The Use of Accounting Information to Estimate Indicators of Customer and Supplier Payment Periods

BanqueNationaleBank
DE BELGIQUE   VAN BELGIË
Eurosystem

Pierrette Heuse
David Vivet

DEUTSCHE BUNDESBANK
EUROSYSTEM

Dominik Elgg
Timm Körting

BANCO DE ESPAÑA
Eurosistema

Luis Ángel Maza
Antonio Lorente

BANQUE DE FRANCE
EUROSYSTÈME

Adrien Boileau
François Servant

BANCA D'ITALIA
EUROSISTEMA

Valentina Nigro

Centrale dei Bilanci
Cerved Group

Rosella Momo

NBP   Narodowy Bank Polski

Ewa Sokolowska

BANCO DE PORTUGAL
EUROSISTEMA

Carla Ferreira
Rita Poiares

TÜRKİYE CUMHURİYET
MERKEZ BANKASI

Merve Artman
Erdem Baser

Financial Statement Analysis Working Group

OUTLINE

1. **Introduction and motivation**

2. **Data sources and methodology**

3. **Empirical results**

4. **Conclusions**

Financial Statement Analysis Working Group

OUTLINE

1. Introduction and motivation

2. Data sources and methodology

3. Empirical results

4. Conclusions

Financial Statement Analysis Working Group

1. Introduction and motivation (I)

- **Trade credits play a major role in the financing of European companies;** on average the outstanding amount of this type of financing **is close to 30 % of GDP**

Trade credits in Euro area

As percentage of GDP
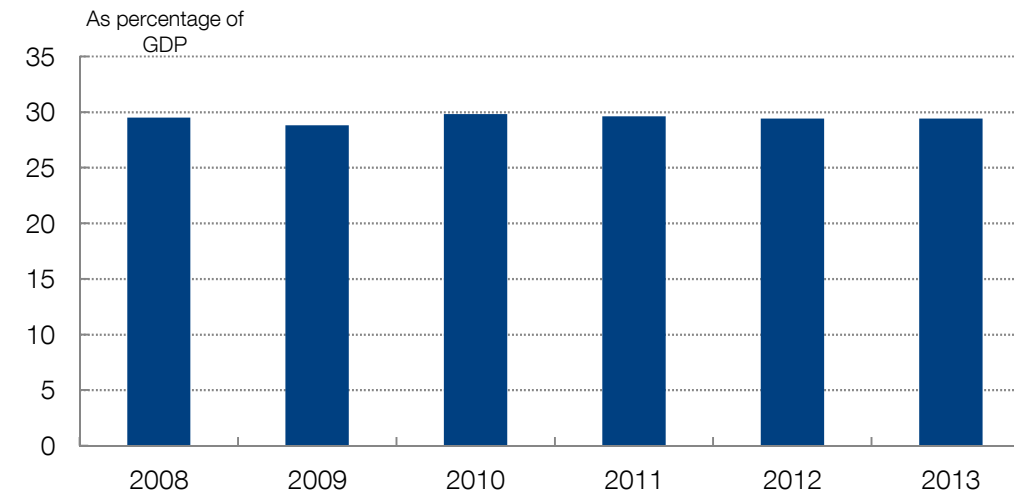
Source: Eurostat (Financial accounts of the Euro area).

However, **trade credits** often played only a **secondary role in financial statement analysis and the statistical information system** in the past

This study aims to offer an insight into the importance of **trade credits** in the **member countries of the ECCBSO Financial Statements Analysis Working Group**, i.e. Belgium, Germany, Spain, France, Italy, Poland, Portugal and Turkey

Financial Statement Analysis Working Group

1. Introduction and motivation (II)

• Cash-flow disruptions induced by late payments are often signalled as a cause of bankruptcy, and the problem has become even more acute since the 2008-2009 financial crisis as financing conditions have been tightened

• "EU Late Payment Directive 2011/7/EU (adopted on 16 February 2011) to improve financing conditions".

• Ex-post evaluation of the European Directive on late payments (2011): "There is little evidence that the Directive has had an impact on payment behaviour and on the practice of late payment"

❑ *Only some improvement has been observed in trade credit figures and some countries actually experienced an increase in payment delays*

❑ *Furthermore, exercise of the rights conferred by the Directive is not widespread due to fear of damaging good business relationships*

❑ *Rather than legislation, business culture, economic conditions and power imbalances in the market are the driving factors behind payment behaviour*

1. Introduction and motivation (III)

- In order to analyse trade credits based on financial statements data, the **ratios Days Sales Outstanding (DSO) and Days Payable Outstanding (DPO)** are used

- **Average** ratios are calculated, but the study aims also to inform on the **full distribution of values** in the national samples (medians, percentiles, KDE distributions)

- The study points out the **differences** in DSO and DPO **distributions:**
  - ❑ *between countries*
  - ❑ *between sectors and size-classes*
  - ❑ *over time (trends in the aftermath of the 2008-2009 financial crisis)*

- It also focuses on other aspects, such as correlations, synthetic indicators and the link between DSO, DPO and financial distress

Financial Statement Analysis Working Group

OUTLINE

Financial Statement Analysis Working Group

2. Data Sources and Methodology (I)

- **Population**:
  - ❑ *The study makes use of the large datasets from each national CBSO*
  - ❑ *Almost 100% of companies included in the samples of this study have a legal form of **corporation or cooperative***
  - ❑ *Sole proprietorships are not included*

- **Time horizon**:
  - ❑ *From 2000 to 2013*

- **Type of financial statements**:
  - ❑ *Individual financial statements*
  - ❑ *Mostly national generally accepted accounting principles (GAAP). In some countries (such as PT and ES), the latest GAAP are very close to IFRS in recent years*

- **Sectoral coverage**:
  - ❑ *Manufacturing*
  - ❑ *Construction*
  - ❑ *Trade*

Financial Statement Analysis Working Group

2. Data Sources and Methodology (II)

- **Size classes**:

  ❑ *This report follows the EU Commission Recommendation concerning the definition of **micro, small, medium-sized and large enterprises**, by using **the turnover criterion***

  ❑ *The **thresholds** used for defining micro, small, medium-sized and large corporations are €2 million, €10 million and €50 million of turnover, respectively…*
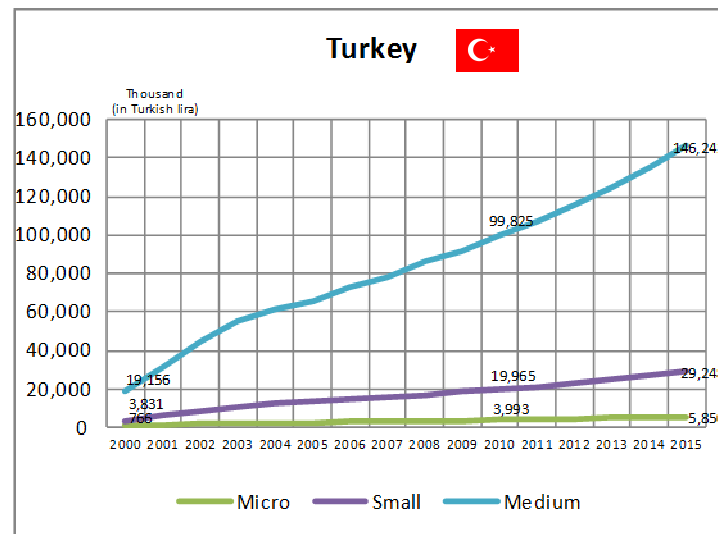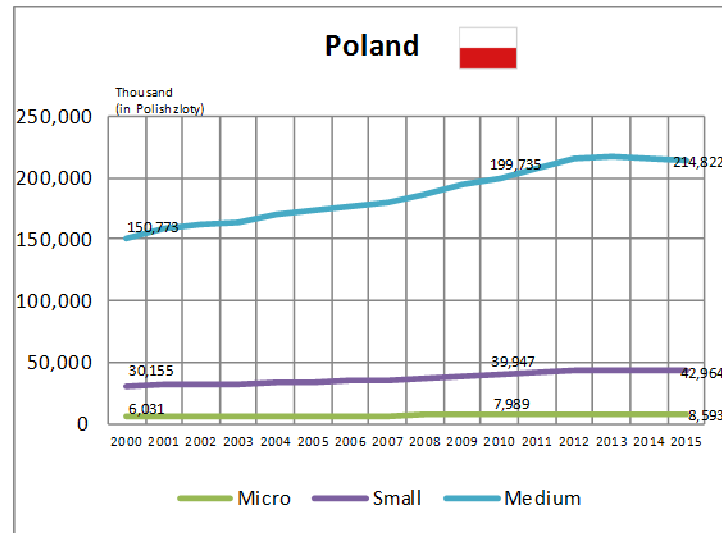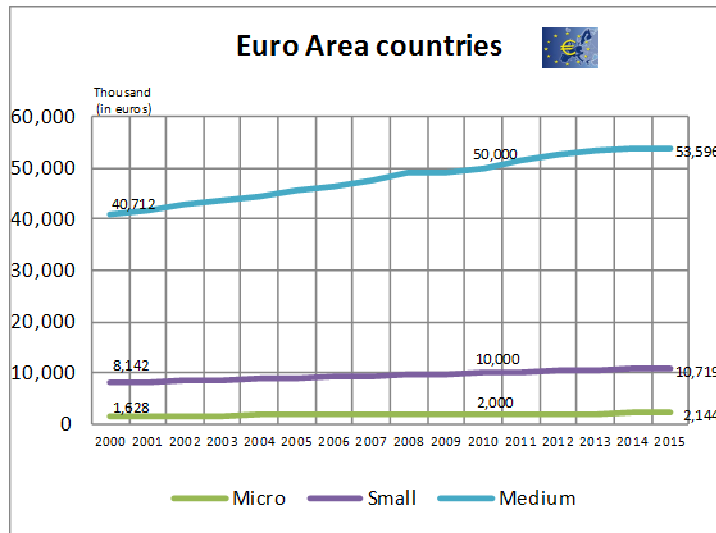
  ❑ *…deflated using the **Harmonised Index of Consumer Prices (HICP) of the Euro area**. Year 2010 was selected as the base year for calculations*

  ❑ ***For Poland and Turkey**, the threshold values were converted into the national currencies by using each country's real effective exchange rate versus the euro area-18 trading partners (REER)*

  ❑ ***Micro-corporations** (i.e. firms with turnover < €2 million) have been excluded from the analysis, because these firms (i) are not directly comparable across countries, due to different data collection methods; and (ii) suffer from outliers and volatility in the ratios*

2. Data Sources and Methodology (III)

- Deflated cut-off points for turnover and exchange rates

Euro Area countries

Thousand (in euros)

40,712	50,000	53,596
8,142	10,000	10,719
1,628	2,000	2,144

Micro — Small — Medium

Poland

Thousand (in Polishzloty)

150,773	199,735	214,822
30,155	39,947	42,964
6,031	7,989	8,593

Micro — Small — Medium

Turkey

Thousand (in Turkish lira)

19,156	99,825	146,242
3,831	19,965	29,248
766	3,993	5,850

Micro — Small — Medium

FSA Working Group
eccbso
European Committee of Central Balance Sheet Data Offices

2. Data Sources and Methodology (IV)

- **Two classical ratios** offer an indication of the liquidity of trade debts and receivables

- FSA WG decided on a **net approach** (net amount of money exchanged with the clients/suppliers of the companies by **prepayments**)

Days Sales Outstanding (DSO) is the average number of days the customer trade receivable is "on the books"

Numerator	360 x (Trade receivables – customer prepayments)
Denominator	Net turnover

Interpretation:
The lower DSO,
the sooner the firm tends to be paid by its customers

Days Payable Outstanding (DPO) is the average number of days a company takes before paying its suppliers

Numerator	360 x (Trade payables – Advances to suppliers)
Denumerator	Purchases

Interpretation:
The lower the DPO,
the faster a company pays its trade credit

2. Data Sources and Methodology (V)

❑ **Rejection of outliers**:

Exclusion of extreme microdata ("outliers") with **Box-Plot method**, **for each sector/size/year combination**

Method based on the interquartile range (Q3-Q1), with a multiplier k (k=6 is used in order to exclude only very extreme outliers):

Algebraically:

Graphically:

$$[Q_1 - k(Q_3 - Q_1), Q_3 + k(Q_3 - Q_1)]$$

Outliers

$$k(Q_3 - Q_1)$$
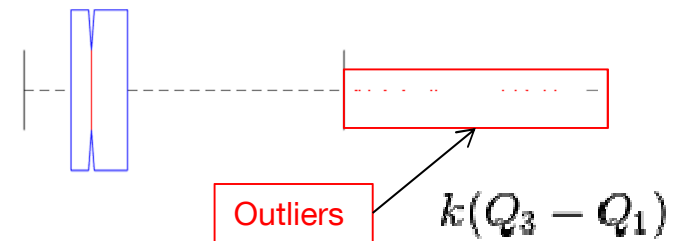
❑ NB: There is a variety of possible treatments for outliers (eg. use of standard deviation instead of interquartile range, 1%-99% cut-offs, winsorisation, etc.)

