{-1} B_i$ and the reduced-form residuals are linear transformations of the structural shocks, $u_t = D\varepsilon_t$, with $D = A^{-1}$. Since the variance-covariance matrix of the reduced form residuals is symmetric $\Sigma_{uu} = DD'$, it provides $\frac{n(n+1)}{2}$ identifying restrictions. In order to compute impulse response functions implied by the reduced-form specification (2), the

recursiveness assumption, which imposes that D is lower triangular, is predominantely used in the policy literature. See, for instance, Blanchard and Perotti (2002).

Mertens and Ravn's identification strategy differs from the preceding one in the following way. Denote by y_t^τ the column of the fiscal policy instrument variable, which in our specification is the average corporate income tax rate. Let ε_t^τ be the corresponding structural shock, $\varepsilon_t^{-\tau}$ the structural shocks to the non-policy variables and D^τ the associated column of matrix D. Similarly, we denote by u_t^τ the reduced-form residuals from the equation for the fiscal policy instrument, and by $u_t^{-\tau}$ the reduced-form residuals for all the other macro, labor or financial variables. Since our interest lies in identifying mpulse responses to corporate tax shocks and not to other shocks, we only need to identify the elements of the associated column τ of matrix D.[4]

Covariance restrictions are obtained from additional assumptions imposed on an appropriate instrument for the policy shocks. Let Z_t be an instrumental variable for the structural shocks ε_t^τ. Here, the narratively identified measures of exogenous shocks to average tax rates from Romer and Romer (2010) are used as an instrument Z_t. Suitable instrumental variables satisfy two conditions, a strong instrument assumption and an exclusion restriction,

$$E[Z_t \varepsilon_t^\tau] = \Phi, \tag{3}$$

$$E[Z_t \varepsilon_t^{-\tau}] = 0, \tag{4}$$

where Φ is a matrix to be estimated. In our specification, since we have only one instrument for the structural shocks of the average corporate income tax, Φ is a scalar. Condition (3) states that the instrument Z_t needs to be sufficiently correlated with the underlying corporate tax shock. Condition (4) states that the instrument must not be correlated with the other structural shocks.

The procedure to obtain impulse response functions following a unit increase in the

[4]In case we are interested in impulse responses to other shocks, the proposed identifying restrictions do not suffice and additional zero or sign restrictions need to be imposed.

structural shock to the tax instrument is the following. First, we estimate the reduced-form VAR in (2) to obtain the residuals to the policy and non-policy variables, u_t^{τ} and $u_t^{-\tau}$, respectively. Second, we regress the VAR residuals of the policy variable, u_t^{τ}, on the instrument Z_t to get the fitted values $\hat{u}_t^{\tau}$ and the covariance matrix $\Sigma_{Zu^{\tau}}$. Third, we regress the residuals of the non-policy variables $u_t^{-\tau}$ on the fitted values $\hat{u}_t^{\tau}$ and obtain the covariance matrix $\Sigma_{Zu^{-\tau}}$. Lastly, we impose the identifying restrictions to get the matrix column D^{τ} and compute impulse responses. We may partition the matrix $D = \begin{bmatrix} D^{\tau,\tau} & D^{\tau,-\tau} \\ D^{-\tau,\tau} & D^{-\tau,-\tau} \end{bmatrix}$, which simplifies the identifying restrictions to be expressed as

$$D^{-\tau,\tau} = \Sigma_{Zu^{\tau}}^{-1} \Sigma_{Zu^{-\tau}} D^{\tau,\tau}. \tag{5}$$

For more details, see Mertens and Ravn (2013).

2.1.3 Data

Table 1 summarizes the data sources and transformations pertaining to the variables in our VAR. Data are quarterly and in logarithms; the sample period is 1979q1-2006q1.

Table 1: Aggregate US Data

Variable	**Source**	**Transformation**
Core Variables		
Average corporate income tax	Mertens & Ravn (2013)	None
Corporate profits	Mertens & Ravn (2013)	None
Real GDP	Mertens & Ravn (2013)	None
Employment	Mertens & Ravn (2013)	None
Excess bond premium	Gilchrist & Zakrajšek (2012)	None
Additional Variables		
Establishment entry	BLS, Census	Chow-Lin (1971)
Establishment exit	BLS, Census	Chow-Lin (1971)
Job creation entry	BLS, Census	Chow-Lin (1971)
Job destruction exit	BLS, Census	Chow-Lin (1971)
Wage aggregate	Haefke et al (2013)	None
Wage newly hired	Haefke et al (2013)	None

Notes:

2.1.4 Results

Figures 1 and 2 present the impulse responses to a policy shock given by one percentage point reduction in the average corporate income tax rate. The solid black line represents the point estimate, while the gray shaded areas are the 95 percent bootstrap confidence intervals.

