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

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

Conference "Uses of Central Balance Sheet Data Offices´ Information"

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Merve Artman
Central Bank of the Republic of Turkey and Financial Statement Analysis Working Group, ECCBSO

Luis Ángel Maza
Banco de España and Financial Statement Analysis Working Group, ECCBSO

Financial Statement Analysis Working Group

OUTLINE

1. Motivation
2. Data Sources and Methodology
3. Empirical Results
4. Conclusions

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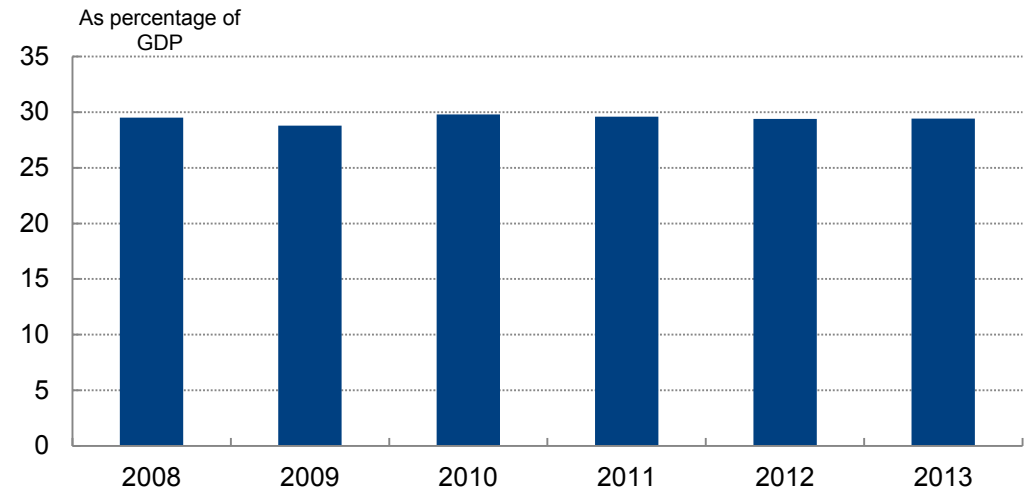
1. Motivation (I)

• **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



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

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

•This study aims at giving an insight into the importance of **trade credits** in the **member countries of the ECCBSO Financial Statements Analysis Working Group**, that is Belgium, Germany, Spain, France, Italy, Poland, Portugal and Turkey

1. Motivation (and II)

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

•Not only **average or median** ratios are calculated, the study wants to particularly inform about the **full distribution of the ratios.**

•Using **Kernel Density Estimations (KDE)**, as this method allows for the most comprehensive representation of the distributions

•In order to study the **differences** in DSO and DPO **distributions:**

- ❑ ***between countries and sectors.***
- ❑ and ***trends*** *in the aftermath of the* ***2008-2009 financial crisis.***

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2. Data Sources and Methodology (I)

- The study makes use of the **large datasets from each national ECCBSO**. They are very similar to the national contributions to the BACH database.
- Highest coverage rates can be observed for **Italy, Belgium and Portugal**, implying that these data samples more or less contain the total population of companies.

	Manufacturing		Construction		Trade	
	Coverage rate [%] in terms of …					
	… firms	… sales*	… firms	… sales*	… firms	… sales*
Belgium	97.2	99.7	99.5	99.5	99.6	99.6
France	47.4	84.1	26.4	77.5	38.5	87.6
Germany	14.6	73.6	7.0	38.8	9.4	61.7
Italy	100.0	100.0	100.0	100.0	100.0	100.0
Poland	8.7	78.6	2.6	39.7	3.3.	47.4
Portugal	97.5	99.5	96.8	98.8	96.7	99.3
Spain	51.3	65.3	57.0	39.0	38.5	69.2
Turkey	1.0	49.3	0.6	14.3	0.2	21.8

2. Data Sources and Methodology (II)

- **Population**:
  - ❑*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).*
    - ❑Although national GAAPs have the Fourth Council Directive as common ground
    - ❑ In some countries (such as PT and ES), the most recent GAAP are very close to IFRS in recent years.
- **Sectoral coverage**:
  - ❑ *Manufacturing*
  - ❑ *Construction*
  - ❑*Trade*

2. Data Sources and Methodology (III)

- **Size classes**:

❑ *This report follows the EU Commission Recommendation concerning the definition of **micro, small, medium-sized and large enterprises**. However, **only the turnover criterion is applied** because in some of our samples the data on the number of employees is not available or is of insufficient quality.*

❑ *The **thresholds** used for defining micro, small, medium-sized and large corporations are €2 million, €10 million and €50 million of turnover respectively.*

❑ *But deflated using the **Harmonized Index of Consumer Prices (HICP) of the Euro area**. Year 2010 was selected as the base year for calculations.*

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

2. Methodology and Data Sources (IV)

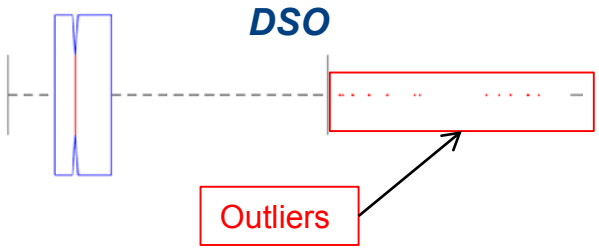
- **Outliers**:

  - *Exclusion of anomalous microdata ("outliers") with **Box-Plot method (k=6)**:*

Algebraically:

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

Graphically:



- **Rejection of micro size class:**

  - *Micro-corporations have been excluded from the "total size class" , due to are not directly compared between the countries.*

Number of companies in national samples, 2012

All sectors	Belgium	Germany	France	Spain	Italy	Poland	Portugal	Turkey
Small	3.216	13.418	53.315	20.201	40.073	7.915	8.313	2.281
Medium-sized	3.962	10.324	16.567	3.707	15.254	3.715	1.943	2.547
Large	1.353	4.764	4.542	906	3.847	1.264	433	1.105
Total	8.531	28.506	74.424	24.814	59.174	12.894	10.689	5.933
for information								
Micro	1.921	10.931	68.474	192.967	15.457	7.279	128.170	744

2. Methodology and Data Sources (V)

- **Two classic 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) generally tells the number of days the average customer trade receivable is "on the books