Financial Statement Analysis Working Group

2. Data Sources and Methodology (VI)

- This chosen approach in DSO and DPO definitions, traditional in financial statement analysis, may result in **some bias** due to the inconsistency between the numerator and the denominator **in relation to indirect taxes**
- While **turnover and purchases do not include indirect taxes**, the balance sheet **trade credit items** (receivables and payables accounts) **do include them**
- =>What is the **impact of VAT on DSO and DPO** in the context of an **international and an over-time comparison?**

STANDARD VAT RATES APPLIED BY COUNTRIES

● 2007   ◆ 2013
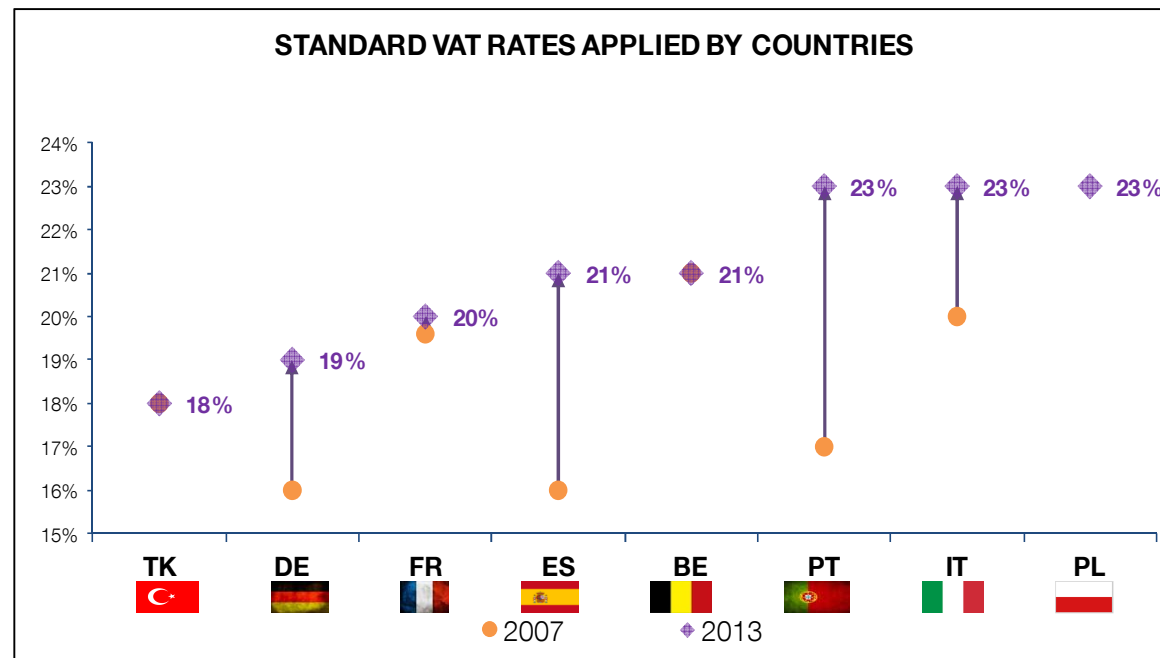
2. Data Sources and methodology (VII)

❑ The information on indirect taxes for **Portugal and Spain is used to measure the magnitude of the bias** in DSO and DPO measurement**:**

    ❑ The VAT correction to the median of the DSO indicator for **Portugal was 8 days**, while it was slightly lower in Spain **(7 days)**

    ❑ With regard to the median DPO, the VAT corrections reduced the payment periods by **7 days in Portugal** and by **5 in Spain**

VAT adjustment in DSO and DPO
(Percentile 50, average 2008-2013)

	Days Sales Outstanding (DSO)		Days Payables Outstanding (DPO)	
	All companies	Large companies	All companies	Large companies
Portugal	-7.9	-5.5	-7.2	-4.2
Spain	-7.1	-5.2	-5.2	-4.5

Portugal Spain
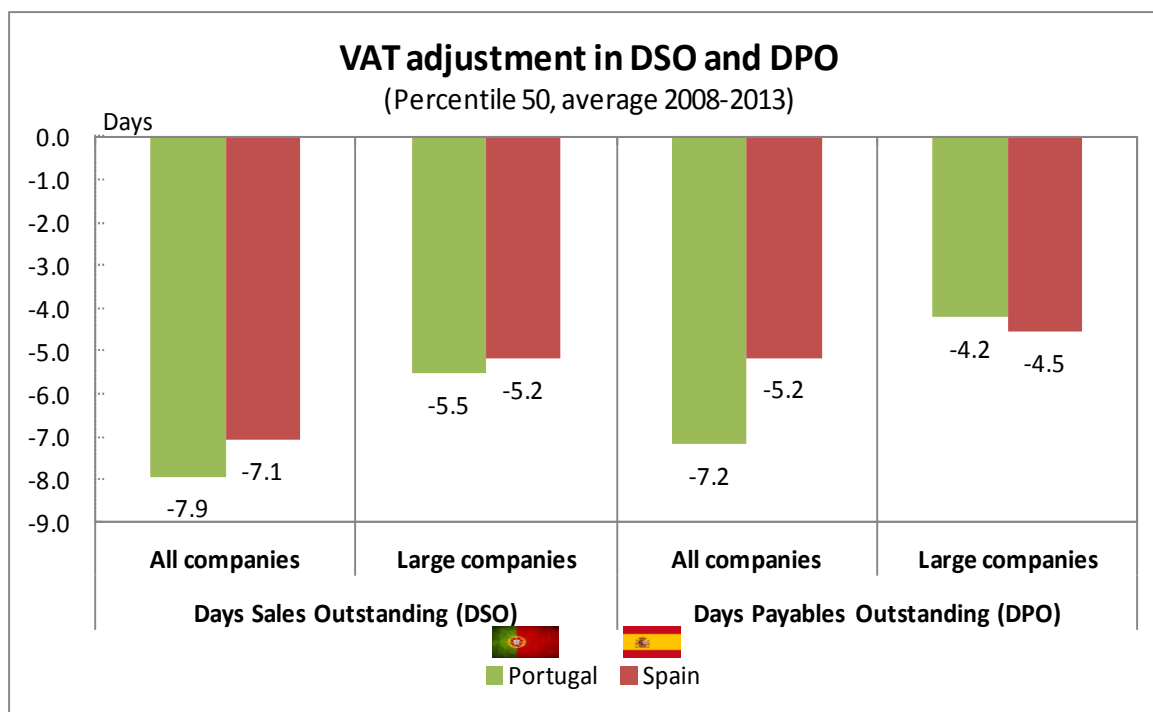
The **problem** of lack of consistency between the numerator and denominator may **not be relevant if the VAT rates hold stable over time**

However, if these modifications in tax rates levels occurred, **some breaks in the evolutions of DSO and DPO would arise**

FSA Working Group
eccbso
European Committee of Central Balance Sheet Data Offices

Financial Statement Analysis Working Group

2. Data Sources and methodology (VIII)

❑ National datasets - breakdown by size

Number of companies, 2013

All sectors, by size

Units	Belgium	Germany	Spain	France	Italy	Poland	Portugal	Turkey
Small	3.308	13.632	17.865	52.144	38.396	7.930	8.088	2.365
Medium-sized	3.862	9.953	3.164	16.125	14.635	3.637	1.887	2.348
Large	1.370	4.659	713	4.555	3.721	1.316	420	966
Total	8.540	28.244	21.742	72.824	56.752	12.883	10.395	5.679
p.m. Micro	1.976	12.886	174.937	64.897	13.665	7.574	123.194	727

% of the total	Belgium	Germany	Spain	France	Italy	Poland	Portugal	Turkey
Small	38,7	48,3	82,2	71,6	67,7	61,6	77,8	41,6
Medium-sized	45,2	35,2	14,6	22,1	25,8	28,2	18,2	41,3
Large	16,0	16,5	3,3	6,3	6,6	10,2	4,0	17,0
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Financial Statement Analysis Working Group

OUTLINE

1. **Introduction**

2. **Data sources and methodology**

3. **Empirical results**

4. **Conclusions**

Weighted means, DSO

❑ There are **considerable differences** in DSO figures **from one country to another** relating, inter alia, to:
  ❑ payment culture
  ❑ legal environment
  ❑ corporation structure
  ❑ trade policy
  ❑ bargaining power, etc.
❑ The larger the firm, the lower the DSO

DSO (weighted means, 2013)