Core Variables

Regarding the core variables shown in Figure 1, we find that one percentage-point cut in corporate income taxes raises output, profits and employment. The time profile of the response, however, differs across the core variables: output rises on impact and does so persistently, while firm profits increase with a lag.[5] Employment is the most sluggish variables of the three, taking three years to record a significant increase.

The tax cut appears to lower the external finance premium; however, the 95% confidence interval is rather wide and contains the zero line. According to Gilchrist and Zakrajšek (2013), the excess bond premium is a component of corporate bond credit spreads that is not directly attributable to expected default risk related to firm characteristics. Intuitively, credit spreads may anticipate future economic activity because they incorporate investors' expectations about future cash flows, which affect the business sector's profits, and in turn hiring decisions today. Our results suggest that a reduction in the corporate tax rate may reduce credit spreads through an increase in expected future profits, which decreases the risk of default. The resulting drop in credit costs in turn alleviates financial constraints on established firms, thereby possibly helping to prevent firm exit and job destruction.

Additional Variables

Expectations of higher future profits should induce forward-looking firms to enter the market and create jobs. Establishment entry indeed rises in response to a tax cut, but only after

[5]Note that by Mertens and Ravn's (2013) identification strategy, all variables are allowed to respond instantaneously, which would not be the case under a Cholesky decomposition where output and other real variables are be predetermined in the current period.