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

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

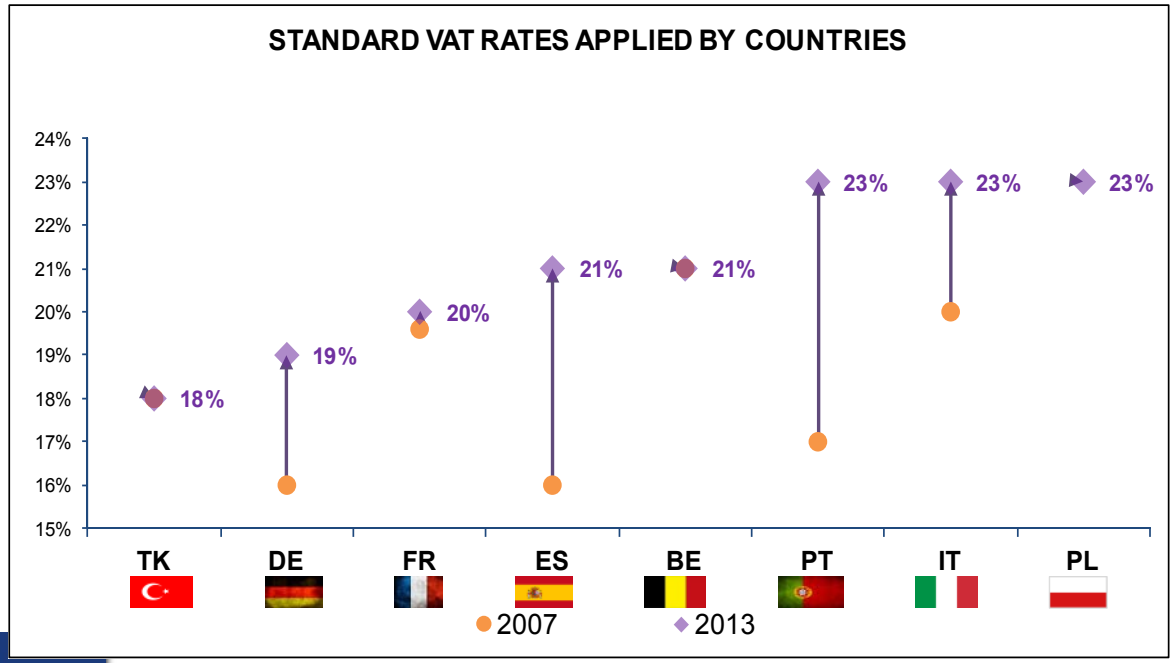
Days Payable Outstanding (DPO) explains a company's pattern of payments to suppliers

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

Interpretation: The more timely a company pays its trade credit the lower the DPO figure.

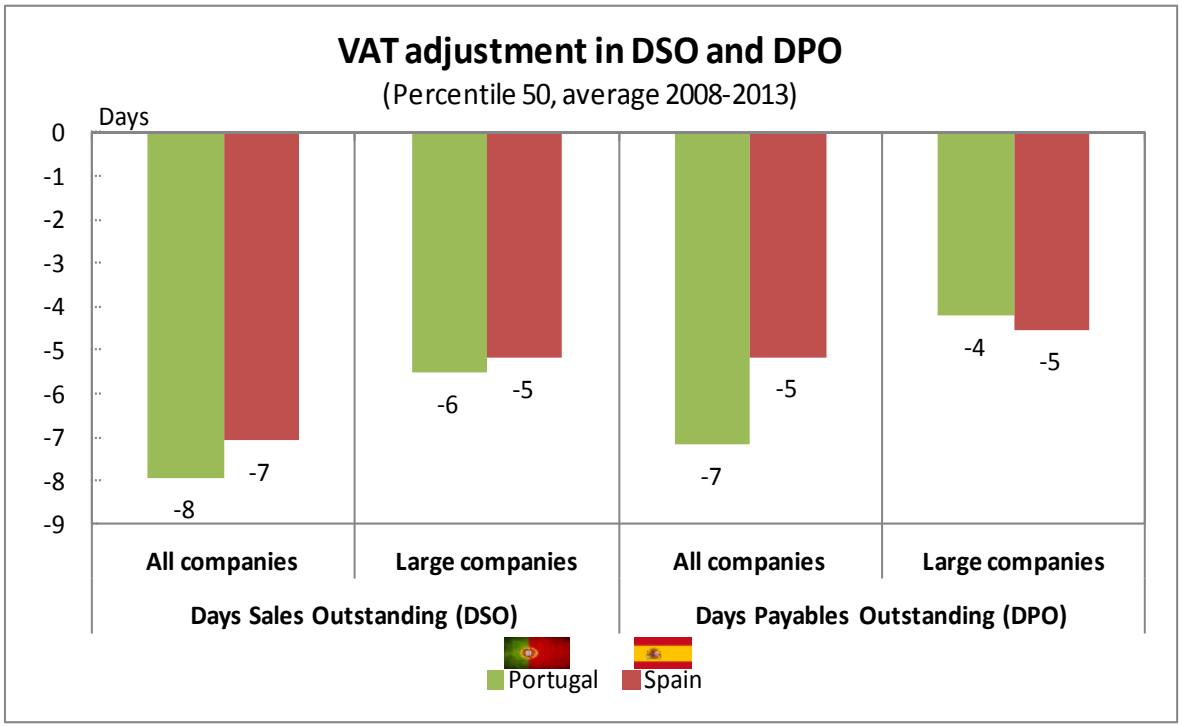
2. Methodology and Data Sources (VI)

- This traditional approach in DSO and DPO definitions 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 indirect taxes.**
- The report analyses the **impact of VAT on DSO and DPO** in the context of an **international and an over-time comparison.**



2. Methodology and Data Sources (and 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 **PT was 8 days**, while it was slightly lower in **ES (7 days)**.
  - With regard to the median DPO, the VAT corrections reduced the payment periods by **7 days in PT** and by **5 in ES.**



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

However, if these modifications in tax rates levels happened, **some breaks in the evolutions of DSO and DPO would come up**.