Legend: ■ Small ■ Medium-sized ■ Large ● Total
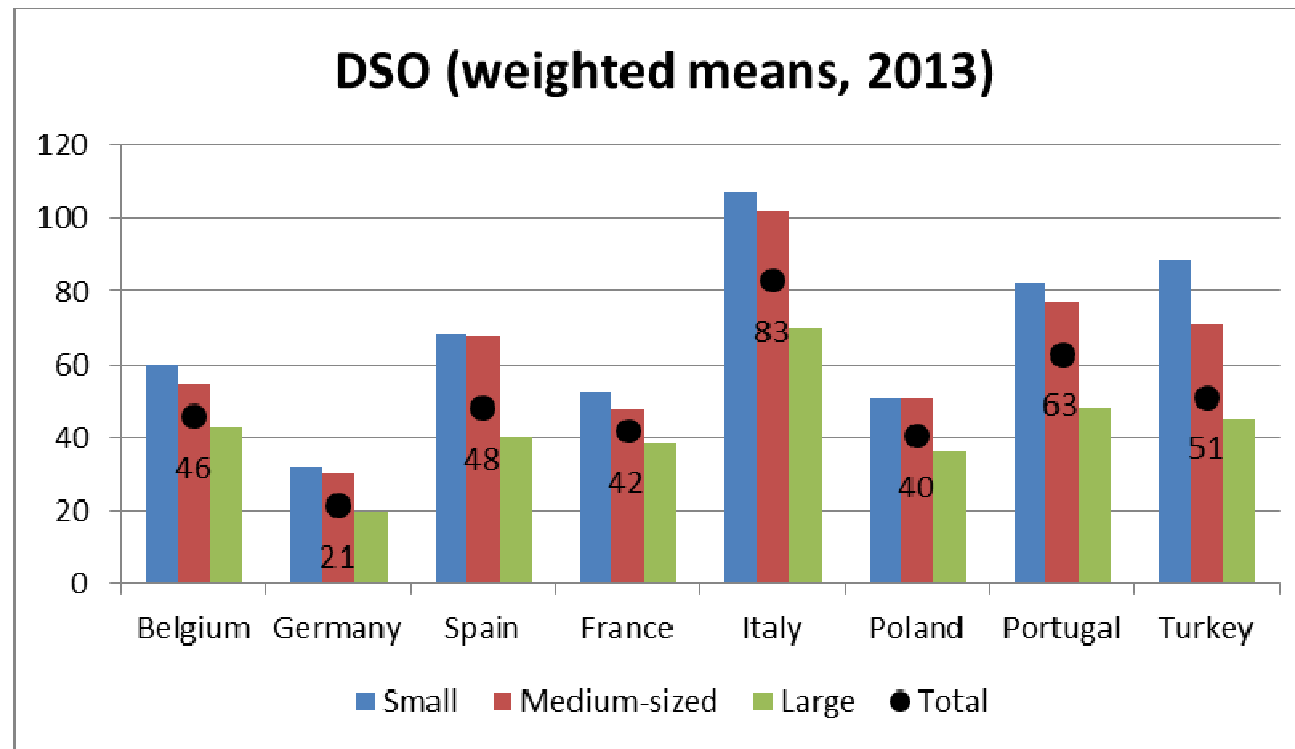
Weighted means, DPO

DPO (weighted means, 2013)
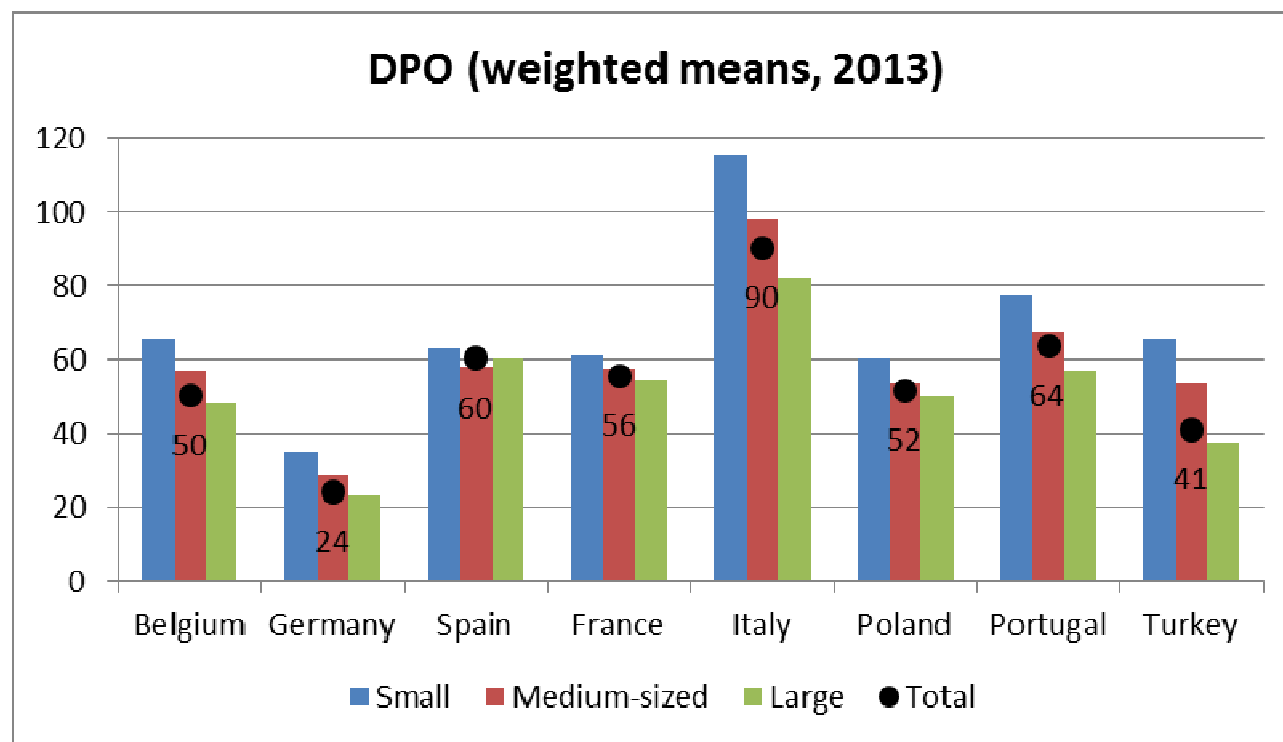
Weighted means. Trade credit periods balance

Trade credit periods balance (weighted means, 2013)
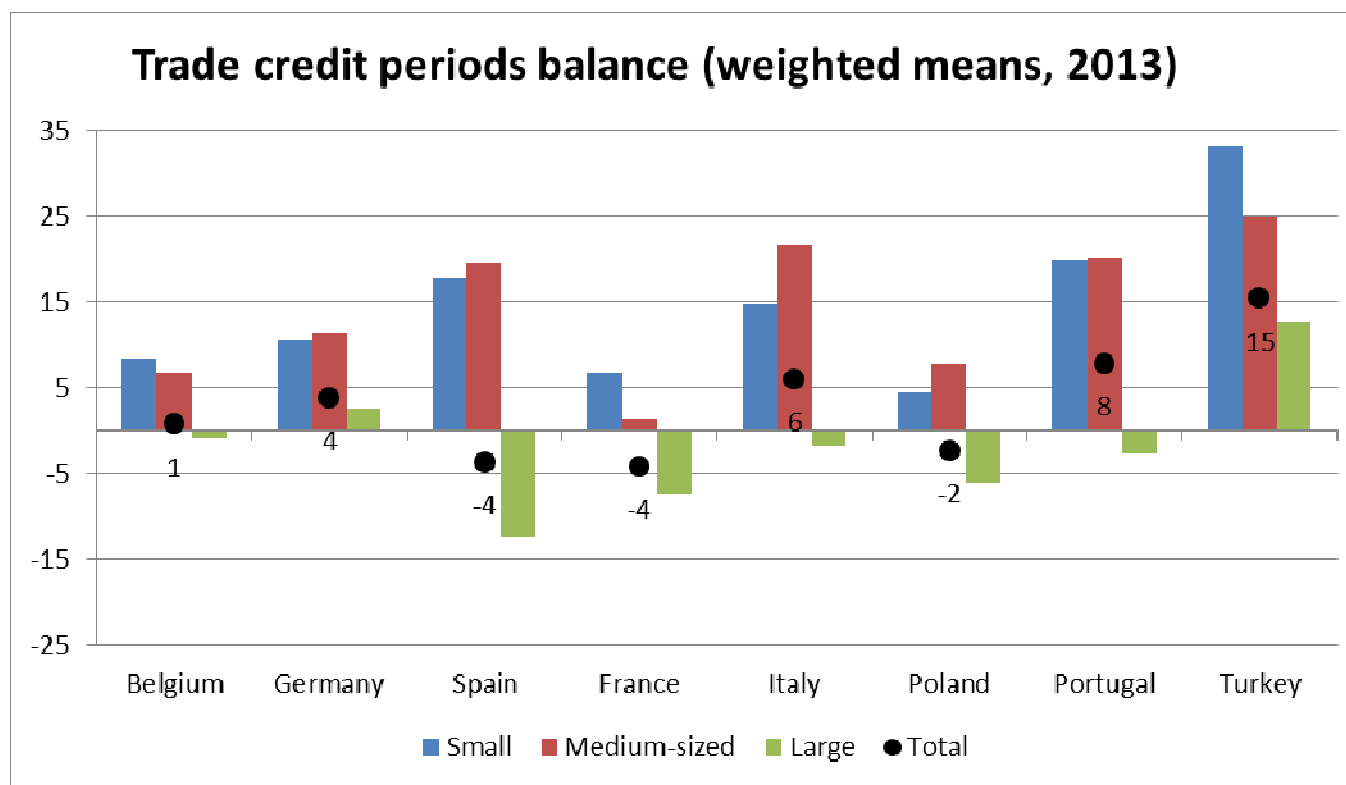
Weighted means, DSO and breakdown by sector

DSO in manufacturing (weighted means), 2013
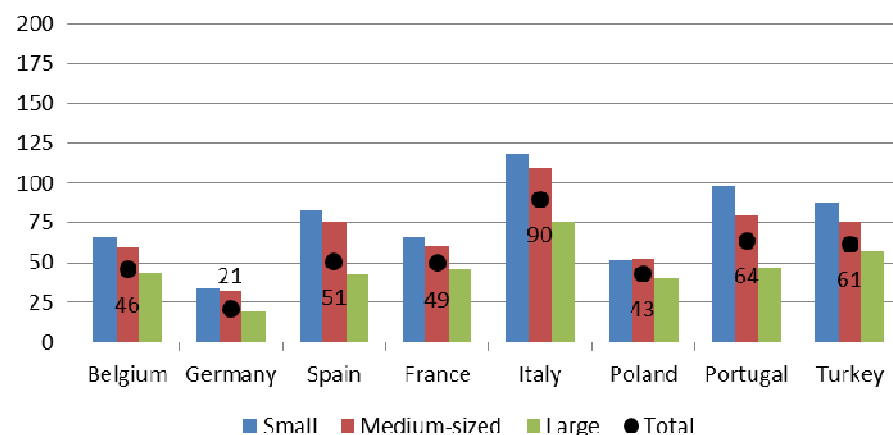
DSO in construction (weighted means, 2013)
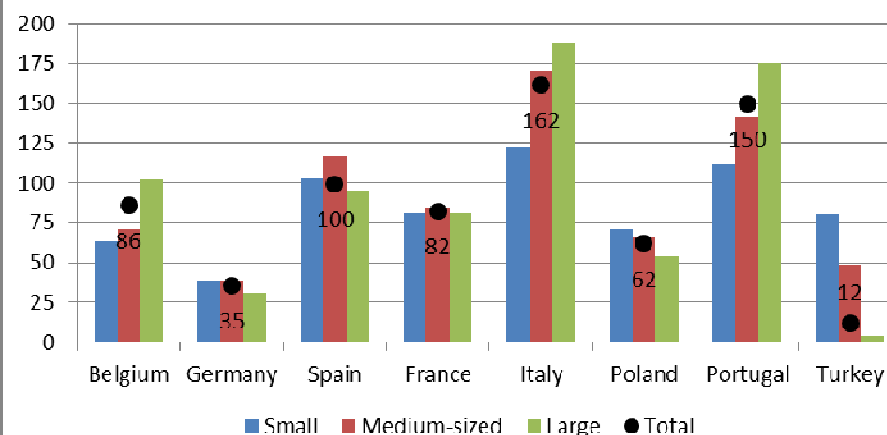
DSO in trade (weighted means, 2013)
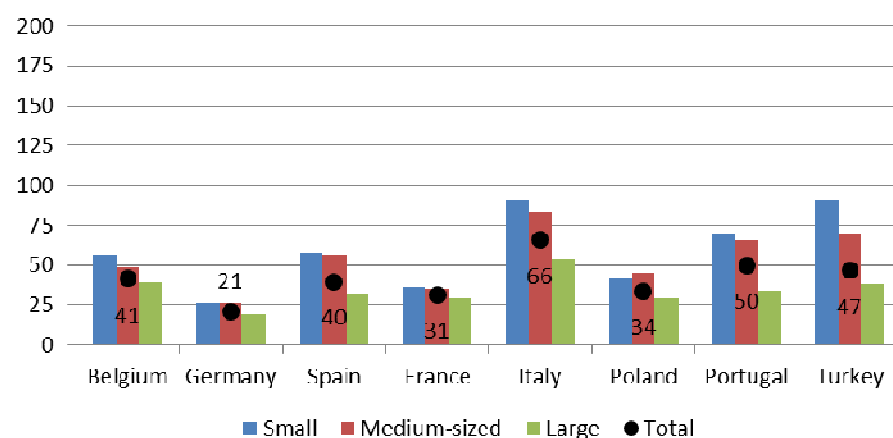
DSO in retail trade (weighted means, 2013)
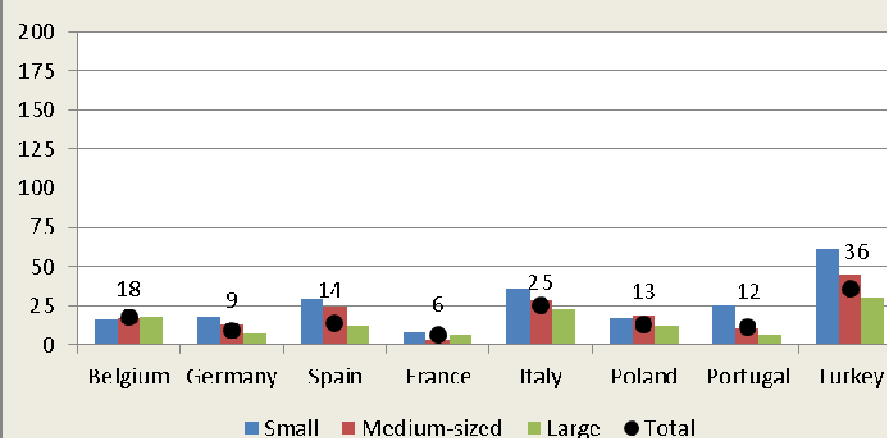
Weighted means, DPO and breakdown by sector

