TA session2# 13

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Contents

Today, we will outline the empirical analysis that GMM is used.

1 Empirical Example1

"The finance-trade nexus revisited: Is the global trade slowdown also a financial story?" M. Gachter and L. Gkrintzails (2017), Economic Letters 158, pp21-25.

This paper studies the role of non-linearities in the finance-trade nexus. While we confirm the positive impact of financial development on the level of trade openness, our findings reveal that the marginal effect decreases considerably with the size of the financial sector.

we estimate an equation relating two measures of trade openness with a set of explanatory variables, including an indicator of financial development. The model has the following form

$$Trade_{it} = \alpha + \beta_1 Finance_{it} + \beta_2 Finance_{it}^2 + \gamma X_{it} + \lambda_t + u_{it}$$

where the dependent variable $Trade$ represents one of the two measures for trade openness (exports and imports as a ratio to GDP). $Finance$ depicts our measure for financial development, which corresponds to private credit (issued by deposit banks and other financial institutions) as a ratio to GDP. First, to address the simultaneity bias between financial development and the trade variables, we estimate a pooled IV model, in which the financial development indicator is instrumented with the initial value of each 5-year period as well as external instruments based on the legal origin of the respective country. Second, we consider a dynamic panel and employ a system GMM estimation, which takes into account the possibility that some explanatory variables might not be exogenous or predetermined. Finally, for robustness purposes, we also estimate a dynamic panel threshold model of the following form

$$\begin{aligned} Trade_{it} =& \alpha + \beta_1 Finance_{it} + \beta_2 Finance_{it} * Threshhold_{it} \\ &+ \beta_3 Threshhold_{it} + \gamma X_{it} + \lambda_t + u_{it} \end{aligned}$$

where Threshold refers to a dummy variable amounting to 1 if a certain credit-to-GDP threshold is exceeded. Thus, if we expect that finance does not affect trade when exceeding this threshold, we would expect that the sum of the coefficients β_1 and β_2 is not statistically significantly different from zero.

Table 1
Empirical results.

Dependent variable	Exports/GDP				
	(1) IV	(2) IV	(3) IV	(4) GMM	(5) Threshold
Finance	0.046*	0.275***	0.172**	0.157**	0.122***
	(1.77)	(4.04)	(2.57)	(2.25)	(2.95)
Finance^2		−0.001***	−0.001***	−0.001**	
		(−3.61)	(−2.79)	(−2.41)	
Finance × Threshold					−0.214**
					(−2.17)
Threshold					21.735
					(1.64)
Population	−0.032***	−0.035***	−0.030***	−0.006	−0.005
	(−5.45)	(−5.90)	(−4.29)	(−1.05)	(−0.94)
GDP per capita, PPP	0.640***	0.619***	0.597***	0.150***	0.137**
	(9.17)	(8.95)	(7.43)	(2.94)	(2.57)
Investment/GDP	0.493***	0.483***	0.091	0.152**	0.151**
	(5.94)	(5.88)	(0.96)	(2.43)	(2.28)
Schooling	−0.046	−0.099**	−0.157***	−0.108***	−0.100***
	(−1.24)	(−2.49)	(−3.04)	(−2.92)	(−3.20)
Government consumption/GDP	−0.312**	−0.328**	−0.149	0.029	0.012
	(−2.36)	(−2.51)	(−0.87)	(0.21)	(0.08)
FDI net inflows			1.382***	0.222*	0.250**
			(10.06)	(1.86)	(2.11)
Inflation			−0.005	0.000	−0.001
			(−0.55)	(0.12)	(−0.37)
Tariff rate, simple mean			−0.057	−0.027	−0.025
			(−0.43)	(−0.53)	(−0.52)
Population growth			−1.961**	−0.722	−0.658
			(−2.35)	(−1.62)	(−1.40)
Lag dependent variable				0.840***	0.815***
				(13.42)	(15.54)
Observations	656	656	531	533	533
Threshold (percent)		115	97	115	
Test overidentifying restrictions (*p*-value)[a]	0.643	0.493	0.276	0.242	0.154
Wald test (*p*-value)[b]					0.180

2 Empirical Example2

"R&D subsidies and the performance of high-tech start-ups" M. G. Colombo et al. (2011), Economic letters 112, pp97-99.