Figure 1: Impulse Responses: Baseline VAR Model

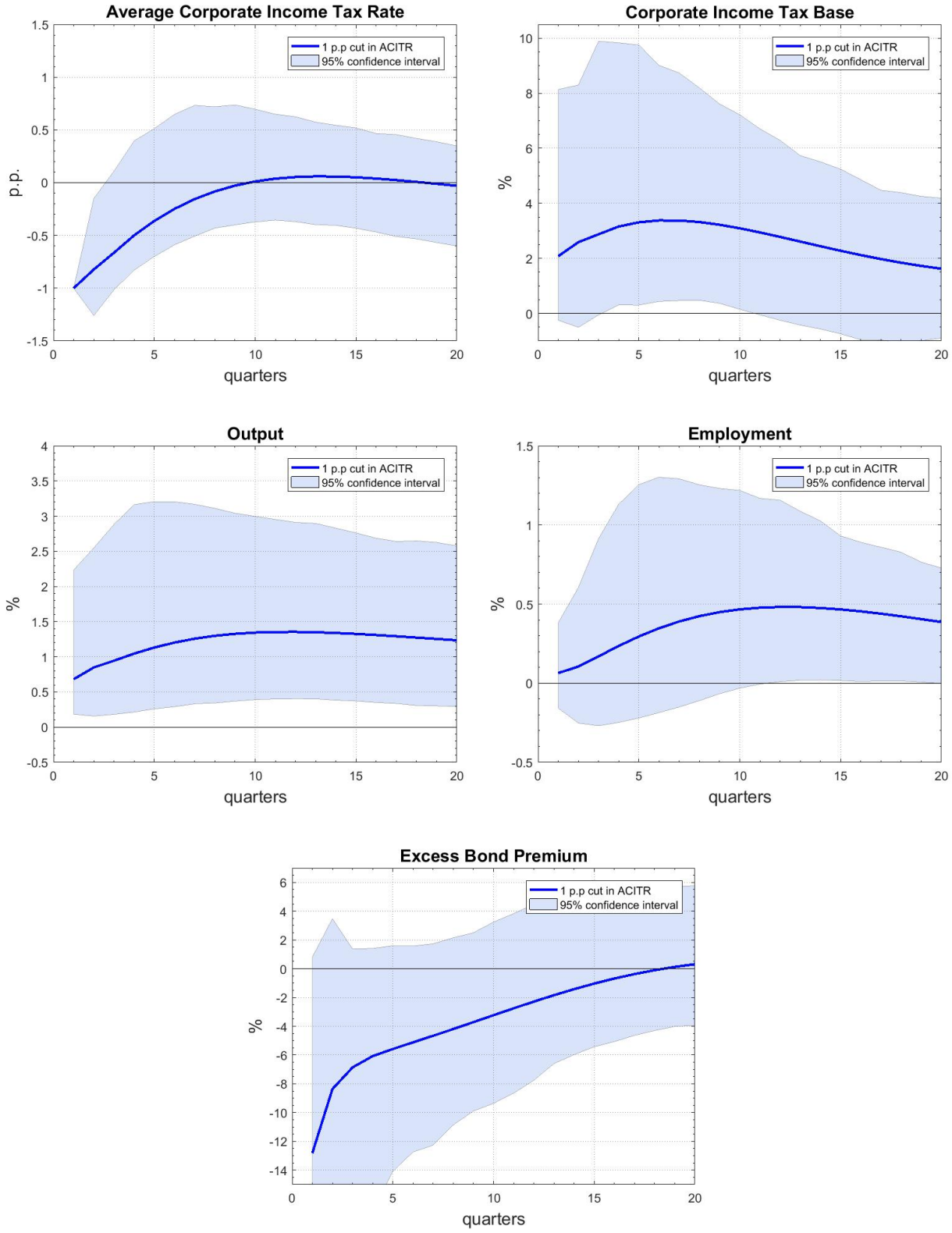
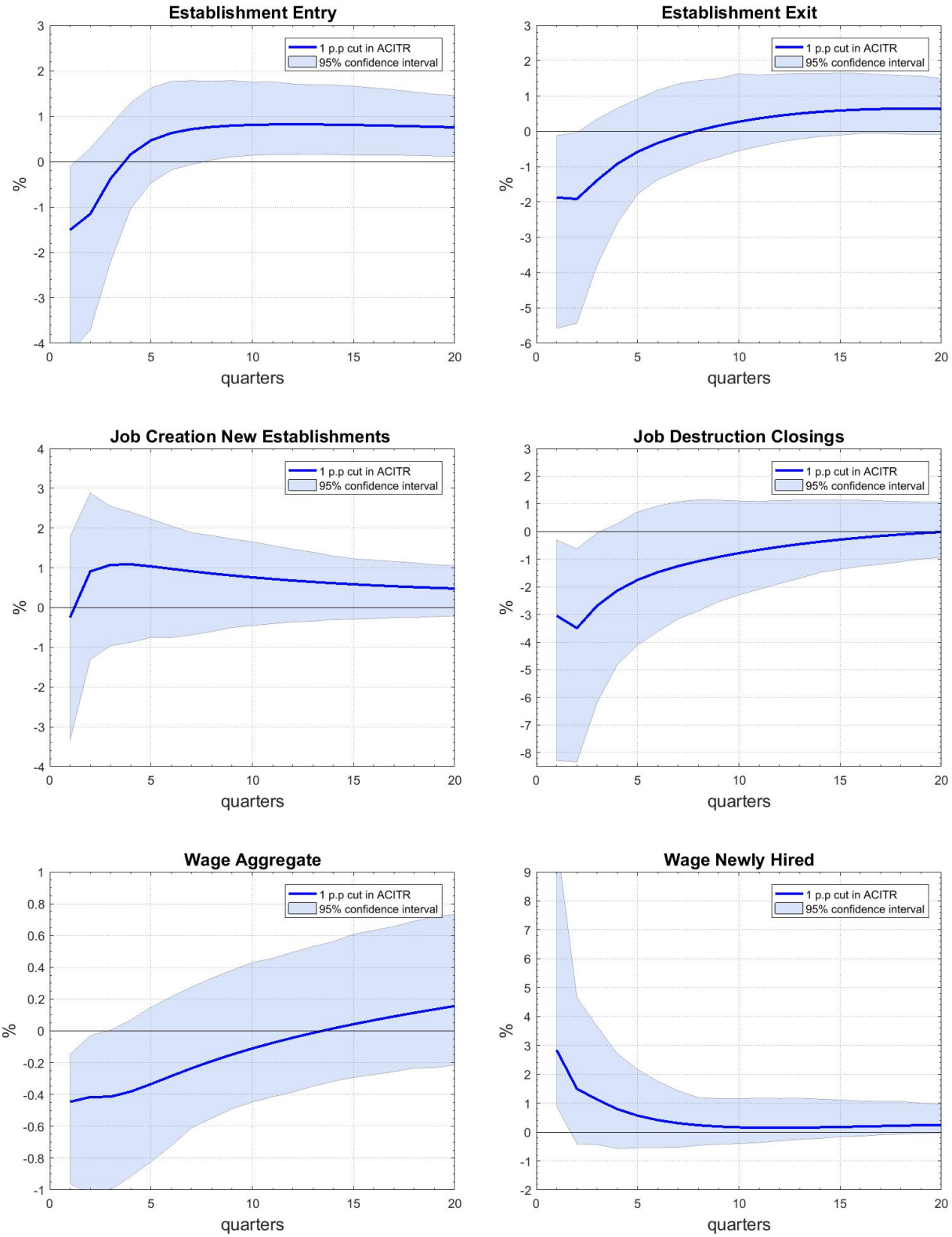


Figure 2: Impulse Responses: Augmented VAR Model



some time. The impact response is instead negative. We find a significant immediate drop in establishment exit and job destruction by deaths in response to a corporate tax cut. This suggests the importance of the exit margin for *establishment* turnover. Note how this findings contrasts with that of acyclical *product* exit that has been used in the endogenous-entry literature as an argument to view exit as exogenous, similar to capital depreciation in the real business cycle literature. See Bernard, Redding and Scott (2010), and Bilbiie, Ghironi and Melitz (2012). It is remarkable that establishment entry and exit show a qualitatively similar response pattern.