DPO in manufacturing (weighted means, 2013)
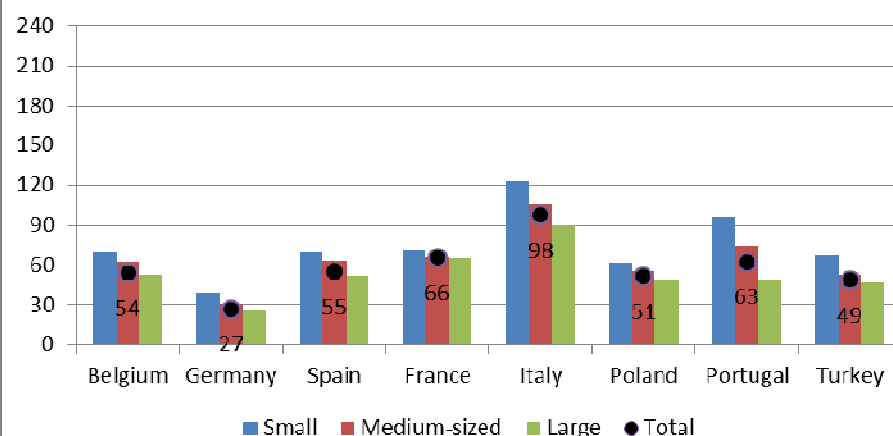
DPO in construction (weighted means, 2013)
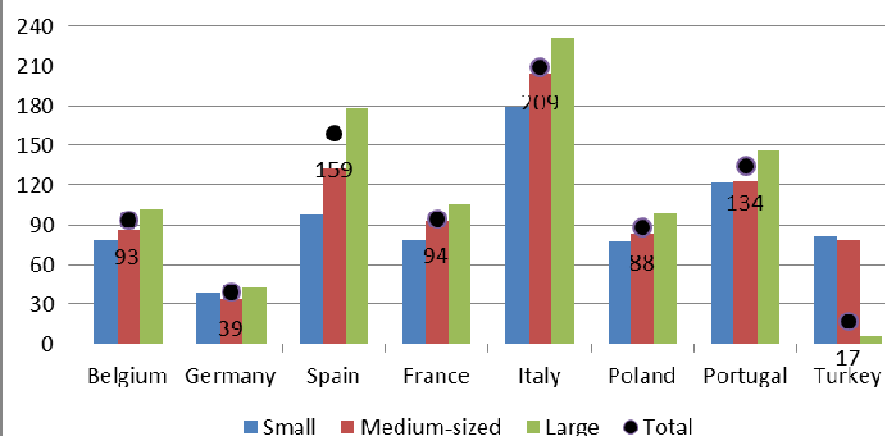
DPO in trade (weighted means, 2013)
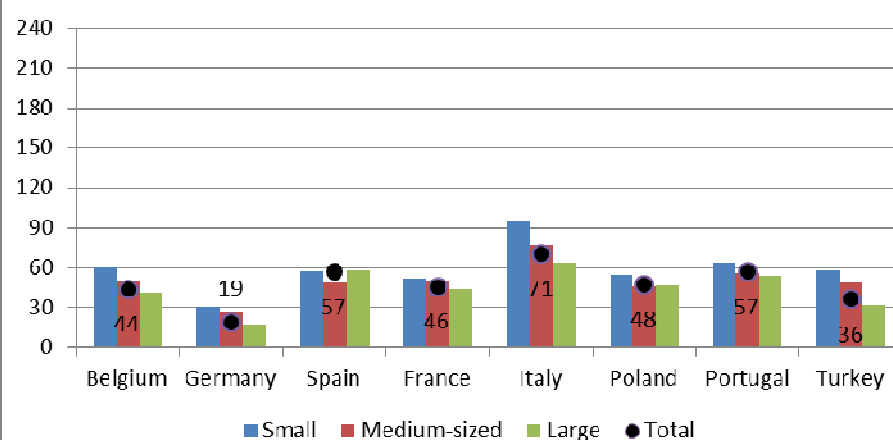
DPO in retail trade (weighted means, 2013)
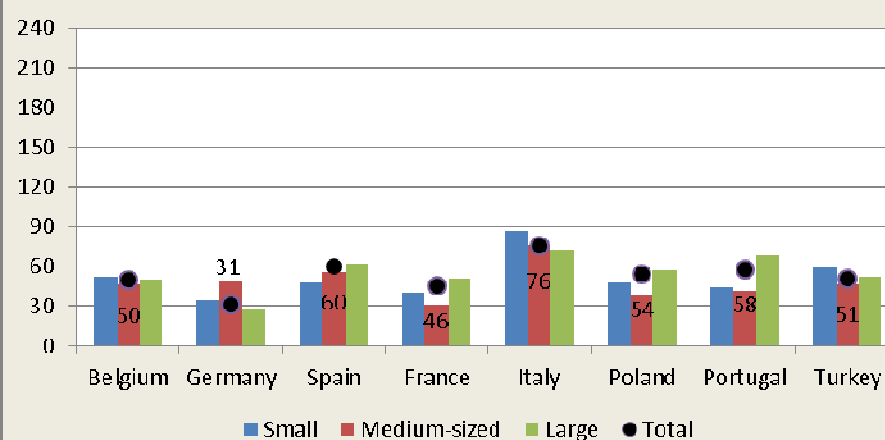
Kolmogorov-Smirnov test

As a **complement** to the analysis of the differences between countries based on weighted means, the distance of the DSO and DPO estimated distribution function of each national sample versus the other countries has been worked out using the calculations of the **Kolmogorov-Smirnov statistics** (KS)

The KS statistics of all countries calculated against the German samples show a **positive correlation between this measure of divergence and weighted means**
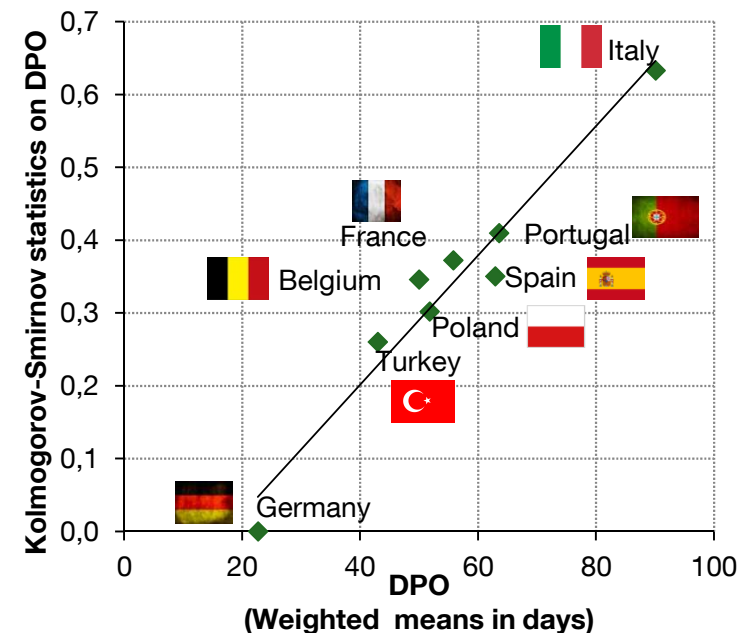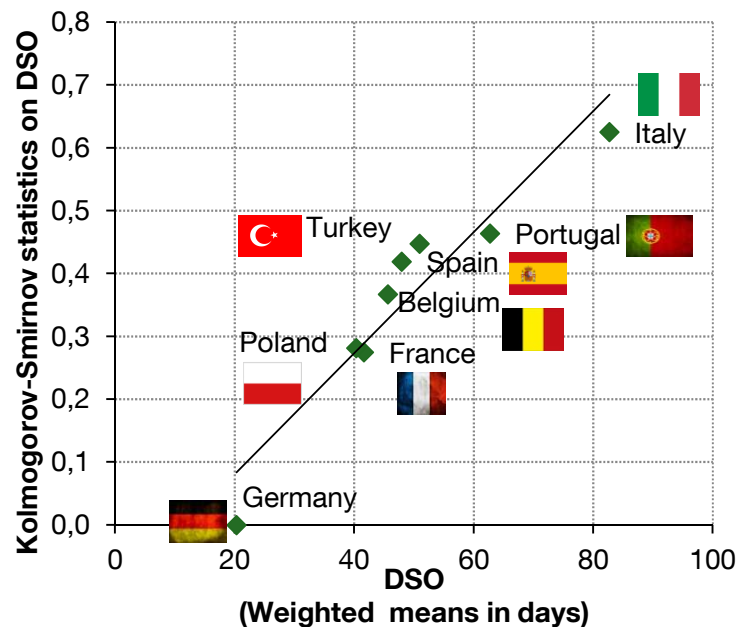
These results **would suggest the robustness of the weighted means for identifying the aggregated behaviour of firms by country and to determine their relative position**