This paper addresses the question of the efficacy of R&D policy measures in support of high-tech start-ups. We show that subsidies awarded on a competitive basis lead to a positive effect, while those assigned through an automatic procedure do not.
To estimate the impact of different types of R&D subsidies on TFP, we specify the following equation:

$$TFP_{it} = \beta_0 + \beta_1 TFP_{it-1} + \beta_2' RDSubs_{it-1} + \gamma' X_{it} + \gamma_t + \epsilon_{it} \quad (1)$$

TFP_{it-1} is the autoregressive term, $R\&DSubs_{it-1}$ is a vector of impulse dummies capturing automatic and selective R&D subsidies. X_{it} includes controls, namely firm age (Age_{it}), the ratio of debt to total assets (DTA_{it}), the cash flow to sales ratio (CFS_{it}), and a composite index reflecting the level of infrastructure and resources development in the province of firm's location (LI_{it}, source: Centro Studi Confindustria), γ_t is a full set of time dummies and ϵ_{it} is the error term.
Systematic differences between subsidized and non-subsidized firms, and between firms subsidized through different types of schemes, may be due to sorting. Therefore, a simple comparison of the mean impact of the subsidies may lead to biased results. To account for this possible distortion, we resorted to the GMM-system estimator. We considered subsidies as potentially correlated with the error term, and treated them as endogenous. We also used additional exogenous instruments to improve estimates consistency (e.g. Benfratello and Sembenelli, 2006), namely the annual amount of central government subsidies on GDP and the percentages of RITA firms located in a given region that received selective and automatic subsidies over the observation period. The validity of the selected instruments was verified through a Hansen test.

Table 2
GMM regression results.

	(1)	(2)
TFP_{it-1}	0.5650**	0.5795**
	(0.0624)	(0.0628)
R&D subsidies_{it-1}	0.0677	
	(0.0946)	
R&D selective subsidies_{it-1}		0.3140*
		(0.1431)
R&D automatic subsidies_{it-1}		−0.0088
		(0.1218)
DTA_{it}	0.1026	0.1086
	(0.3111)	(0.2838)
CFS_{it}	0.2655	0.3600
	(0.3834)	(0.3454)
Age_{it}	0.0126*	0.0105
	(0.0061)	(0.0055)
LI_{it}	0.0022**	0.0023**
	(0.0008)	(0.0007)
Constant	1.5050**	1.4536**
	(0.3444)	(0.2906)
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Obs.	1198	1198
N. groups	247	247
Hansen test	110.48 [113]	103.68 [124]

Legend: robust standard errors in parentheses.
* Statistical significance at the 5% level.
** Statistical significance at the 1% level.
To limit possible finite sample bias (e.g., Bond, 2002), we restrict moment conditions of endogenous variables to the interval $t-2(t-1)$ and $t-5(t-4)$ for instruments in levels (differences).

3 Empirical Example3

"The impact of bank competition and concentration on industrial growth" G.Liu et al. (2014), Economic Letters, 124, pp.60-63.

This paper studies whether bank competition affects growth of non-banking industries. We find that non-cooperative bank competition and stability promote industrial growth robustly. Bank concentration may also affect growth positively; the latter effect increases for higher levels of competition.

We collected data for 23 industries over the period 19932007 for 48 emerging and mature markets2 and used OLS to estimate the following empirical model:

$$
\begin{aligned}
Growth_{i,c} =& Const + \beta_1 SectorDummies_i + \beta_2 CountryDummies_c + \beta_3 Share\_in\_value\_added_{i,c} \\
&+ \beta_4 External\_Dependence_i \times Financial\_Depth_c + \beta_5 External\_Dependence_i \times Bank\_Competition_c \\
&+ \beta_6 External\_Dependence_i \times Control\_Variables_c + \epsilon_{ic}
\end{aligned}
$$