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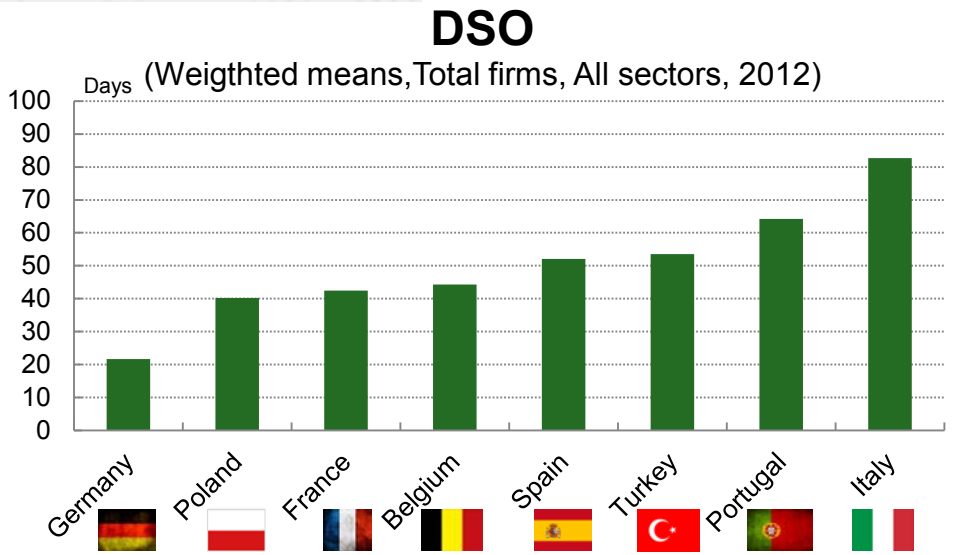
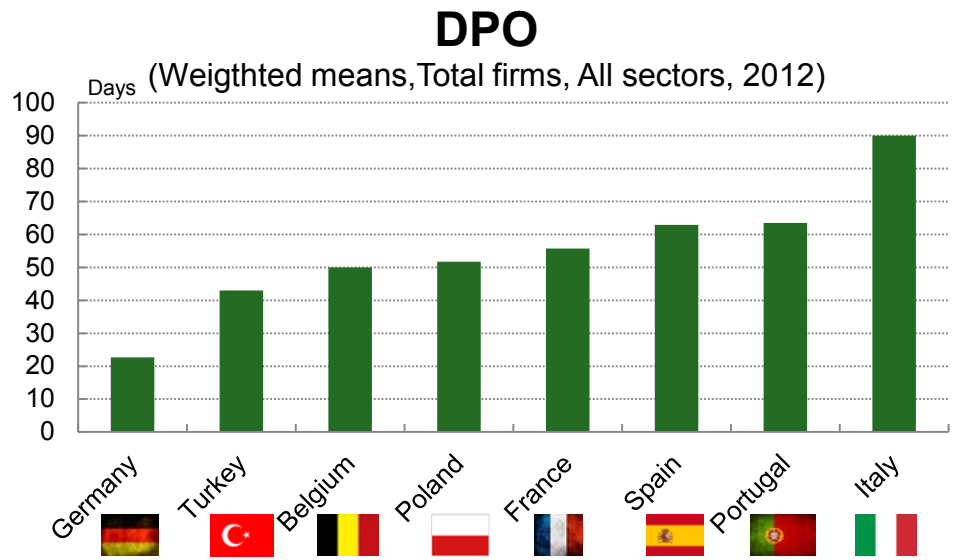
3. Empirical Results (I)

There are **considerable differences** in DSO and DPO figures **between countries** (weighted average).

❑**DSO:** in **Germany,** the collection behavior is around 20 days, while **Italian** companies receive quite late their trade receivables (80 days).