Our results suggest that in the short run, a reduction in taxes acts to save jobs - by reducing establishment exit - rather than helping to create new ones. Establishment births and the associated job creation rise only after a substantial delay. Figure 2 provides some suggestive evidence of what might drive this delay. Entry could be inhibited due to the increase in the wages of newly hired workers, which drives up entry costs if the latter involves wage payments. The initial decrease in the number of new firms entering the market coincides with the positive response of newly hired wages. This may suggest that entrants face entry costs in terms of marginal wages rather than fixed output costs as in Jaimovich and Floetotto (2008) or aggregate wages (Ghironi and Melitz, 2005).

The two subplots in the bottom row of Figure 2 show a strong positive response of wages of newly hired workers, whereas the aggregate wage initially drops and subsequently increases in response to a tax reduction. These divergent responses motivate the question what kind of models of wage setting and labor market institutions are consistent with the observed wage response patterns? In a frictionless labor market, workers can be replaced costlessly, so that each worker is marginal; differences in the wages of newly hired workers and incumbent workers cannot be an equilibrium outcome, implying the same behavior of two wage measures (Barro, 1977). With search frictions in the labor market, hiring is a forward-looking decision. The number of newly created jobs is found by equalizing the cost of opening a vacancy with the expected net present value of profits that the firm will make

once the vacancy has been filled. The latter in turn depends on the productivity and the wage of the marginal worker over the contracting period.

The increase in newly hired wages observed in Figure 1 implies that hiring a marginal worker becomes more expensive, which might explain the initial drop in establishment entry.

The cyclical behavior of newly hired wages may be very different from the cyclical behavior of the aggregate wage. Under certain bargaining arrangements, workers' bargaining power is pro-cyclical, consistent with the response of newly hired wages reported above.

The estimated wage response of the aggregate wage qualitatively exhibits a similar behavior as firm exit. Intuitively, with long-term wage contracting and a larger share of ongoing matches than new matches, a tax reduction induces firms with lower productivity and lower wages to stay in the market that would otherwise exit the market. Haefke, Sonntag and Van Rens (2013) find that aggregate wages grow almost independently of aggregate productivity, while wages at the start of an employment relationship react strongly to changes in productivity. While we consider an exogenous tax reduction rather than a productivity shock, our results also suggest a higher degree of stickiness in the wages of existing employment relations relative to the wages of newly-formed matches.

2.1.5 Robustness

We investigate the robustness of our results by considering two alternative VAR specifications. First, we consider a VAR in first differences of all observable variables. Second, we augment our baseline specification to control for the responses of government spending and labor income to corporate tax surprises, since these omitted variables can lead to misspecification. We find that the short-run and medium-run effects of corporate tax shock are robust to these alternative specifications.

2.2 US State-Level Evidence

In this section, we use variations in state-level corporate income taxes across US states to identify the effects of a fiscal stimulus on output, the labor market, wages and firm dynamics. The econometric approach is similar to the one employed by Nakamura and Steinsson (2014) to identify the government spending multiplier and to Suárez Serrato and Zidar (2016), who identify the effects of business tax cuts on local economic activity.

2.2.1 Regression Model

The empirical specification is the following,

$$\frac{Y_{it} - Y_{it-2}}{Y_{it-2}} = \beta(\tau_{it}^{CI} - \tau_{it-2}^{CI}) + \beta_x(X_{it} - X_{it-2}) + \alpha_i + \gamma_t + \varepsilon_{it}, \tag{6}$$

where Y_{it} is the dependent variable in state i in year t, thus $\frac{Y_{it}-Y_{it-2}}{Y_{it-2}}$ measures approximately the percentage growth of the dependent variable in state i over two years; τ_{it}^{CI} is the state-level corporate income tax rate in state i in year t, α_i and γ_t represent state and year fixed effects, and X_{it} is a vector of controls.

By including *state fixed effects*, we are allowing for state-specific time trends in the dependent variable and account for unobserved time-invariant heterogeneity across states. The inclusion of *time fixed effects* allows us to control for aggregate shocks and policies, such as changes in distortionary federal taxes and aggregate monetary policy. The controls we consider in our baseline specification are the investment tax credit rate and the research and development (R&D) tax credit rate.

To gauge the robustness of our estimates, we augment the baseline model by adding, separately, two more control variables. First, we include per-capita government spending in X_{it}. To the extent that the decrease in corporate taxes needs to be financed locally, states may have to tighten other fiscal policies when cutting corporate taxes. Such a policy tightening may counteract the intended effect of tax reductions.

Second, we control for the external finance premium measured by the 'excess bond

premium' (EBP) of Gilchrist and Zakrajšek (2012). We abstract from locally segmented financial markets and assume that financing costs are uniform across US states, but allow for heterogeneous responses of US states to aggregate financing conditions. We do so by including in X_{it} the aggregate excess bond premium interacted with state dummies.

2.2.2 Data

Table 2 contains the data sources and variable transformations related to the state-level regressions. Data are yearly and cover the period 1980-2006 for wages of newly hired and incumbent workers, and the period 1992-2010 for all other variables.