Bank_Competition is a degree of bank sector competition measured as the responsiveness of growth of bank market share to change of bank cost efficiency (source: BankScope and own estimations based on Hay and Liu, 1997). In particular, for this variable, we employ a simplified version of Hay and Liu ' s model to estimate efficiency competition within the context of the banking business, which is as follows:

$$MS_{it} = \alpha + \beta \frac{c_{it}}{c_t} + \gamma P_{it} + \epsilon_{it}$$

MS_{it} is the market share; c_{it} is the unit overhead cost (total non-interest expenses) of total assets of a bank; c_t is the average overhead costs per unit of the total assets of the bank sector. P_{it} is the interest rate spread, implying a price of bank assets employed for banking business. In a competitive market, we expect a negative coefficient β because in any non-cooperative competition, firms with higher costs relative to the market average costs will grow slowly and then lose their market share. We employ a dynamic GMM panel method to estimate β for each economy, which is then used in the empirical model. As this variable enters the main model of the paper as a generated regressor, it can lead to a bias in the estimated coefficients and the confidence intervals may be underestimated. For this reason, we checked the initial regressions that we performed in order to estimate β for each economy. As the coefficients are highly statistically significant in the vast majority of cases, the uncertainty arising from the generated regressor is minimised.

Table 3
Regression results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share in value added	−0.031***	−0.033***	−0.034***	−0.031***	−0.037**	−0.035***	−0.031***	−0.033**
	[3.03]	[3.27]	[3.36]	[3.01]	[2.03]	[3.43]	[3.06]	[3.23]
Financial depth								
Credit to private sector ∗ FD	0.046*	0.032	0.058**	0.050*	−0.010	0.008	0.037	0.012
	[1.80]	[1.22]	[2.15]	[1.83]	[0.34]	[0.23]	[1.42]	[0.32]
Bank concentration								
5-firm ratio ∗ FD	0.133**			0.085			0.091	0.082
	[2.07]			[1.28]			[1.36]	[1.23]
Bank competition								
Efficiency competition ∗ FD		0.060***		0.048**		0.048**	0.098**	0.093**
		[2.97]		[2.23]		[2.29]	[2.23]	[2.11]
Interaction term								
5-firm conc ratio ∗ Efficiency competition ∗ FD							0.009*	0.011*
							[1.77]	[1.70]
Bank stability								
Z-score ∗ FD			0.453**	0.358*		0.353*		0.093*
			[2.14]	[1.67]		[1.65]		[1.71]
Institution								
Property rights ∗ FD					0.164*	0.121		0.125*
					[1.94]	[1.63]		[1.69]
Industry dummies (23 sectors)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies (48 countries)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48	48	48
Observations	928	928	928	928	928	928	928	928
R-squared	0.45	0.45	0.45	0.46	0.45	0.46	0.45	0.46
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
F-statistic	9.71	9.82	9.72	9.65	9.73	9.67	9.61	9.48

Notes: the dependent variable is the average (compounded) real growth of value added over the period 1993–2007. Share in value added is the fraction of value added of each sector in each country in the year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Robust *t*-values are in parentheses.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

4 Empirical Example4

"An empirical test of the inequality trap concept" C.Daymon and C. Gilmet (2009), Economic Letters 105, pp.165-167.

The paper uses a GMM estimation to prove the impact of equity on inequality persistence which suggests the presence of inequality trap, and underline the significant influence of the credit market, wealth and education access initial levels.

Since the study of inequality traps refers to a dynamic process, we must study to what extent the lagged values of the variables influence the current value of income distribution. When the ordinary least squares estimator is used for this purpose, there is an upward bias. The within estimator is also biased, but in the opposite direction. To solve this problem, we use a dynamic model allowing the introduction of instrumental variables, which are correlated to the lagged value of the endogenous variable and not with the error term (Bond, 2002). The system GMM therefore seems the method best adapted to our estimation.

Their model can be written as follows:

$$y_{it} = \alpha y_{it-1} + \beta X_{it-1} + u_i + v_{i,t} \quad (2)$$

With $y_{i,t-1}$ the dependent lagged variable, $X_{i,t}$ is the set of explanatory lagged variables, u_i is the specific individual effect for each country, $v_{i,t}$ is the specific shock at each period and on each country.

Where

$$E[x_{it}(u_i + v_{it})] = 0 \quad (3)$$

Variables and results are follows.

Table 1
Explanatory variables.