Financial Statement Analysis Working Group

Correlations at country level

For both weighted means and median values, DSO and DPO are **positively and closely linked** (>0.90): the higher the DSO, the higher the DPO, and viceversa
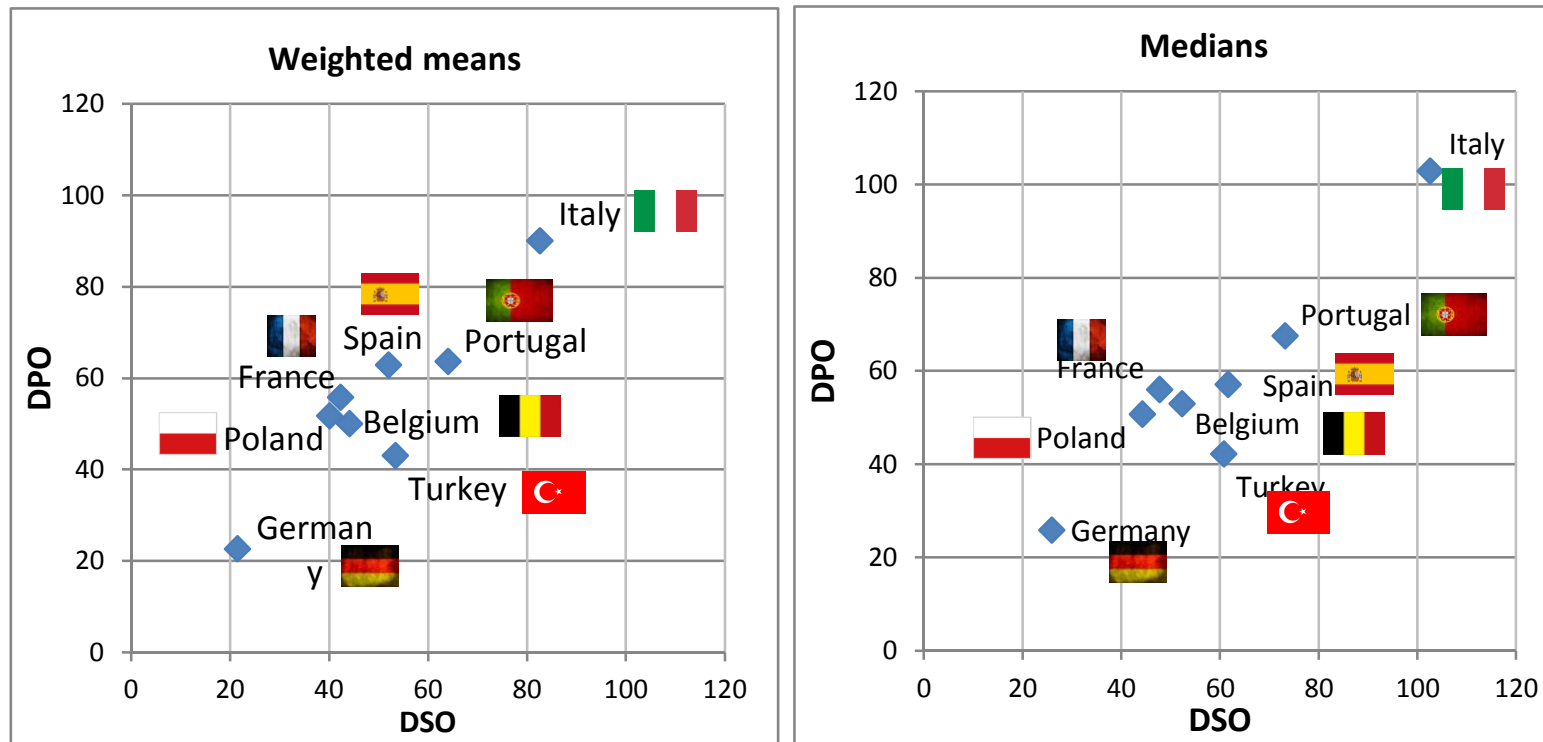
Correlations at firm level

Correlation coefficients remain positive but are markedly lower (between 0.20 and 0.40 in most cases)

Correlation Coefficients DSO vs DPO in 2012									
Sector	Size	Belgium[1]	France[1]	Germany	Italy	Poland	Portugal	Spain	Turkey
1 Manufacturing	1 Micro	0,28	0,30	0,23	0,33	0,30	0,32	0,83	0.07[Δ]
1 Manufacturing	2 Small	0,31	0,33	0,19	0,31	0,30	0,29	0,28	0,15
1 Manufacturing	3 Medium	0,27	0,34	0,14	0,32	0,34	0,29	0,15	0,15
1 Manufacturing	4 Large	0,35	0,26	0,07	0,33	0,24	0,26	0,15	0,20
1 Manufacturing	Total w/o Micro	0,30	0,33	0,16	0,33	0,30	0,31	0,21	0,17
2 Construction	1 Micro	0,14	0,40	0,26	0,26	0,41	0,30	0,00[Δ]	-0.12[Δ]
2 Construction	2 Small	0,26	0,39	0,27	0,42	0,39	0,30	0,10	0,20
2 Construction	3 Medium	0,33	0,37	0,22	0,41	0,35	0,53	0,66	0.12[Δ]
2 Construction	4 Large	0,27	0,31	0,11[Δ]	0,42	0,56	0,69	-0,08[Δ]	0.13[Δ]
2 Construction	Total w/o Micro	0,30	0,38	0,25	0,43	0,38	0,34	0,12	0,18
3 Trade	1 Micro	0,14	0,37	0,28	0,25	0,24	0,25	0,01	0.06[Δ]
3 Trade	2 Small	0,36	0,45	0,29	0,45	0,34	0,45	0,38	0,20
3 Trade	3 Medium	0,37	0,48	0,10	0,40	0,40	0,43	0,50	0,36
3 Trade	4 Large	0,42	0,39	0,04	0,31	0,41	0,20	0,88	0,21
3 Trade	Total w/o Micro	0,37	0,45	0,20	0,43	0,35	0,45	0,44	0,27

(1) Correlation coefficients relate to year 2013.
(Δ) Correlation coefficients are not significantly different from 0 at the 95% threshold.

Synthetic indicators – FSA weighted averages

With the aim of summarising the national information in **synthetic indicators**, FSA aggregates **for DSO and DPO** have been constructed as **averages of the eight countries of the FSA WG**, weighted by **the value added of each economy's non-financial corporations** (constant weights)


FSA synthetic indicators: weighted averages
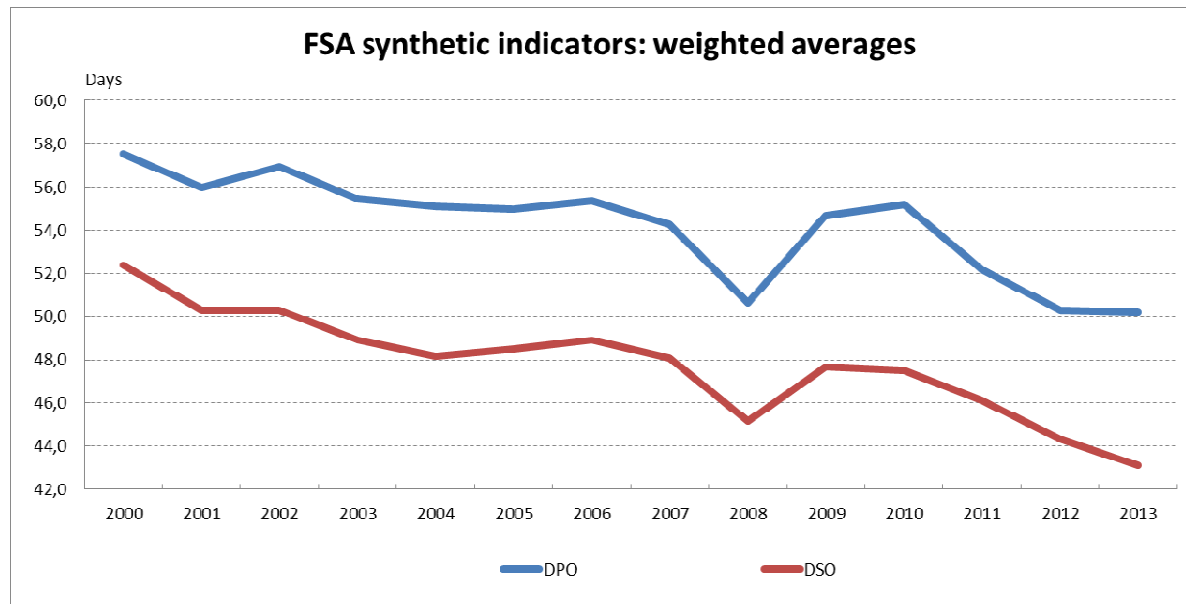
The DSO and DPO synthetic indicators show a clearly **downward trend** between 2000 and 2013 (with a break in 2008-2009 due to the economic downturn), with the lowest levels being reached in the last year. It reflects mainly the reduction of payment periods in a small number of (big) countries

Synthetic indicators - Cross-country variations

To measure the **dispersion** of DSO and DPO of the individual countries around the FSA averages, **coefficients of variation were calculated too**

These weighted cross-country **coefficients of variation** are calculated as the weighted (by the respective value added of non-financial corporations) **standard deviation** of DSO/DPO across countries divided by the FSA synthetic indicator
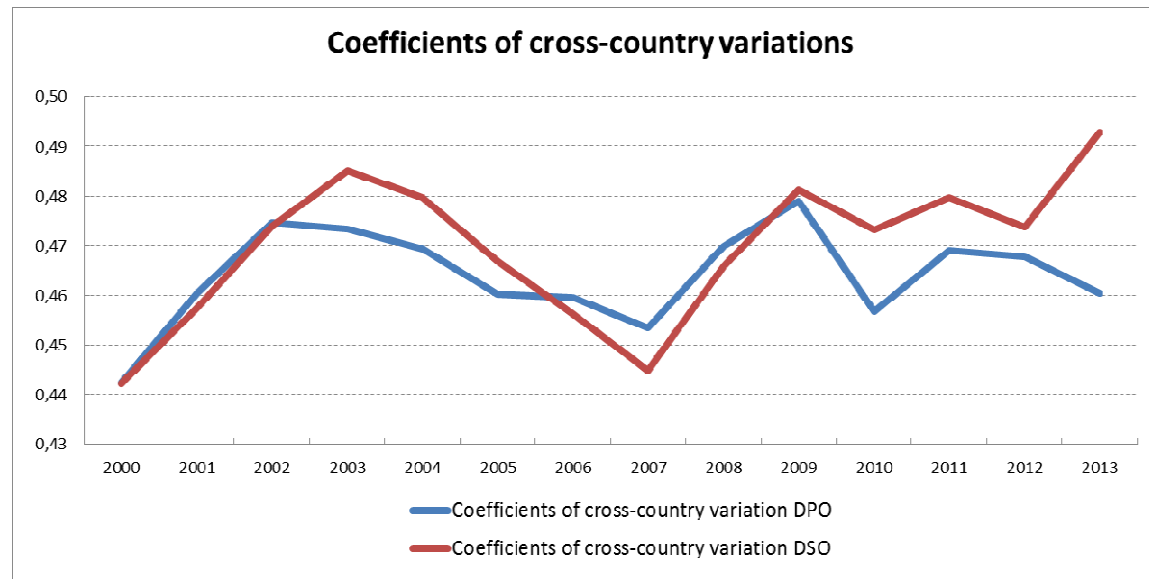
After 2007, a trend has been observed towards an **increase in the heterogeneity in the national behaviour** of customer-collection and supplier-payment periods, **due to probable substantial differences in the macroeconomic consequences of the crisis**