❑**DPO**: similar differences are observable when interpreting payment figures

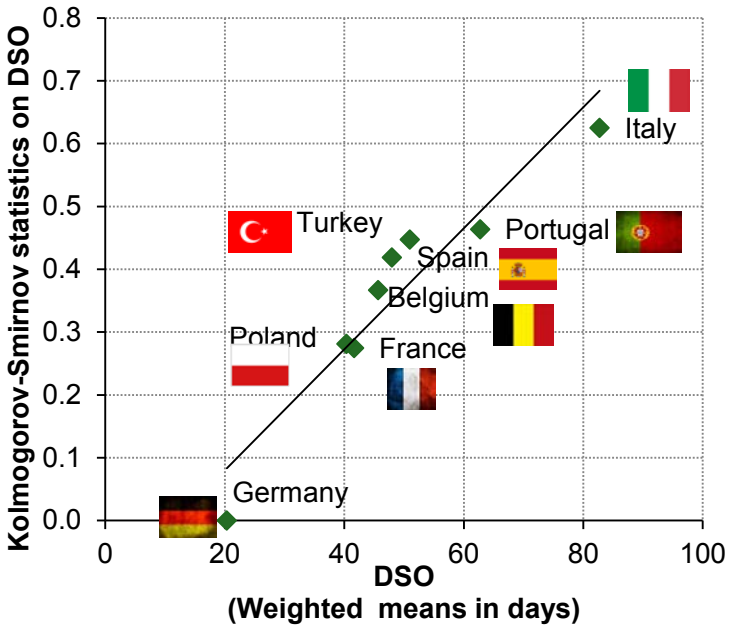


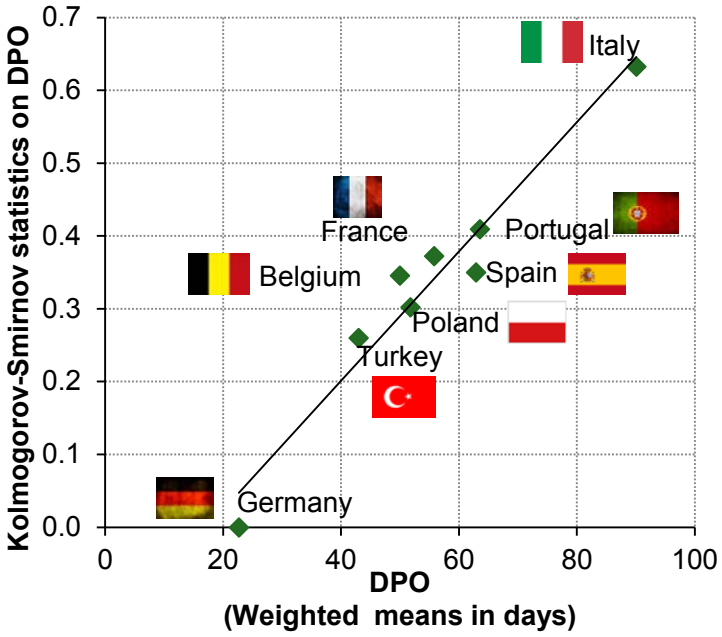


3. Empirical Results (II)

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

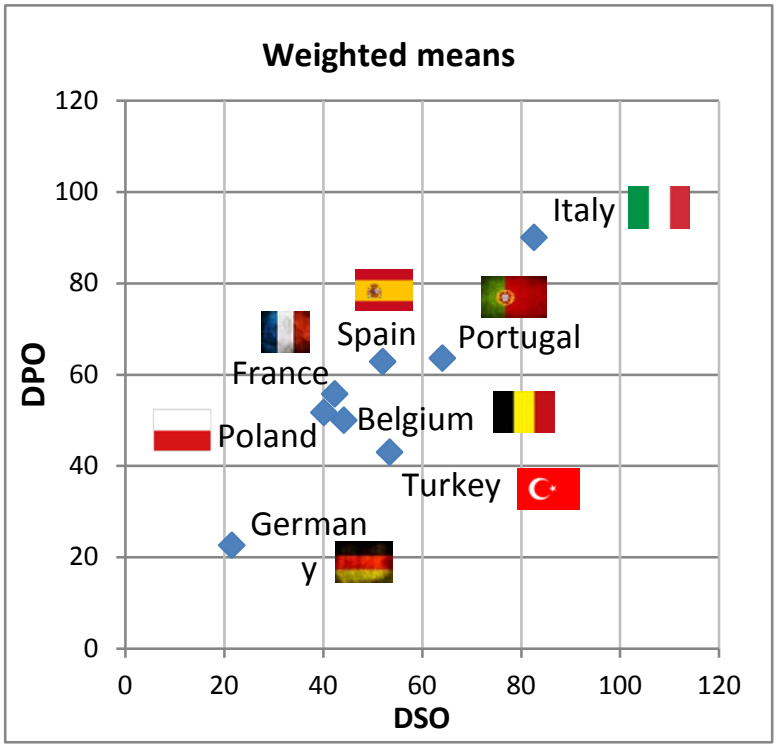
The KS statistics of all countries calculated against German samples of DSO and DPO show a **positive correlation between this measure of divergence and weighted means**. These results **would suggest the robustness of the weighted means in order to identify the aggregated behaviour of firms by countries**

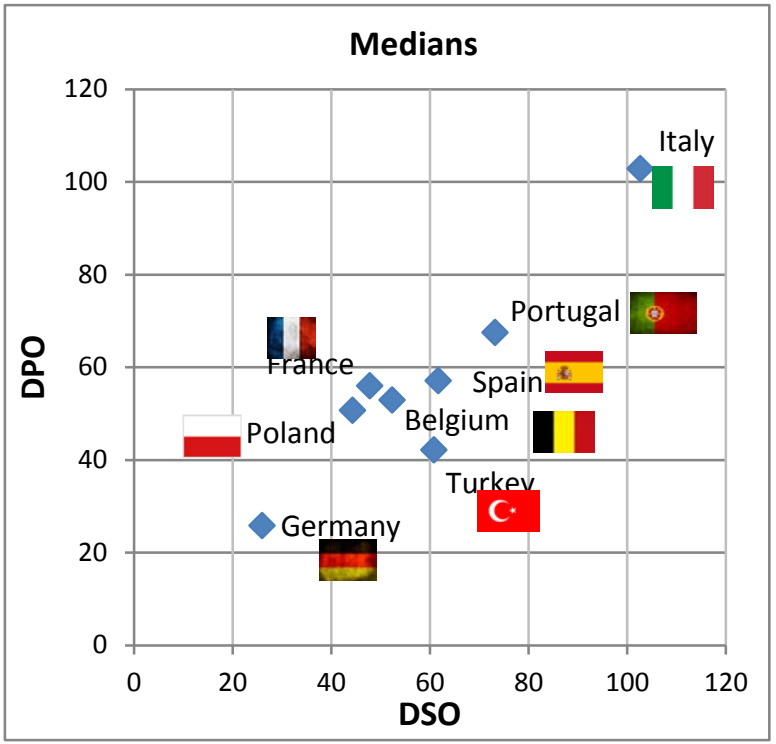




3. Empirical Results (III)

For all combinations of weighted average and median values, DSOs and DPOs are **positively and closely linked**: the higher the DSO, the higher the DPO, and conversely.

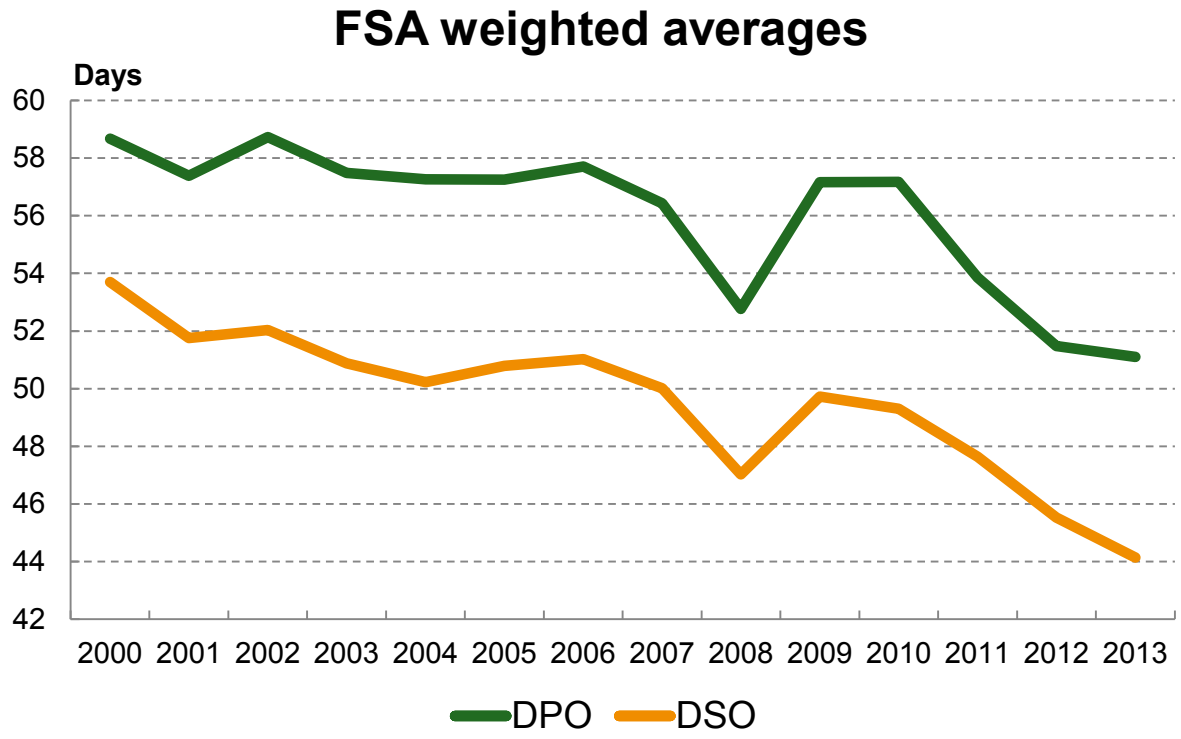




We observe a significant positive correlation between DSO and DPO using firm level data too.

3. Empirical Results (IV)

With the aim of summarizing the national information in **synthetic indicators**, aggregates of **all the countries in the WG FSA for DSO and DPO** have been built as **averages of eight countries**, as a function of the **GDP of each economy**.

