Firm Growth, European Industry Dynamics and Domestic Business Cycles

Harald Oberhofer

University of Salzburg

4. FIW Research Conference
International Economics

Motivation

- Single Market Program of 1992 constitutes (de jure) one single European Market
- From spring 2008 until Winter 2009 European manufacturing industry production faced a sharp recession
  - EUROSTAT reported negative (annual) industry growth rates since May 2008 for EU 27 (April 2009: -19.4%)
  - At the same time within EU 27 the harmonized unemployment rate showed a continuous increase from 6.9% (May 2008) to 9.6% (January 2010)
- Some industries seemed to be more influenced be the general downturn (e.g. car manufacturing)
- Countries tended to be asymmetrically affected by the recession
  - In July 2009 Ireland (Germany) reported an annual industry production growth rate of 4.7% (-17%)

This paper...

- Studies the impacts of European industry fluctuations and domestic business cycles on the growth performance of European firms
- Takes non-reaction of firms explicitly into account
- Distinguishes between purely domestic firms and subsidiaries of Multinational enterprises (MNEs)
- Combines the empirical firm growth literature (e.g. Hart 2000) and heterogeneous (microeconomic) adjustment models (e.g. Caballero, Engel and Haltiwanger 1997)

More specifically, this paper asks:

- **Do European firms react to European industry fluctuations and/or to domestic business cycles, and if yes, is there heterogeneity in the reaction**

UNIVERSITY of SALZBURG

Data Description

- Data Sources:
  - **Firm level data:** AMADEUS database Nov. 2006 (update 146); Older version for MNEs
  - **Industry level data:** NACE 3-digit industry value added to factor costs collected by the Austrian Institute of Economic Research (WIFO)
- Growth rates are calculated using first differences of logs of firm level employment and the respective value added data in two subsequent years
- MNE subsidiary status is constructed using AMADEUS November versions of the subsequent years
- Final sample contains 104,595 unconsolidated firms from 2000-2003

Sample Composition

Year	Obs. $g_i \neq 0$	Obs. $g_i = 0$	Share $g_i = 0$	$\bar{g}_i$	$\bar{g}_j$	$\bar{g}_c$
2000	66,369	38,226	0.365	0.083	0.023	0.063
2001	65,153	39,442	0.377	0.044	0.024	0.018
2002	63,194	41,401	0.396	0.009	−0.008	0.017
2003	63,865	40,730	0.389	−0.004	−0.007	0.015

Notes: N = 104,595 Observations.

ANOVA for the firm growth rate

	Growth 2000		Growth 2001		Growth 2002		Growth 2003	
Source	Abs.	%	Abs.	%	Abs.	%	Abs.	%
CO	569.7***	5.1	47.7***	0.9	7.7***	0.2	4.1***	0.1
Ind.	8.7	0.1	2.3	0.0	2.5	0.1	4.0	0.1
CO * Ind.	109.7***	1.0	110.1***	2.2	30.3	0.9	35.0	1.0
Constant	1207.2	10.9	260.3	5.1	35.8	1.1	18.58	0.5
Model	1,895.3***	17.1	420.3***	8.3	76.24***	2.4	61.69***	1.7
Residual	9,165.5	82.9	4,657.0	91.7	3,153.6	97.6	3,638.6	98.3
Total	11,060.7	100.0	5,077.3	100.0	3,229.8	100.0	3,700.3	100.0

Notes: P-values are based on F-tests according to 13 d.f. (degrees of freedom) for Country Effects, 97 d.f. for Industry Effects and 1055 d.f. for Country * Industry Effects.

Two-Part Model

- Latent outcome variable:

$$y_{it}^* = \begin{cases} 0 \text{ for } g_{it} = 0 \\ 1 \text{ for } g_{it} \neq 0 \end{cases}$$

- First part:

$$P(y_{it}^* = 1|\mathbf{z}_{it}) = P(g_{it} \neq 0|\mathbf{z}_{it}) = F(\mathbf{z}_{it}\gamma)$$

- Second part:

$$E(y_{it}|\mathbf{x}_{it}, y_{it}^* = 1) = \mathbf{x}_{it}\beta$$

- The conditional mean of the two-part model is given by:

$$\begin{aligned} E(y_{it}|\mathbf{x}_{it}) = P(y_{it}^* = 1|\mathbf{z}_{it})E(y_{it}|\mathbf{x}_{it}, y_{it}^* = 1) \\ + P(y_{it}^* = 0|\mathbf{z}_{it})E(y_{it}|\mathbf{x}_{it}, y_{it}^* = 0) \end{aligned}$$

Explanatory Variables I

- $\mathbf{z}_{it}$ contains:
  - **Firm size** (Varejao and Portugal 2007; Hölzl and Huber 2009)
  - **Firm age** (Varejao and Portugal 2007; Hölzl and Huber 2009)
  - **Sales per employee** (Nilsen, Salvanes and Schiantarelli 2007)
  - **Relative size** (MES: 3rd quartile of previous sales distribution)
  - **MNE subsidiary status** (e.g. Oberhofer and Pfaffermayr 2010)
  - **European industry value added to factor costs growth rates** (EU)
  - **Country specific total manufacturing value added to factor costs growth rates** (CO)