Variable	Definition	Expected sign	Role of the variable
Economic and political inequalities			
Political liberty	Rating of political rights from 1 to 7, with 1 representing the best mark and 7 representing the lowest degree of freedom (Freedom House (2005)).	*pr* (+)	For Cling et al. (2005) the emergence of an inequality trap can be explained by political power inequality that leads to the establishment of inequitable institutions that maintain the inequality situation within the country.
Credit access	Relation between domestic credit and the gross domestic product (IMF (2007)).	*domcred* (−)	The assumption made here is that efficient markets and access to financial resources guaranteeing equity are the necessary conditions for combating inequality traps.
Social and cultural inequalities			
Gender inequality	Share of literate women compared to literate men between the ages of 15 and 24 (WDI (2007)).	*gender* (−)	This task discrimination based on sex causes a gender inequality which is passed on to the next generation (Rao, 2006).
Youth literacy rate	Share of young people between 15 and 24 likely to be able to read, write and understand a short, simple text about everyday life (WDI (2007)).	*literacyyoung* (−)	As the WDR 2005 stresses, promoting equity in the field of human abilities inevitably involves paying particular attention to very young children.
Population growth	Annual exponential change in the population actually present for a given period in a given country (WDI (2007)).	*popgrowth* (+)	The Sarkar (2005) model underlines the role played by population growth in the persistence of inequalities.
Infantile mortality	Probability of a child dying before the age of 5 for 1000 children (WDI (2007)).	*mortalityyoung* (+)	According to Deaton (2003) and Lynch et al.'s (2004) studies, the literature comes to the conclusion that there is a strong correlation between inequality and mortality.

Table 2
Results of the OLS, within and GMM analyses over a period of 5 years.

Explanatories variables	REG (5 years)	REG (5 years)	Within (5 years)	Within (5 years)	GMM SYS (5 years)	GMM SYS (5 years)	GMM SYS (5 years)	GMM SYS (5 years)
					$t-2$	$t-2$	$t-3$	$t-3$
$ehii_{t-1}$	.791	.798	.390	.299	.599	.479	.602	.515
	(18.59)	(20.17)	(5.05)	(5.05)	(12.60)	(10.02)	(12.64)	(10.79)
pr_{t-1}	−0.045	−0.141	−0.080	−0.096	−0.098	−0.044	−0.101	−0.069
	(−0.38)	(−1.36)	(−0.51)	(−0.71)	(−0.79)	(−0.66)	(−0.419)	(−0.57)
$domcred_{t-1}$	−0.007	−0.009	−0.025	−0.009	−0.019	−0.025	−0.019	−0.024
	(−0.92)	(−0.14)	(−2.15)	(−1.07)	(−2.21)	(−2.68)	(−2.15)	(−2.64)
$gender_{t-1}$	020		.013		.020		.020	
	(1.10)		(0.39)		(1.19)		(1.20)	
$literacyyoung_{t-1}$		−0.007		−0.130		−0.018		−0.019
		(−0.71)		(−1.21)		(−1.72)		(−1.78)
$mortalityyoung_{t-1}$	.012		.047		.029		.029	
	(1.39)		(3.04)		(3.21)		(3.22)	
$popgrowth_{t-1}$	.269	.198	−0.105	−0.579	.283	.365	.275	.325
	(1.25)	(1.04)	(−0.24)	(−1.12)	(1.26)	(1.72)	(1.22)	(1.47)
Region		1.43				1.70		2.32
		(2.28)				(2.43)		(1.47)
Cons	7.07	8.91	30.87	24.15	13.32	22.64	13.12	21.32
	(2.45)	(4.33)	(5.67)	(7.49)	(4.14)	(9.27)	(4.06)	(8.74)
	R-squ = 0.73; Adj. *R*-squ = 0.72	*R*-squ = 0.69; Adj. *R*-squ = 0.68	Within = 0.38	Within = 0.31	Sargan = 0.131 AR(2) = 0.843	Sargan = 0.147 AR(2) = 0.553	Sargan = 0.106 AR(2) = 0.891	Sargan = 0.035 AR(2) = 0.567

We concentrate in particular on the results provided by the GMM estimation.9 The use of this model is validated because the coefficient of this GMM estimated variable is higher than that of the within estimator and lower than that of the OLS estimator.