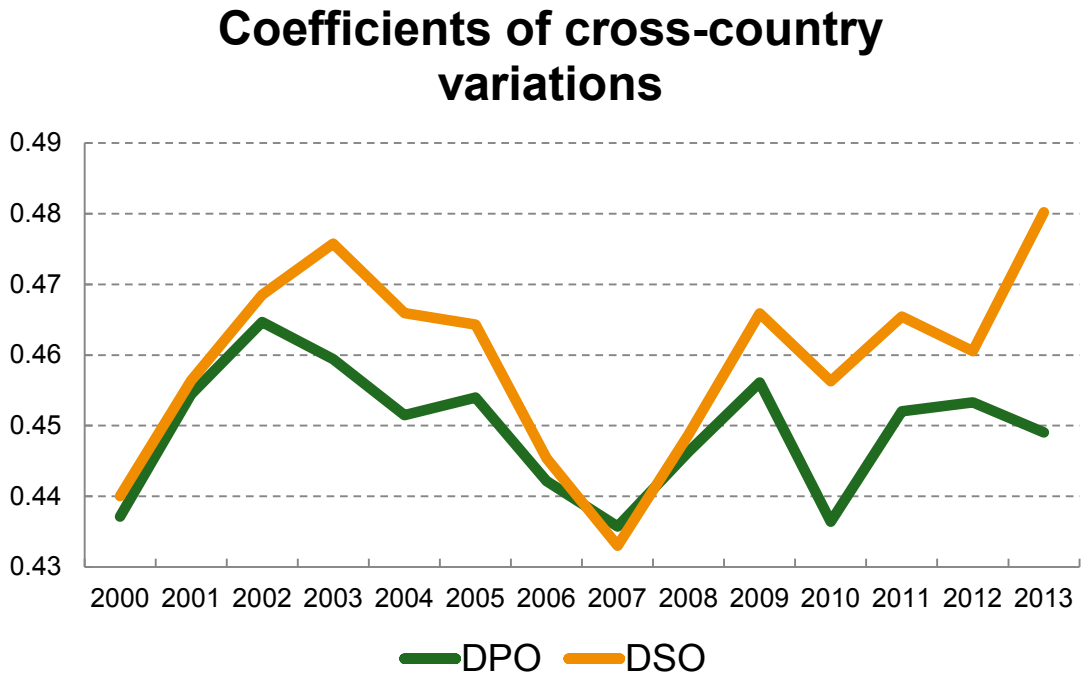


- The FSA average DSO and DPO ratios show a clearly **downward trend** between 2000 and 2013, with the lowest levels being reached in last year.

- **This trend could lay**, mainly, the reduction of periods in countries with the longest DSO and DPO, as a result of the **process of economic integration of Europe** and the certain economic policy measures (such as the **European Directive on Late Payment**)

3. Empirical Results (V)

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

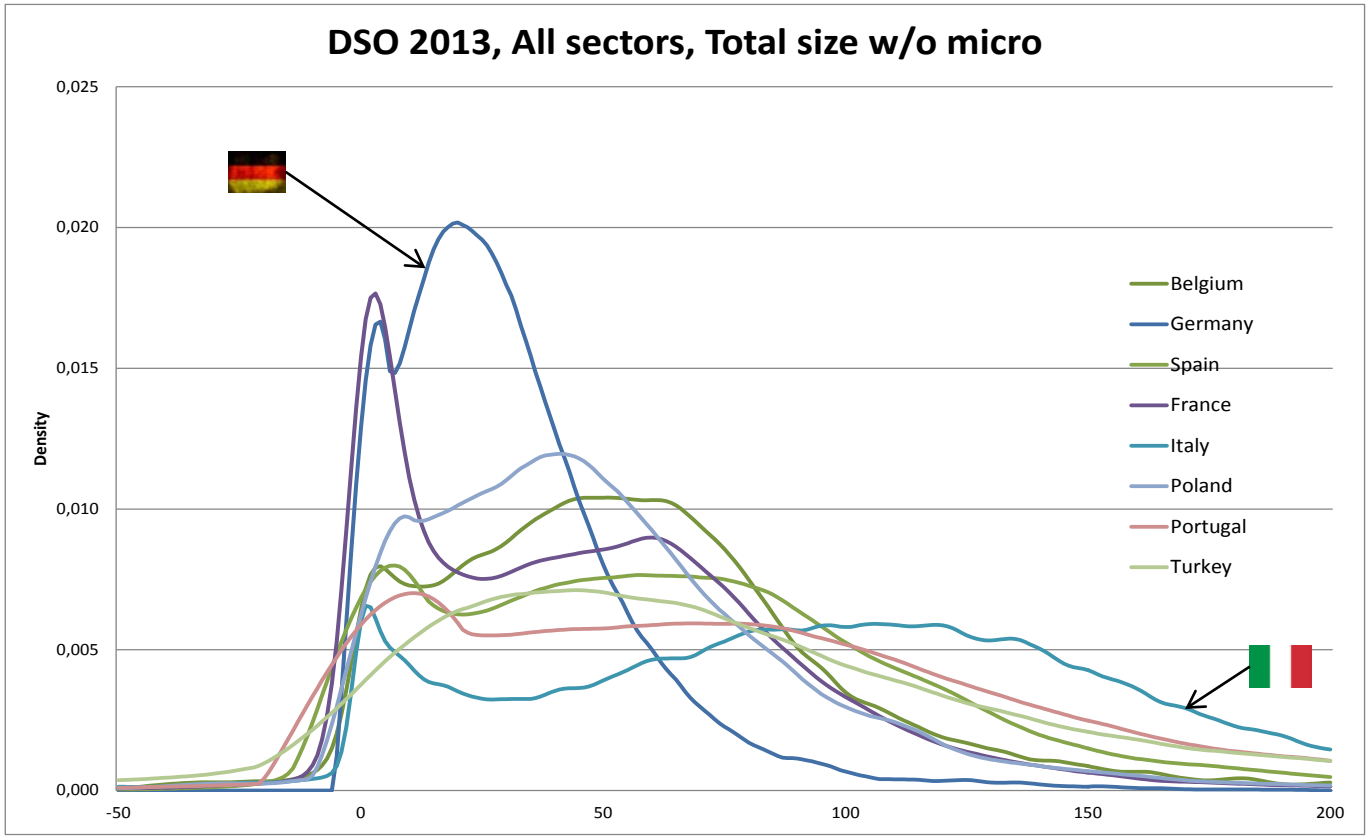


❑These weighted cross country **coefficients of variation** are computed as the weighted (by the respective GDP) standard deviation of DSO and DPO across countries divided by the FSA averages.