Explanatory Variables II

- $\mathbf{x}_{it}$ contains:
  - **Firm size** (Hart 2000)
  - **Firm age** (Hart 2000)
  - **MNE subsidiary status** (e.g. Oberhofer and Pfaffermayr 2010)
  - **European industry value added to factor costs growth rates** (EU)
  - **Country specific total manufacturing value added to factor costs growth rates** (CO)
  - **Interaction terms between European industry growth rates and all firm characteristics** (heterogeneous employment adjustment)
  - **Interaction terms between country specific total manufacturing growth rates and all firm characteristics** (heterogeneous employment adjustment)

First part results

	2000	2001	2002	2003
Size	0.134^{***}	0.150^{***}	0.146^{***}	0.138^{***}
Age	-0.036^{***}	-0.046^{***}	-0.040^{***}	-0.061^{***}
Sales per employee	0.0002^{***}	0.0001^{***}	0.0001^{***}	0.0000^{***}
Relative size	0.0001	-0.0001^{***}	-0.0001^{***}	-0.0001^{***}
MNE	-0.016	0.014	0.024	0.031
EU	0.091	-0.037	-0.091	-0.073
CO	1.471^{***}	-0.611^{***}	-0.610^{*}	-2.154^{***}
Pseudo R^2	0.137	0.130	0.135	0.168
N	104,595	104,595	104,595	104,595

Notes: Average marginal effects are reported. Robust standard errors clustered by industry-country in parentheses.

	2000	2001	2002	2003
Con.	0.335***	0.162***	0.055***	0.014**
S.2	−0.236***	−0.064***	−0.020***	−0.010
S.3	−0.257***	−0.082***	−0.016**	−0.002
S.4	−0.278***	−0.124***	−0.032***	−0.002
A.2	−0.044***	−0.015***	−0.018***	−0.014***
A.3	−0.034***	−0.005	−0.019***	−0.020***
A.4	−0.067***	−0.024***	−0.038***	−0.033***
MNE	0.030**	0.007	−0.011**	−0.010*
EU	0.551	−0.058	0.285***	0.041
CO	0.886***	0.536***	0.491***	0.491**
S.2 * EU	−0.381	0.010	−0.074	0.093
S.3 * EU	−0.331	−0.058	−0.104	0.085
S.4 * EU	−0.473	0.072	−0.106	0.047
A.2 * EU	0.005	−0.046	−0.127**	0.049
A.3 * EU	−0.014	0.002	−0.083	0.113)
A.4 * EU	−0.055	0.060	−0.063	0.094
	(0.135)	(0.091)	(0.055)	(0.070)
MNE * EU	−0.148	−0.090	−0.085	0.059
S.2 * CO	−0.954***	−0.628***	−0.756***	−0.278
S.3* CO	−0.821**	−0.815***	−0.826***	−0.360*
S.4 * CO	−0.241	−0.776***	−0.506***	−0.187
A.2 * CO	0.173	0.237***	0.063	−0.115
A.3 * CO	0.153	0.286***	−0.024	−0.182**
A.4 * CO	0.473***	0.315***	0.233***	−0.108
MNE * CO	−0.860***	0.203	0.038	0.039
R^2	0.107	0.031	0.012	0.006
N	66,369	65,153	63,194	63,865

Notes: Robust standard errors clustered by industry-country in parentheses.

Conditional Means (2000-2001)

	2000			2001		
	(1)	(2)	(3)	(1)	(2)	(3)
Size 1-Age 1 Firms (non-MNE)	0.442	0.406	0.182	0.398	0.166	0.065
Size 2-Age 2 Firms (non-MNE)	0.587	0.065	0.039	0.563	0.084	0.047
Size 3-Age 3 Firms (non-MNE)	0.704	0.063	0.045	0.688	0.073	0.050
Size 4-Age 4 Firms (non-MNE)	0.839	0.054	0.049	0.856	0.018	0.015
MNEs	0.911	0.041	0.038	0.871	0.043	0.035

Conditional Means (2002-2003)

	2002			2003		
	(1)	(2)	(3)	(1)	(2)	(3)
Size 1-Age 1 Firms (non-MNE)	0.382	0.065	0.025	0.390	0.026	0.009
Size 2-Age 2 Firms (non-MNE)	0.550	0.012	0.007	0.554	−0.009	−0.006
Size 3-Age 3 Firms (non-MNE)	0.675	0.011	0.008	0.683	−0.011	−0.007
Size 4-Age 4 Firms (non-MNE)	0.848	−0.016	−0.014	0.859	−0.025	−0.022
MNEs	0.860	−0.007	−0.007	0.863	−0.021	−0.019

Conclusions

- European industry fluctuations are not able to explain the variation in firm growth rates across European Firms
- Domestic business cycles are able to explain the variation in the firm growth rates and create detectable heterogeneity in the reaction
- The smallest and youngest firms tend to have the highest growth rates but most sensitively react to cyclical movements
- Firm size of MNE subsidiaries is relatively stable during a business cycle

The domestic business cycle seems to be (still) a more important determinant of firm performance compared to European industry fluctuations