KDE in a nutshell

The **KDE** method allows a distribution function to be estimated that is not dependent on the width of the bins used to construct a histogram. It smooths out the contribution of each observed data point around its local vicinity.
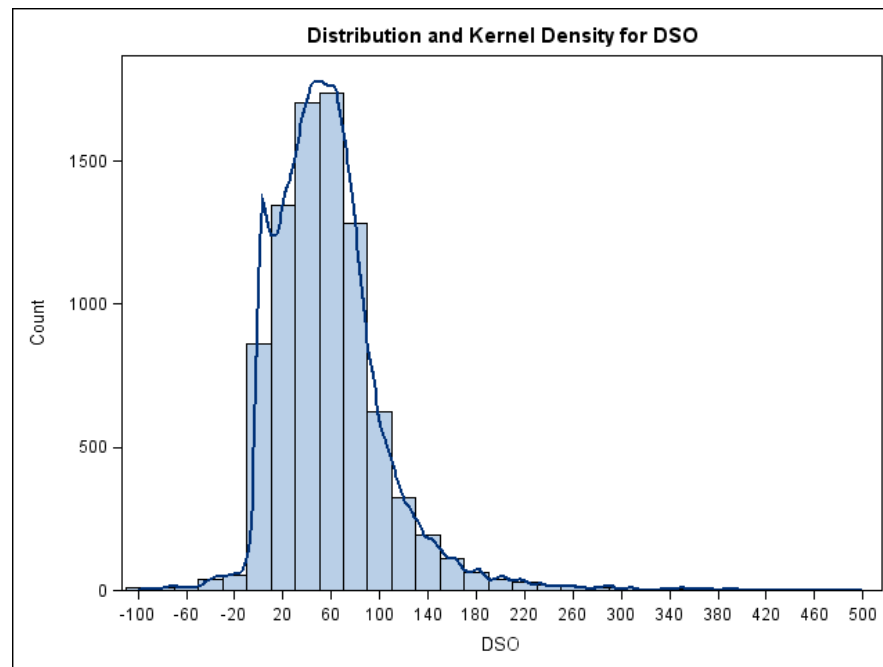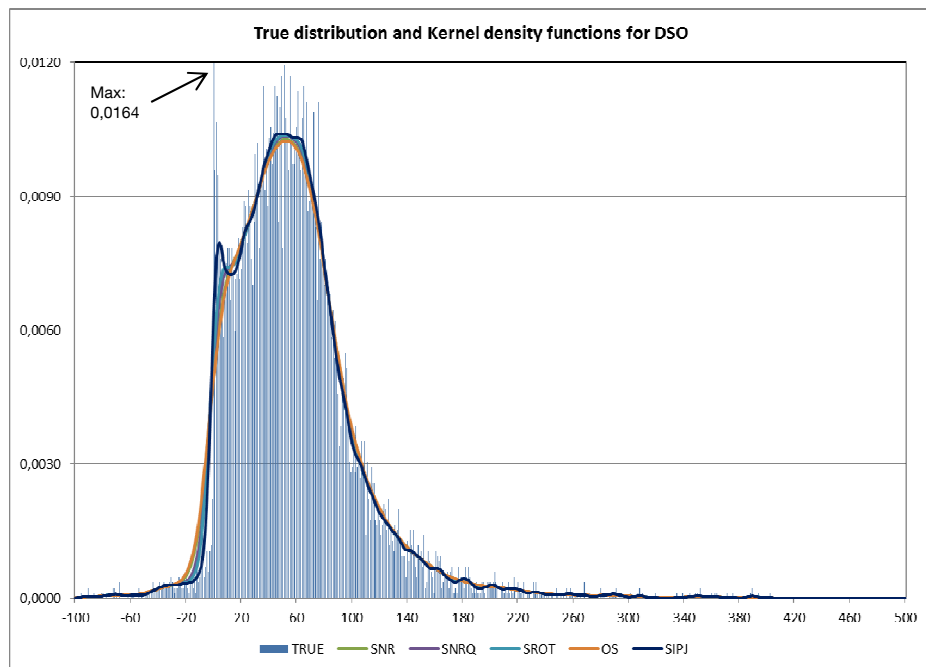
Parameters can be used to adjust the smoothing level of the KDE distribution. In this analysis, we used the default parameters proposed by statistical software in use.

We used the KDE method to compare graphically the distribution functions of different groups of firms (country/sectors/years).

KDE distributions, by country

DSO 2013, All sectors

Legend: Belgium, Germany, Spain, France, Italy, Poland, Portugal, Turkey

Financial Statement Analysis Working Group

KDE distributions, by country

DPO 2013, All sectors

Legend: Belgium, Germany, Spain, France, Italy, Poland, Portugal, Turkey

Cumulated KDE distributions, by country

DSO 2013, All sectors, cumulative

Cumulated KDE distributions, by country

DPO 2013, All sectors, cumulative

Financial Statement Analysis Working Group

KDE distributions, by country and sector

DSO 2013, Manufacturing

DSO 2013, Construction

DSO 2013, Trade

DSO 2013, Retail trade

Financial Statement Analysis Working Group

KDE distributions, by country and sector

DPO 2013, Manufacturing

DPO 2013, Construction

DPO 2013, Trade

DPO 2013, Retail trade

Legend: Belgium, Germany, Spain, France, Italy, Poland, Portugal, Turkey

Financial Statement Analysis Working Group

Extreme values in DSO and DPO ratios: the Turkish case

Outlier Analysis for KDE Estimates: Some factors for the densities beyond -100 and 500, by sector:

CONSTRUCTION

- Contracting companies
- Completion method for accounting
- Interim payment problems
- Lump-sum accounting records for separate projects

MANUFACTURING

- Long-term manufacturing
- International contracts-exchange rate risk
- Sub-group companies-access to finance problem

TRADE

- Long-term energy investments
- Long-term contracts covering machine trade
- Working with dealers
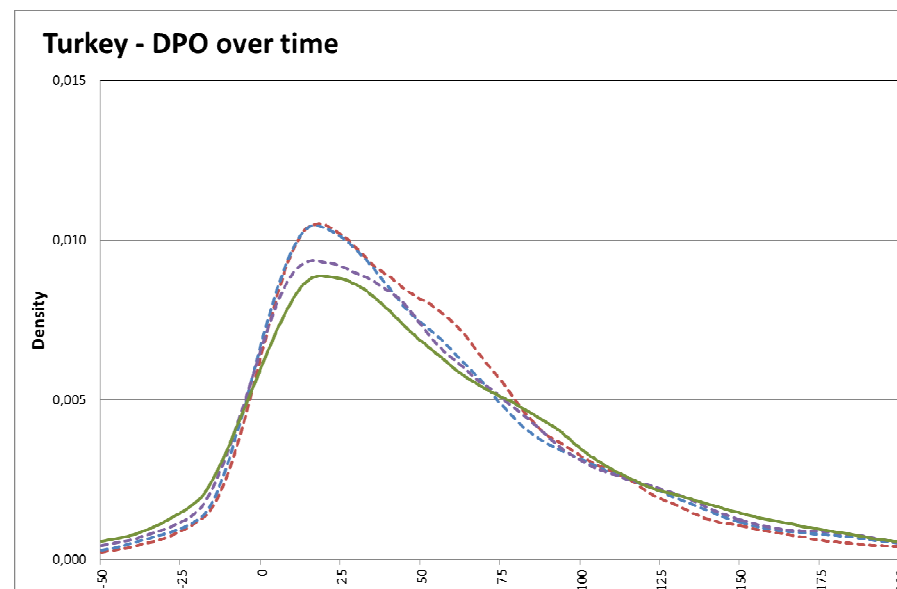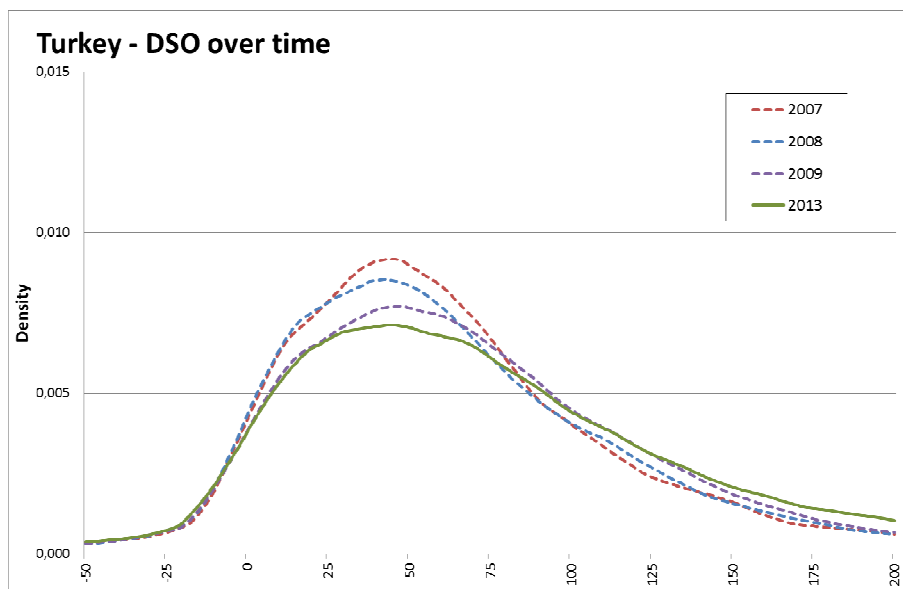
KDE distributions over time: FRANCE

In **France,** DSO and DPO have markedly shortened because of the introduction of the LME (Loi de modernisation de l'économie).
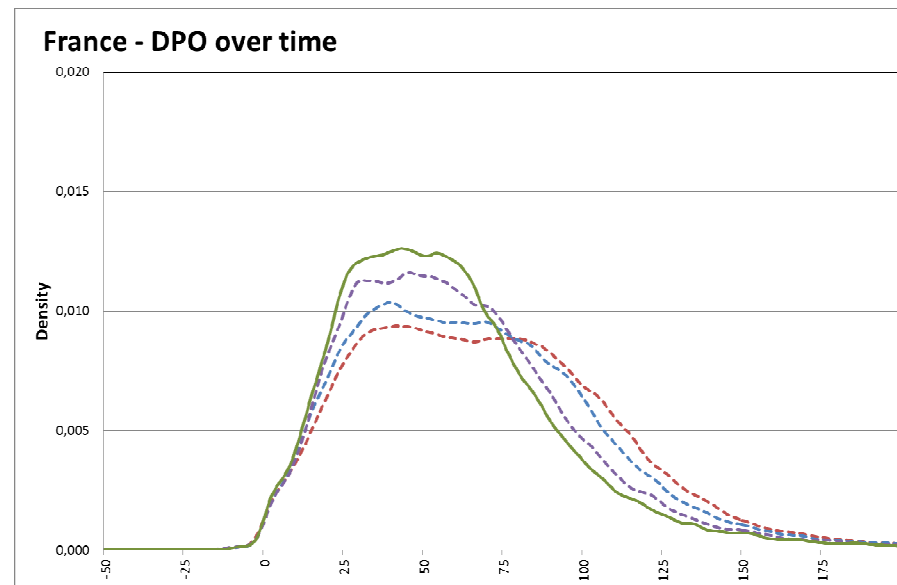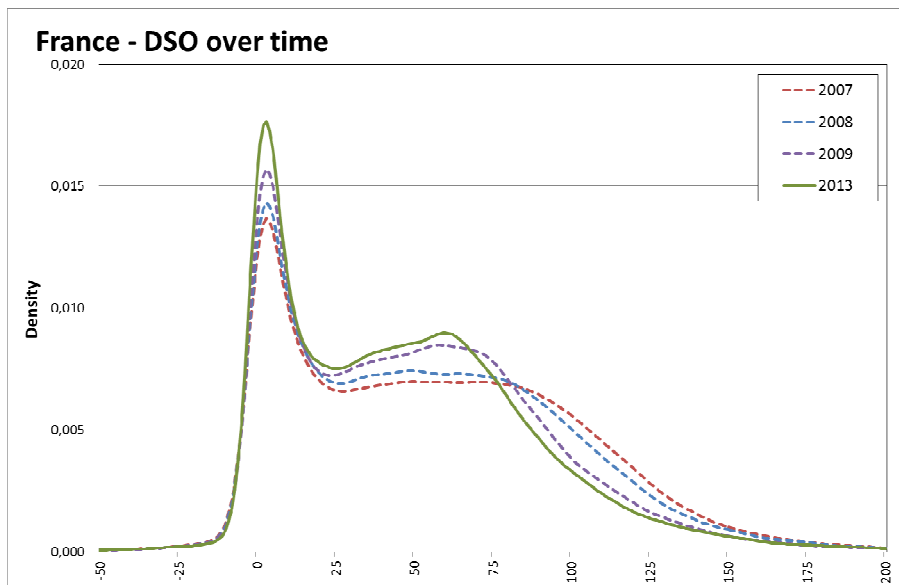
DSO	2007	2013	Δ 2007-2013
P25	20	15	-5
P50	58	48	-10
P75	92	76	-17
DPO	2007	2013	Δ 2007-2013
P25	43	35	-7
P50	71	56	-15
P75	99	79	-21

Financial Statement Analysis Working Group

KDE distributions over time: TURKEY

In **Turkey,** DSO and DPO distributions became flatter. Payment periods grew markedly longer at the right tail of the distribution.