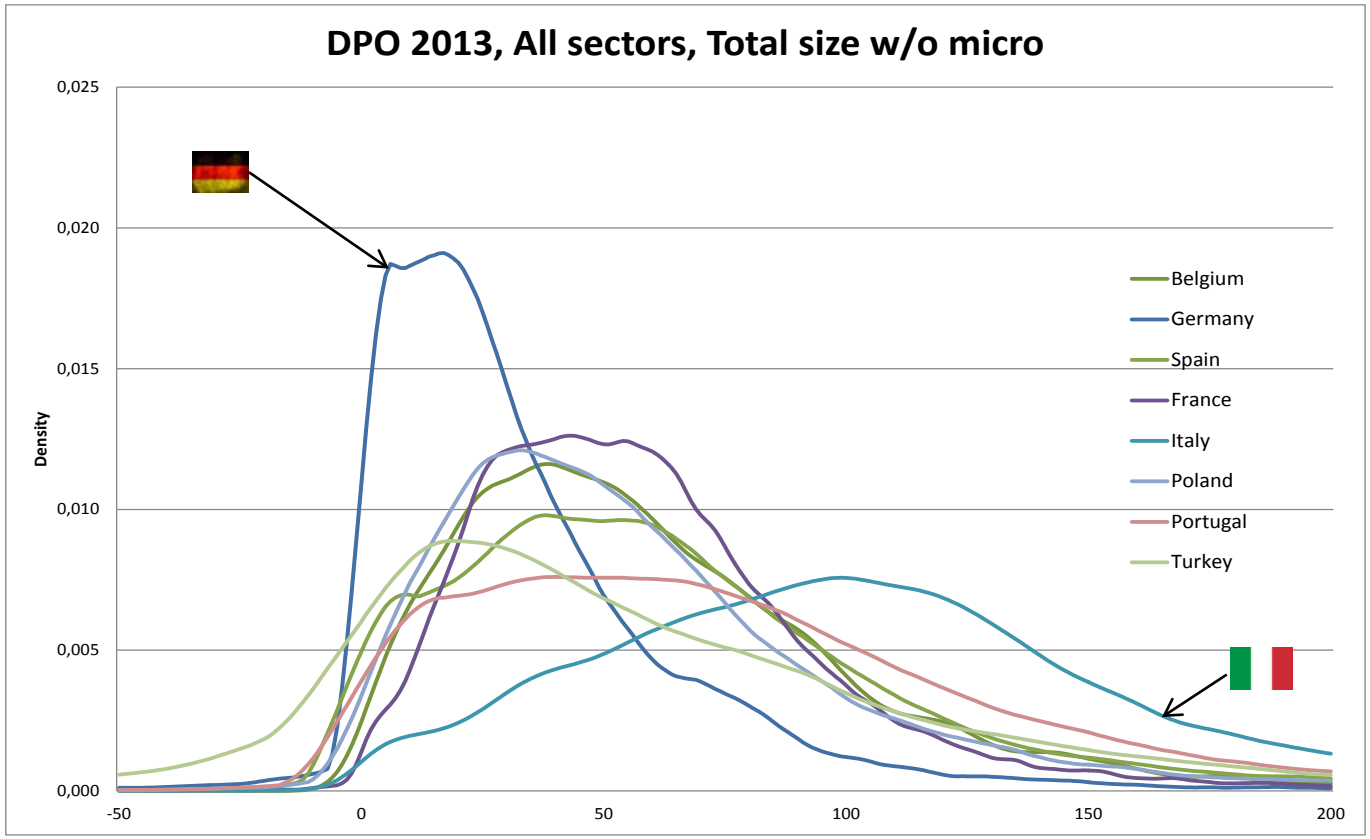
❑After 2007, a trend has been observed towards **increasing the heterogeneity in the national behaviour** of customer-collection and supplier-payment periods , **due to likely substantial differences in the macroeconomic consequences of the crisis**.

3. Empirical Results (VI)

Analyzing distributions with the help of **Kernel Density Estimations (KDE)**



3. Empirical Results (VII)



Germany presents KDE functions somehow different from the other countries. Its functions are more left- hand sided than the other countries' ones, which are more evident in DSO density functions. In the opposite direction are the Italian KDE.

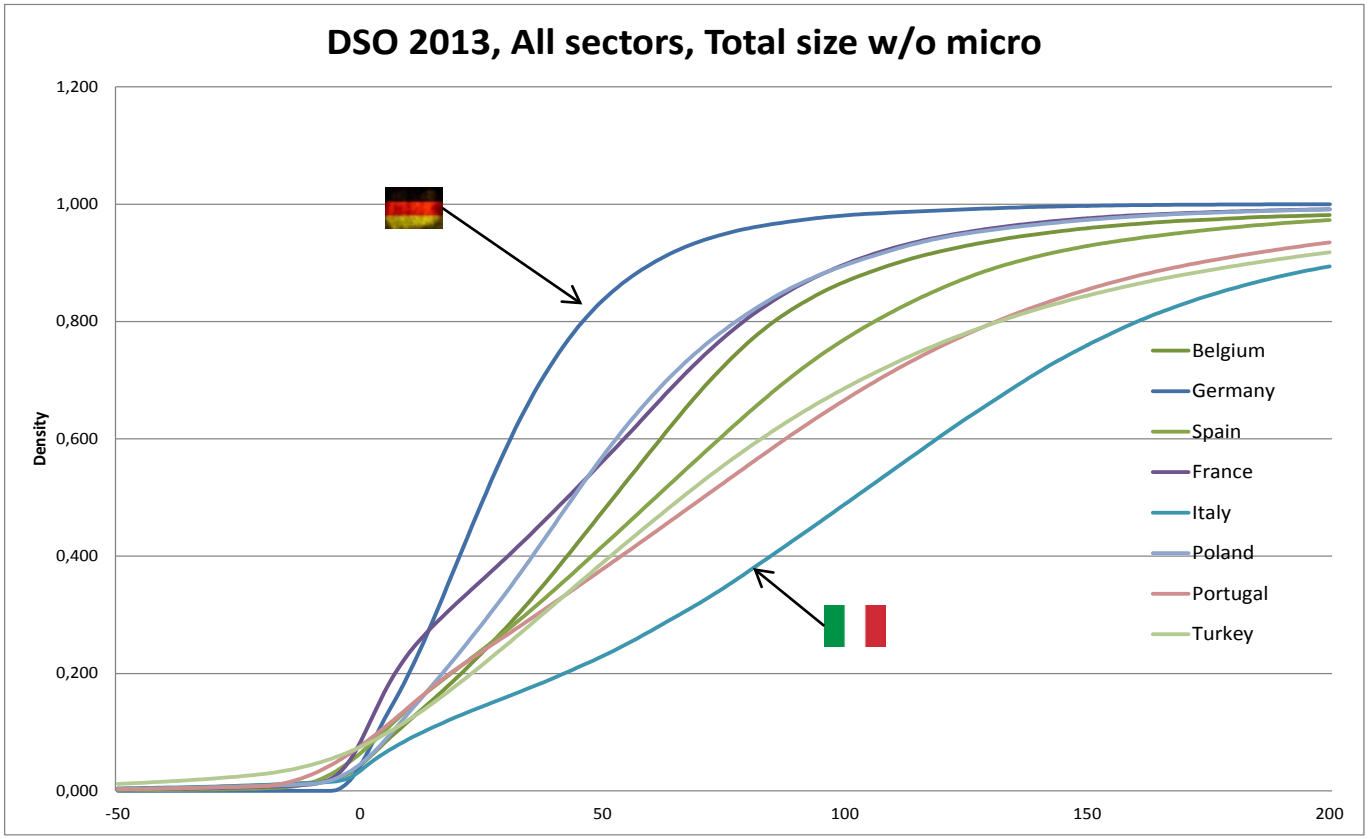
3. Empirical Results (VIII)