Table 2: State Level Data

Variable	**Source**	**Transformation**
Core Variables		
Corporate income tax	Suárez Serrato & Zidar (2016)	None
Investment tax credit	Suárez Serrato & Zidar (2016)	None
R&D tax credit	Suárez Serrato & Zidar (2016)	None
Corporate profits	Compustat	Deflated by aggregate CPI
Real GDP	BEA	Deflated by aggregate CPI
CPI	BLS	2010=1
Excess bond premium	Gilchrist & Zakrajšek (2012)	None
Additional Variables		
Establishment entry	BLS	None
Establishment exit	BLS	None
Establishment entry	BLS	None
Establishment exit	BLS	None
Job creation entry	BLS	None
Job creation expansions	BLS	None
Job destruction exit	BLS	None
Job destruction contractions	BLS	None
Real wage per worker	BEA	Deflated by aggregate CPI
Wage stay workers	Suárez Serrato & Zidar (2016)	Constructed from HSV (2013)
Wage newly hired	Suárez Serrato & Zidar (2016)	Constructed from HSV (2013)

Notes: HSV stands for Haefke, Sonntag and van Rens (2013).

2.2.3 Results

Table 3 summarizes the effect of corporate tax changes on economic activity over two years. For brevity, we only report the estimated coefficients on state taxes and statistical significance. More elaborate tables with standard errors and coefficients on government spending

and the excess bond premium can be found in the Appendix.

From Table 3, we see that only two variables respond significantly to a corporate tax rise within a two-year period. The first column in Table 3 shows that a one percentage-point increase in the corporate income tax rate induces a significant 1.18 percent decrease in the establishment entry growth over two years. Controlling for local demand shocks measured by the state-level government spending per capita reduces the coefficient only marginally, see column (2). Relatedly, Suárez Serrato and Zidar (2016) find that a one percentage-point cut in business taxes causes roughly a 4 percentage point increase in the establishment growth rate over a ten-year period.

One potential concern is that these coefficients may be overestimated due to reallocation effects and establishment mobility. Increasing corporate taxes in one state might induce firms to open a new establishment in a neighboring state. This would increase establishment entry in the latter state in the absence of local state tax changes. One way to isolate the local effect is to control for changes in the state corporate tax of other states. To do so, a simple approach is to control for the average corporate tax across states without using state-dependent network weights as in, for instance, the 'nearest neighbor' approach. In this way, we want to make these 'open economy' estimates more comparable to the 'closed economy' estimates from our VAR. By holding average state changes constant, we find no evidence of significant reallocation effects on establishment entry.[6]

Here, we do not obtain divergent responses of the aggregate real wage and wages of newly hired workers as we do in the VAR. Note, however, that the aggregate real wage is *per worker* compensation, while incumbent and newly hired wage is a measure of *per hour* compensation, which limits direct comparability.[7]

When controlling for firms' borrowing costs (see column 3 of Table 3), corporate income taxes significantly affect job destruction by incumbent firms. A one percentage point increase

[6]For more details, see column 4 in Table 7 reported in the Appendix.

[7]Our measure of aggregate wages used in the VAR estimation comes from the BLS Productivity and Cost Account; however, that measure is not available at the state level.

Table 3: Effects of Corporate Tax Increase on Local Economic Activity over 2 Years

	(1)	(2)	(3)	(1)	(2)	(3)
		Output			*Corporate Profits*	
Corporate Tax	-0.29	-0.27	-0.12	-2.84	-2.88	-7.79
Invest Tax Credit	0.32***	0.14*	0.32***	-6.97	-6.61	-7.61
R&D Tax Credit	0.13	0.04	0.12	1.64	1.83	1.64
R^2	0.464	0.794	0.507	0.073	0.073	0.165
		Employment			*Real Wage per Worker*	
Corporate Tax	-0.03	-0.03	0.02	-0.19	-0.18	-0.17
Invest Tax Credit	0.11**	0.09**	0.12**	0.11**	0.08	0.11*
R&D Tax Credit	0.00	-0.01	-0.01	0.02	0.01	0.03
R^2	0.859	0.872	0.874	0.567	0.610	0.598
		Establishment Entry			*Establishment Exit*	
Corporate Tax	-1.18**	-1.17**	-1.19*	0.82	0.82	1.04
Invest Tax Credit	0.34*	0.31*	0.38**	0.12	0.12	0.11
R&D Tax Credit	0.13	0.12	0.17	-0.00	-0.00	0.07
R^2	0.369	0.371	0.403	0.478	0.478	0.515
		Job Creation Births			*Job Creation Expansions*	
Corporate Tax	-0.50	-0.49	-0.88	0.19	0.20	0.36
Invest Tax Credit	0.58*	0.51*	0.65**	0.36***	0.31***	0.39***
R&D Tax Credit	0.21	0.17	0.24	0.13*	0.10*	0.12*
R^2	0.331	0.337	0.365	0.745	0.754	0.777
		Job Destruction Exit			*Job Destruction Contractions*	
Corporate Tax	1.08	1.09	1.27	0.23	0.23	0.58*
Invest Tax Credit	-0.09	-0.16	-0.08	0.12	0.09	0.13
R&D Tax Credit	0.17	0.13	0.23	0.01	-0.01	0.06
R^2	0.413	0.417	0.439	0.706	0.709	0.736
		Wage Stay Workers			*Wage Newly Hired*	
Corporate Tax	-0.03	-0.04	-0.03	-0.39	-0.39	-0.03
Invest Tax Credit	-0.01	-0.01	-0.01	-0.29	-0.29	-0.14
R&D Tax Credit	-0.01	-0.00	0.00	0.18	0.18	0.15
R^2	0.344	0.356	0.381	0.102	0.113	0.204