Turkey - DSO over time

Turkey - DPO over time

DSO	2007	2013	Δ 2007-2013
P25	27	30	3
P50	54	65	11
P75	91	113	22
DPO	2007	2013	Δ 2007-2013
P25	17	16	-1
P50	43	45	2
P75	77	89	12

Financial Statement Analysis Working Group

FSA Working Group
eccbso
European Committee of Central
Balance Sheet Data Offices

KDE distributions over time: BELGIUM

In **Belgium,** the differences over time are small. We can only observe a slight change in the KDE distributions to the left, indicating a shortening of the payment periods.
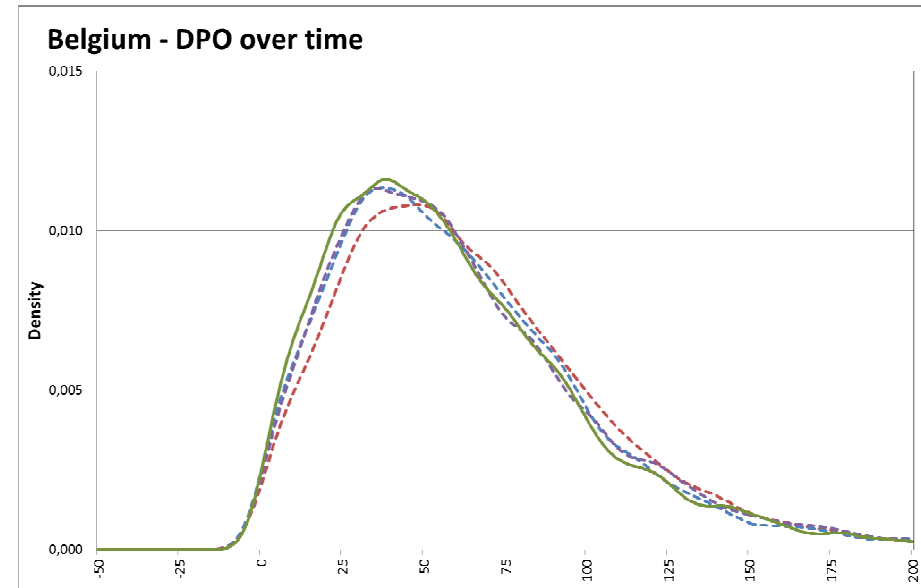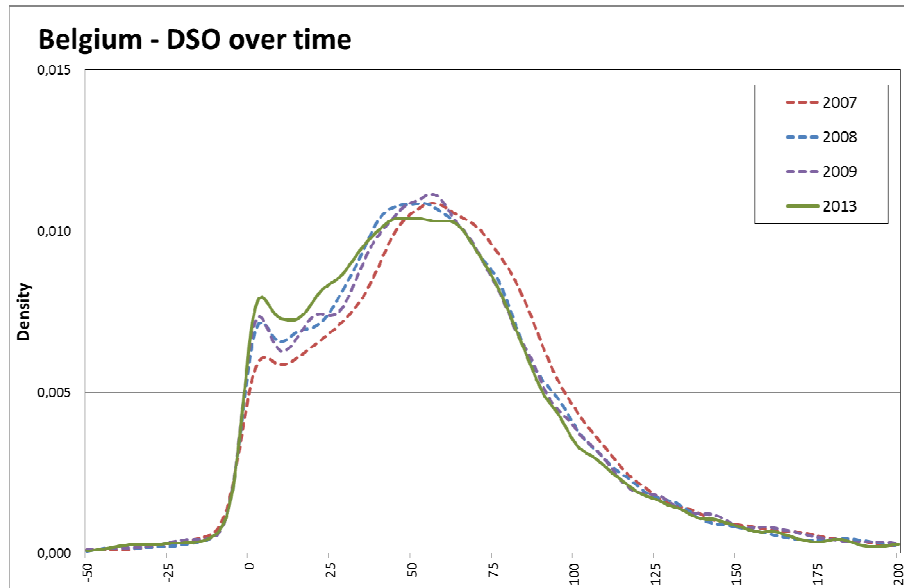
DSO	2007	2013	Δ 2007-2013
P25	33	27	-6
P50	58	52	-6
P75	84	78	-6
DPO	2007	2013	Δ 2007-2013
P25	36	31	-5
P50	59	53	-6
P75	89	82	-7

Financial Statement Analysis Working Group

Differences over time: are they significant?

(ii) **using the chi-square test of homogeneity** in order to determine whether these distributions are similar or different according to the year

Chi-square test: DSO over time

Observed data

Sector:		Total			Country:	FR	
					Size:	Total w/o Micro	

		DSO < 0	0 <= DSO < 30	30 <= DSO < 60	60 <= DSO < 90	90 <= DSO < 120	DSO >= 120	# of companies
FR	2012	2,5	32,9	25,9	23,2	9,6	5,9	74424
FR	2013	2,3	33,4	25,5	23,0	9,8	6,1	72824

Observed frequency

		DSO < 0	0 <= DSO < 30	30 <= DSO < 60	60 <= DSO < 90	90 <= DSO < 120	DSO >= 120	
FR	2012	1842	24471	19293	17284	7110	4424	74424
FR	2013	1673	24298	18551	16750	7127	4425	72824
		3515	48769	37844	34034	14237	8849	147248

Expected frequency

		DSO < 0	0 <= DSO < 30	30 <= DSO < 60	60 <= DSO < 90	90 <= DSO < 120	DSO >= 120	
FR	2012	1777	24649	19128	17202	7196	4473	74424
FR	2013	1738	24120	18716	16832	7041	4376	72824
		3515	48769	37844	34034	14237	8849	

Calculations

2,41	1,29	1,43	0,39	1,02	0,53	Chi statistic
2,46	1,32	1,46	0,40	1,05	0,54	**14,30**

$Chi^2_{0,05}(5)=$ 11,07   p-value   0,01

Null hypothesis: The DSO distributions for Total sector and all sizes (FR) in 2012 and 2013 are similar.

The test compares whether frequency counts are distributed identically across different samples (2012 and 2013).
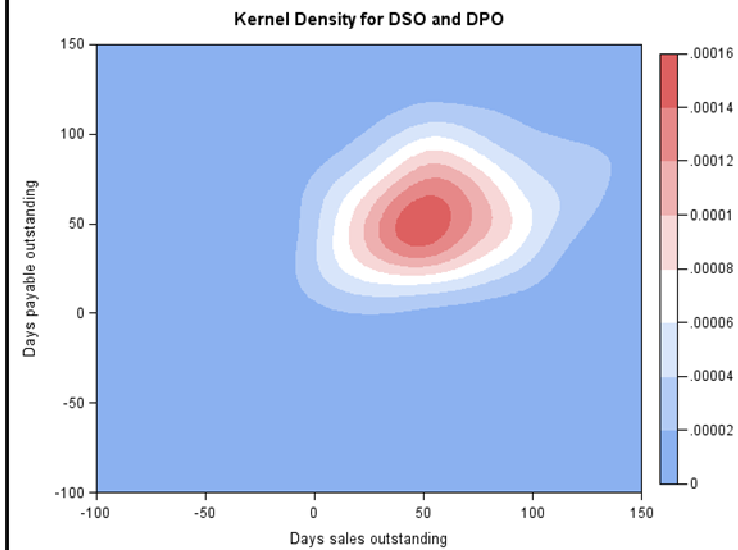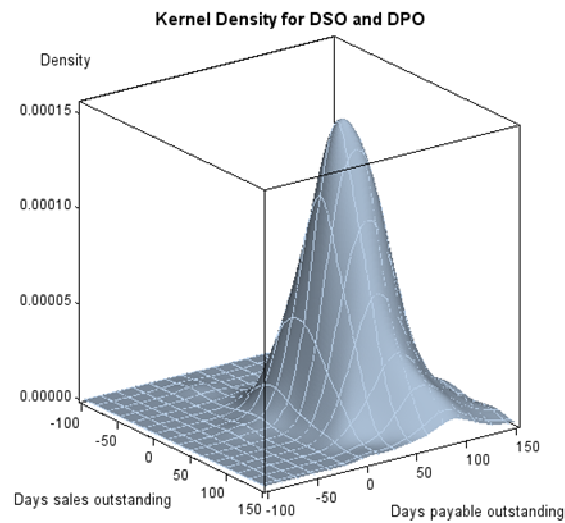
The example of resolution of the **chi-square test** for the DSO ratio for the **French samples**. If the significance level is 5%, then we would conclude that there **is a statistically significant difference in the proportion of firms** in the six categories of DSO between 2012 and 2013.
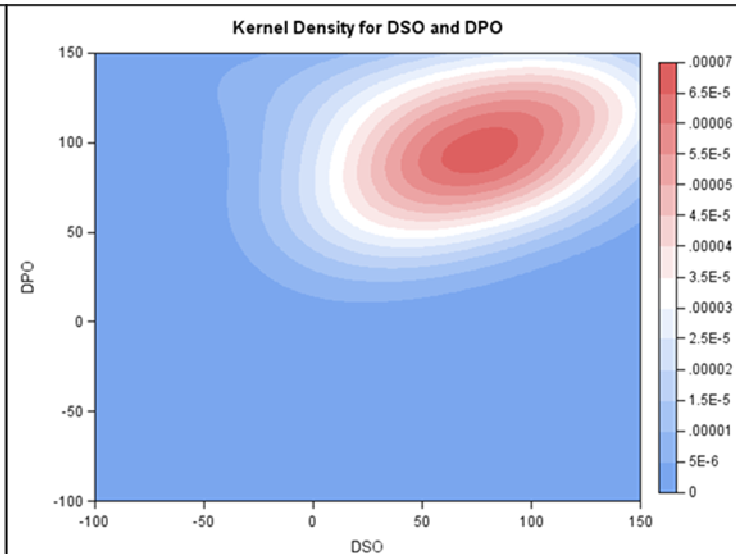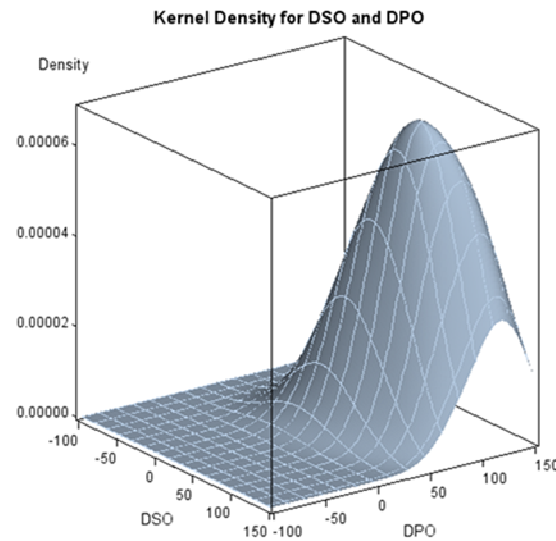
Bivariate KDE – Large firms – Industry