Note: In Table 3, columns (1) to (3) show the effect of corporate tax shocks while controlling for state investment tax credit and R&D tax credit shocks. Per capita government spending changes and the aggregate excess bond premium, interacted with state dummies, are included in columns (2) and (3), respectively. All regressions include state fixed-effects and time-fixed effects. Standard errors are clustered by state and statistical significance is indicated by p-values as follows: *** $p < 0.01$, **$p < 0.05$, *$p < 0.1$.

in the corporate income tax rate raises job destruction through contractions by 0.58 percent over an eight-quarter period. Intuitively, since a tax increase reduces the net present value of future profits, this leads to a contractions of the workforce and hence an increase in the firing rate.

Interestingly, the results in Table 3 indicate that a rise in the investment tax credit raises significantly output, establishment entry, wage and employment through job gains at both margins: job creation by establishment births and through expansions. R&D tax credits also stimulate job creation at incumbent firms.

Overall, our results suggest that corporate income tax changes may be effective in incentivising new firms to enter the market, whereas labor market variables are more responsive to an investment or R&D tax credit stimulus.

3 Model

To be added

4 Conclusion

This paper is a first-step exploration into the effects of corporate income tax stimulus on the labor market. We find that firms in the United States respond strongly to corporate income tax incentives. Several channels are prominent: external finance premium, endogenous entry and exit, endogenous job creation and destruction and wages of newly hired workers. Another interesting direction for future research involves a decomposition of corporate tax into dividend and capital gains tax to study implications of heterogeneity in tax reforms.

References

[1] Barro, Robert J. (1977). Long-term Contracting, Sticky Prices, and Monetary Policy. Journal of Monetary Economics 3(3), 305-316.

[2] Bernard, Andrew B.; Stephen J. Redding, and Peter K. Schott (2010). Multiple-Product Firms and Product Switching. American Economic Review 100(1): 70-97.

[3] Bilbiie, Florin O., Fabio Ghironi and Marc J. Melitz (2012). Endogenous Entry, Product Variety, and Business Cycles. Journal of Political Economy 120(2), 304-345.

[4] Blanchard, Olivier and Roberto Perotti (2002). An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output. Quarterly Journal of Economics 117(4), 1329-1368.

[5] Chow, Gregory C. and Lin, An-loh (1971). Best Linear Unbiased Interpolation, Distribution, and Extrapolation of Time Series by Related Series. Review of Economics and Statistics 53(4), 372-375.

[6] Colciago, Andrea and Lorenza Rossi (2012). Endogenous Market Structures and Labor Market Dynamics. Manuscript.

[7] Colciago, Andrea and Federico Etro (2010). Endogenous Market Structures and the Business Cycle. Economic Journal 120(549), 1201-1233.

[8] Davis, S.J., Haltiwanger, J. (1990). Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications. NBER Macroeconomics Annual 5, 123-168.

[9] Gilchrist, Simon and Egon Zakrajšek (2012). Credit Spreads and Business Cycle Fluctuations. American Economic Review 102(4), 1692-1720.

[10] Ghironi, Fabio and Marc J. Melitz (2005). International Trade and Macroeconomic Dynamics With Heterogeneous Firms. Quarterly Journal of Economics 120(3), 865-915.

[11] Haefke, Christian; Marcus Sonntag, and Thijs van Rens (2013). Wage rigidity and job creation. Journal of Monetary Economics 60(8), 887-899.

[12] Jaimovich, Nir and Max Floetotto (2008). Firm Dynamics, Markup Variations, and the Business Cycle. Journal of Monetary Economics 55(7), 1238-1252.

[13] Lewis, Vivien and Roland Winkler (2017). Government Spending, Entry and the Consumption Crowding-In Puzzle, International Economic Review 58(3), 943972.

[14] Lewis, Vivien and Arnoud Stevens (2015). Entry and Markup Dynamics in an Estimated Business Cycle Model, European Economic Review 74, 14-35.

[15] Lewis, Vivien and Céline Poilly (2012). Firm Entry, Markups and the Monetary Transmission Mechanism. Journal of Monetary Economics 59(7), 670-685.

[16] Mertens, Karel and Morten O. Ravn (2013). The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States. American Economic Review 103(4), 1212-1247.

[17] Monacelli, Tommaso; Roberto Perotti and Antonella Trigari (2010). Unemployment Fiscal Multipliers, Journal of Monetary Economics 57(5), 531-553.

[18] Mortensen, Dale T. and Christopher A. Pissarides (1994). Job Creation and Job Destruction in the Theory of Unemployment. Review of Economic Studies 61, 397-415.

[19] Nakamura, Emi and Jón Steinsson (2014). Fiscal Stimulus in a Monetary Union: Evidence from US Regions. American Economic Review 104(3), 753-92.

[20] Romer, Christina D. and David H. Romer (2010). The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks. American Economic Review 100(3), 763-801.

[21] Spletzer, James R. (2000). The Contribution of Establishment Births and Deaths to Employment Growth. Journal of Business & Economic Statistics 18(1), 113-126.

[22] Suárez Serrato, Juan Carlos and Owen Zidar (2016). Who Benefits from State Corporate Tax Cuts? A Local Labor Markets Approach with Heterogeneous Firms. American Economic Review 106(9), 2582-2624.

Appendix

In this appendix, we report full results tables of the effect of corporate income tax increases on different endogenous variables, controlling for government per-capita spending and the excess bond premium. Furthermore, we provide robustness checks with respect to reallocation effects by including the average state corporate tax as an additional control. In Tables 4 to 15, all four columns show the effect of corporate tax shocks while controlling for state investment tax credit and R&D tax credit. We additionally control for per capita government spending changes in the second column, for the excess bond premium in the third colum, and for average state corporate tax in the fourth column. All regressions include state fixed effects and time fixed effects; standard errors are clustered by state and reported in brackets.

Table 4: Output

	(1)	(2)	(3)	(4)
Corporate Tax	-0.29	-0.27	-0.12	-0.13
	(0.423)	(0.183)	(0.351)	(0.191)
Invest Tax Credit	0.32***	0.14*	0.32***	0.14
	(0.108)	(0.077)	(0.118)	(0.088)
R&D Tax Credit	0.13	0.04	0.12	0.05
	(0.100)	(0.045)	(0.104)	(0.044)
Gov Spending		0.51***		0.52***
		(0.042)		(0.042)
EBP			-0.05***	-0.02***
			(0.005)	(0.004)
R^2	0.464	0.794	0.507	0.814

Table 5: Employment

	(1)	(2)	(3)	(4)
Corporate Tax	-0.03	-0.03	0.02	0.02
	(0.106)	(0.062)	(0.091)	(0.069)
Invest Tax Credit	0.32***	0.14*	0.32***	0.09*
	(0.042)	(0.042)	(0.048)	(0.047)
R&D Tax Credit	0.00	-0.01	-0.01	-0.02
	(0.022)	(0.023)	(0.023)	(0.024)
Gov Spending		0.07***		0.08***
		(0.042)		(0.042)
EBP			-0.05***	-0.02***
			(0.022)	(0.022)
R^2	0.859	0.872	0.874	0.886

Table 6: Corporate Profit

	(1)	(2)	(3)	(4)
Corporate Tax	-2.84	-2.88	-7.79	-7.77
	(8.931)	(9.498)	(11.356)	(13.245)
Invest Tax Credit	-6.97	-6.61	-7.61	-6.19
	(6.684)	(6.389)	(7.086)	(5.907)
R&D Tax Credit	1.64	1.83	1.64	2.20
	(1.546)	(1.760)	(1.898)	(2.638)
Gov Spending		-1.01		-4.18
		(1.052)		(4.148)
EBP			-0.12	-0.34
			(0.156)	(0.357)
R^2	0.073	0.073	0.165	0.169

Table 7: Establishment Entry

	(1)	(2)	(3)	(4)
Corporate Tax	-1.18**	-1.17**	-1.19*	-1.19*
	(0.455)	(0.481)	(0.592)	(0.603)
Invest Tax Credit	0.34*	0.31*	0.38**	0.35*
	(0.171)	(0.165)	(0.186)	(0.179)
R&D Tax Credit	0.13	0.12	0.17	0.15
	(0.110)	(0.109)	(0.128)	(0.123)
Gov Spending		0.09*		0.10*
		(0.048)		(0.056)
EBP			-0.12***	-0.11***
			(0.010)	(0.010)
R^2	0.369	0.371	0.403	0.406

Table 8: Establishment Exit

	(1)	(2)	(3)	(4)
Corporate Tax	0.82	0.82	1.04	1.04
	(0.866)	(0.866)	(0.829)	(0.830)
Invest Tax Credit	0.12	0.12	0.11	0.11
	(0.176)	(0.175)	(0.186)	(0.186)
R&D Tax Credit	-0.00	-0.00	0.07	0.07
	(0.170)	(0.170)	(0.174)	(0.174)
Gov Spending		0.01		0.00
		(0.078)		(0.078)
EBP			0.05***	0.05***
			(0.011)	(0.012)
R^2	0.478	0.478	0.515	0.515