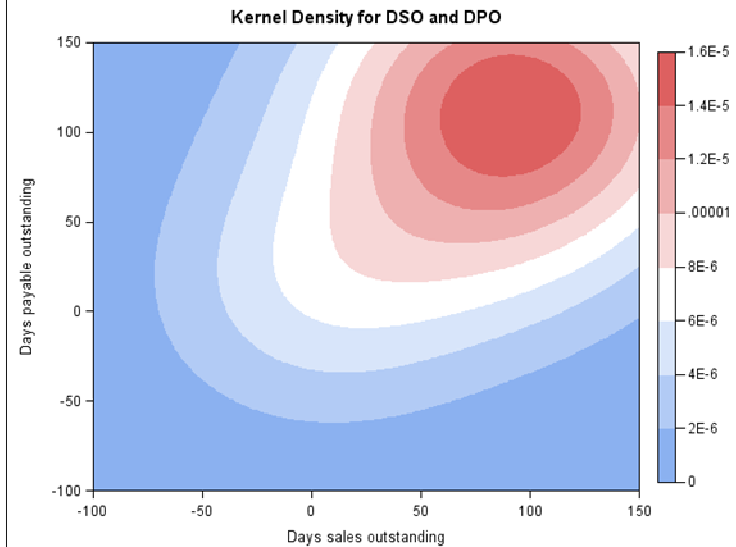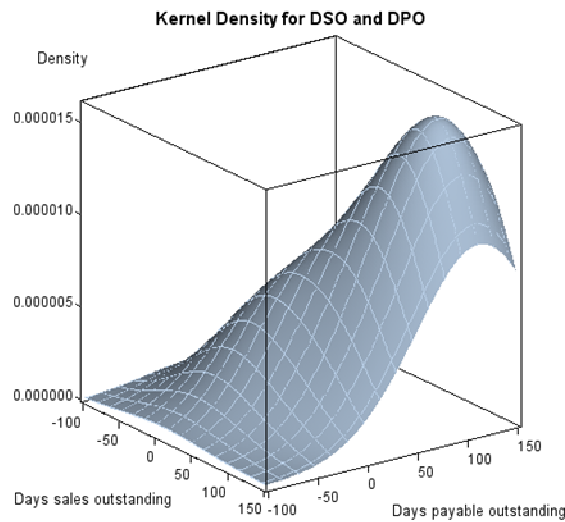|		
• Belgium		
• Spain		
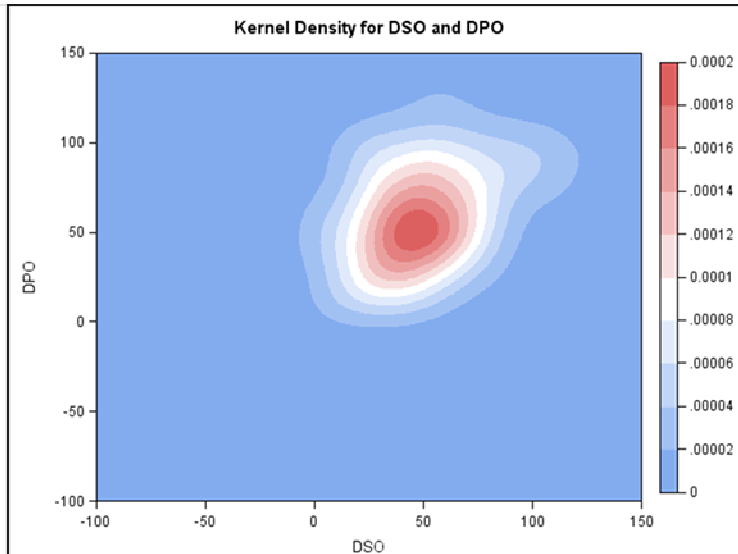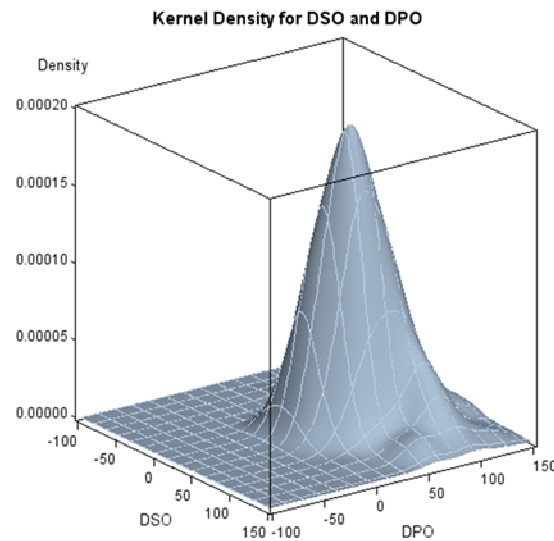
Bivariate KDE – Large firms – Construction

• Belgium		
• Spain		

Bivariate KDE – Large firms – Retail trade
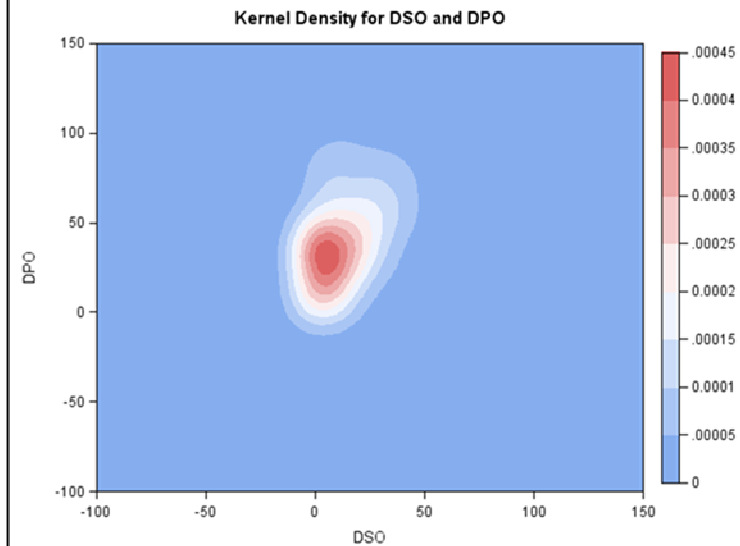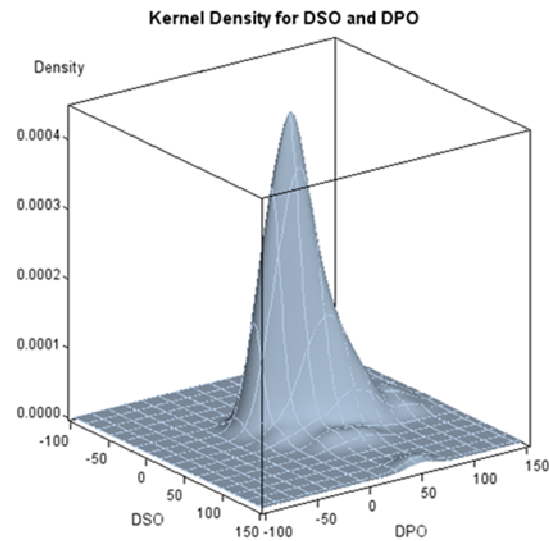
• Belgium		
• Spain		
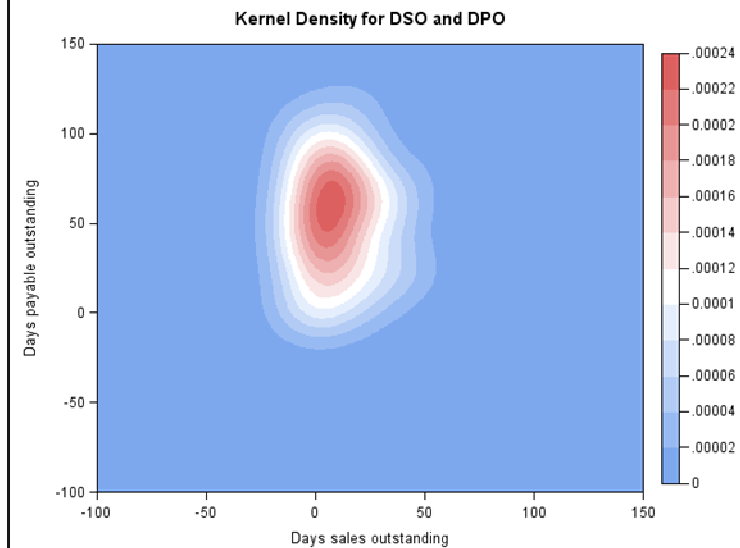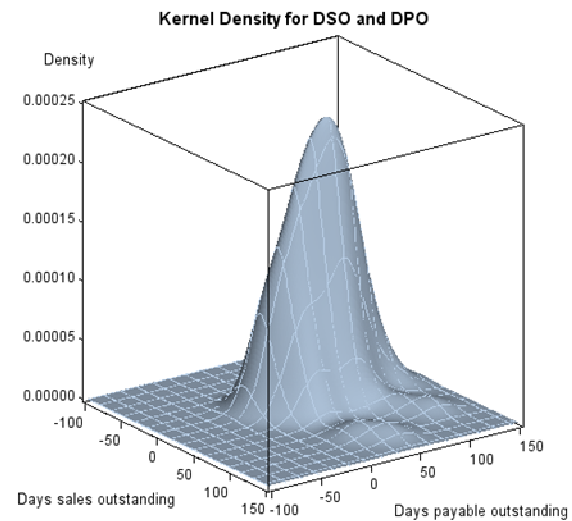
OUTLINE

1. **Introduction**

2. **Data sources and methodology**

3. **Empirical results**

4. **Conclusions**

4. Conclusions

❑ The study examines the importance of **trade credits** in the FSA WG countries

❑ The **collection and payment periods** of trade credit, obtained from accounting data, are assessed by means of **two key financial ratios**:

    ❑**Days Sales Outstanding** (DSO)

    ❑**Days Payables Outstanding** (DPO)

❑ The results reveal **differences** in DSO and DPO across **countries, sectors and sizes**

❑ Identifying **heterogeneous trends** in the evolution of DSO and DPO in the aftermath of the 2008-2009 financial crisis

❑Future plan → To set up this study on DSO and DPO as **a permanent ECCBSO database of collection and payment periods**

    ❑Weighted average

    ❑KDE

    ❑Statistics test of homogeneity (by year, by country, etc.)

THANK YOU FOR YOUR ATTENTION.
ANY QUESTIONS?

Financial Statement Analysis Working Group