Table 9: Job Creation Entry

	(1)	(2)	(3)	(4)
Corporate Tax	-0.50	-0.49	-0.88	-0.88
	(1.148)	(1.227)	(1.059)	(1.132)
Invest Tax Credit	0.58*	0.51*	0.65**	0.58**
	(0.291)	(0.274)	(0.296)	(0.277)
R&D Tax Credit	0.21	0.17	0.24	0.22
	(0.247)	(0.251)	(0.248)	(0.246)
Gov Spending		0.20**		0.21**
		(0.083)		(0.085)
EBP			-0.16***	-0.15***
			(0.014)	(0.015)
R^2	0.331	0.337	0.365	0.371

Table 10: Job Creation Expansions

	(1)	(2)	(3)	(4)
Corporate Tax	0.19	0.20	0.36	0.36
	(0.365)	(0.442)	(0.481)	(0.563)
Invest Tax Credit	0.36***	0.31***	0.39***	0.34***
	(0.122)	(0.107)	(0.129)	(0.114)
R&D Tax Credit	0.13*	0.10*	0.12*	0.10*
	(0.070)	(0.060)	(0.069)	(0.057)
Gov Spending		0.14***		0.15***
		(0.029)		(0.029)
EBP			-0.13***	-0.13***
			(0.005)	(0.005)
R^2	0.745	0.754	0.777	0.786

Table 11: Job Destruction Exit

	(1)	(2)	(3)	(4)
Corporate Tax	1.08	1.09	1.27	1.26
	(1.350)	(1.359)	(1.724)	(1.758)
Invest Tax Credit	-0.09	-0.16	-0.08	-0.15
	(0.300)	(0.284)	(0.318)	(0.303)
R&D Tax Credit	0.17	0.13	0.23	0.20
	(0.420)	(0.413)	(0.469)	(0.456)
Gov Spending		0.20**		0.21**
		(0.078)		(0.078)
EBP			-0.04**	-0.03
			(0.018)	(0.019)
R^2	0.413	0.417	0.439	0.443

Table 12: Job Destruction Contractions

	(1)	(2)	(3)	(4)
Corporate Tax	0.23	0.23	0.58*	0.58*
	(0.272)	(0.283)	(0.313)	(0.303)
Invest Tax Credit	0.12	0.09	0.13	0.11
	(0.132)	(0.132)	(0.140)	(0.139)
R&D Tax Credit	0.01	-0.01	0.06	0.05
	(0.075)	(0.078)	(0.085)	(0.086)
Gov Spending		0.08		0.07
		(0.049)		(0.048)
EBP			0.04***	0.04***
			(0.008)	(0.008)
R^2	0.706	0.709	0.736	0.738

Table 13: Real Wage per Worker

	(1)	(2)	(3)	(4)
Corporate Tax	-0.19	-0.18	-0.17	-0.18
	(0.191)	(0.162)	(0.200)	(0.387)
Invest Tax Credit	0.11*	0.08	0.11*	0.03
	0.02	0.01	0.03	0.04
R&D Tax Credit	(0.031)	(0.023)	(0.037)	(0.057)
	(0.070)	(0.060)	(0.069)	(0.057)
Gov Spending		0.09***		0.07***
		(0.017)		(0.021)
EBP			-0.00***	-0.01***
			(0.001)	(0.001)
R^2	0.567	0.610	0.598	0.122
Average Corp Tax				-3.99***
				(1.474)

Table 14: Wage Stay Workers

	(1)	(2)	(3)	(4)
Corporate Tax	-0.03	-0.04	-0.03	-0.04
	(0.033)	(0.034)	(0.033)	(0.033)
Invest Tax Credit	-0.01	-0.01	-0.01	0.00
	(0.065)	(0.066)	(0.061)	(0.062)
R&D Tax Credit	-0.01	-0.00	0.00	0.01
	(0.048)	(0.052)	(0.051)	(0.055)
Gov Spending		0.06***		0.06***
		(0.018)		(0.017)
EBP			-0.02***	-0.02***
			(0.003)	(0.003)
R^2	0.344	0.356	0.381	0.392

Table 15: Wage Newly Hired

	(1)	(2)	(3)	(4)
Corporate Tax	-0.39	-0.39	-0.03	0.13
	(2.499)	(2.391)	(3.150)	(3.026)
Invest Tax Credit	-0.29	-0.29	-0.14	-0.18
	(0.473)	(0.461)	(0.444)	(0.439)
R&D Tax Credit	0.18	0.18	0.15	0.17
	(0.426)	(0.442)	(0.412)	(0.427)
Gov Spending		-0.36*		-0.38*
		(0.197)		(0.222)
EBP			0.08***	0.05***
			(0.017)	(0.018)
R^2	0.102	0.113	0.204	0.216