Outlier Analysis for KDE Estimates: Some factors for the densities beyond -100 and 500 according to sectors:

CONSTRUCTION	MANUFACTURING	TRADE
• Contracting companies • Completion method for accounting • Interim payment problems • Lump sum accounting records for separate projects	• Long term manufacturing • International contracts-exchange rate risk • Sub-group companies-access to finance problem	• Long term energy investments • Long term contracts about machine trade • Working with dealers

3. Empirical Results (IX)

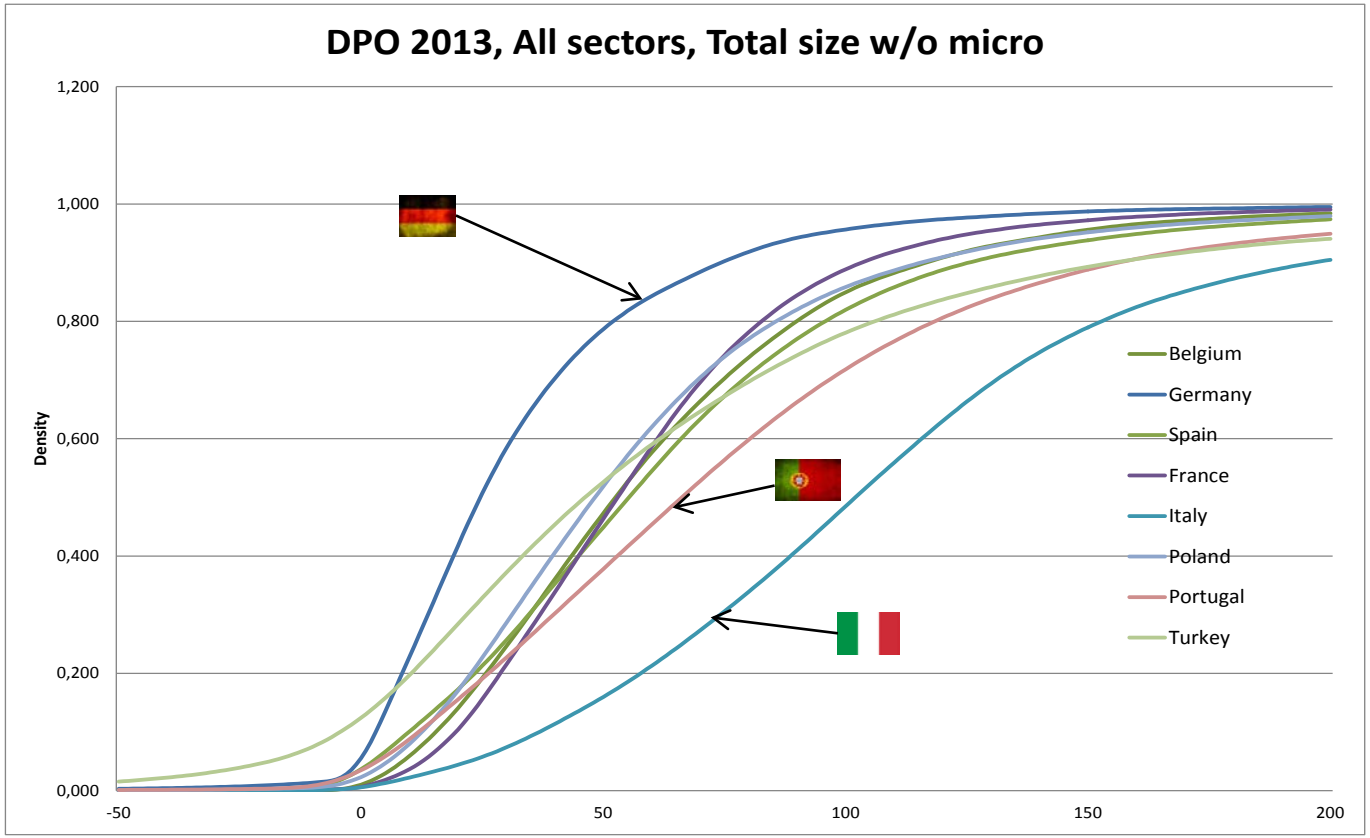
Accumulated Kernel Density Estimations show similar ranking by countries in DSO….



3. Empirical Results (X)

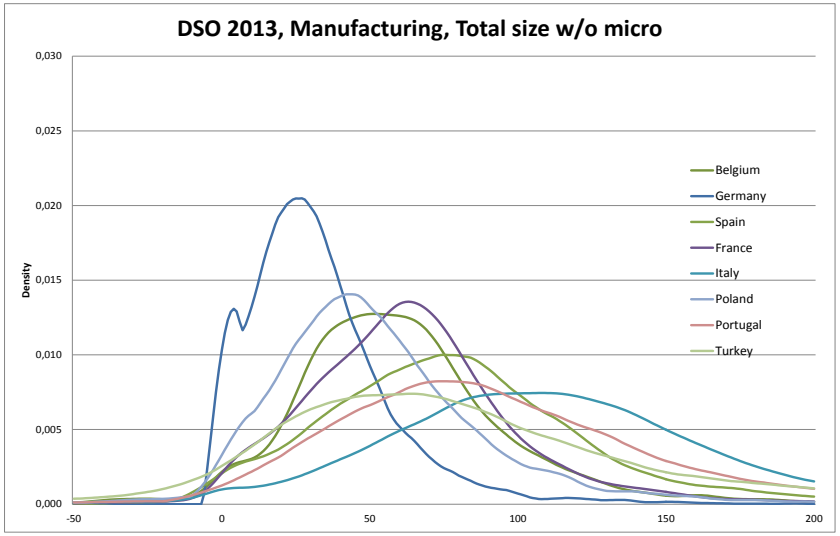
…. and DPO. These **differences** might be related with, for instance,:

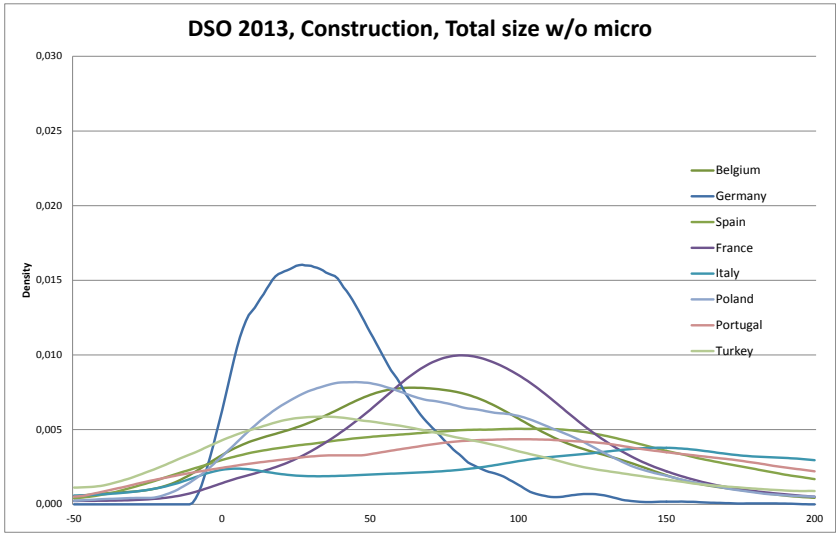
- ❑ **different commercial negotiating policies,**
- ❑ **corporation structure,**
- ❑ **general different payment culture.**

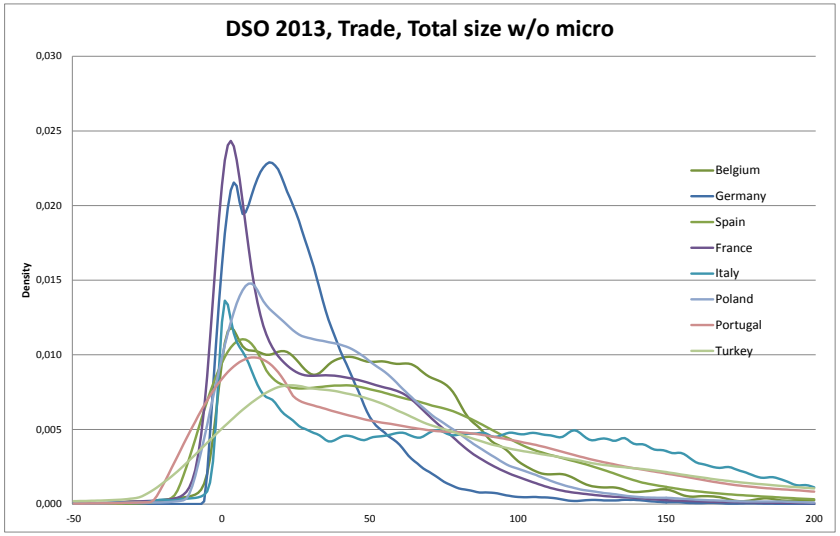


3. Empirical Results (XI)

The presented **differences** between countries remain applicable to the **main activity sectors in DSO…**

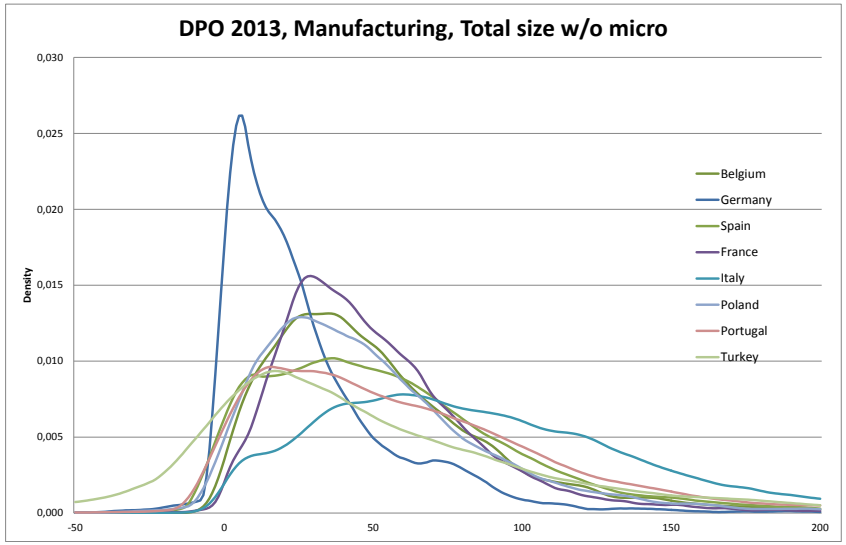


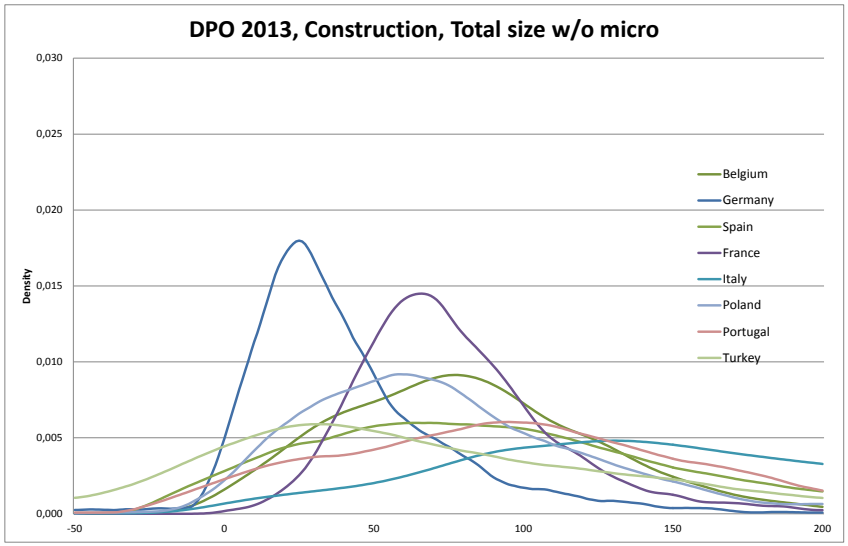


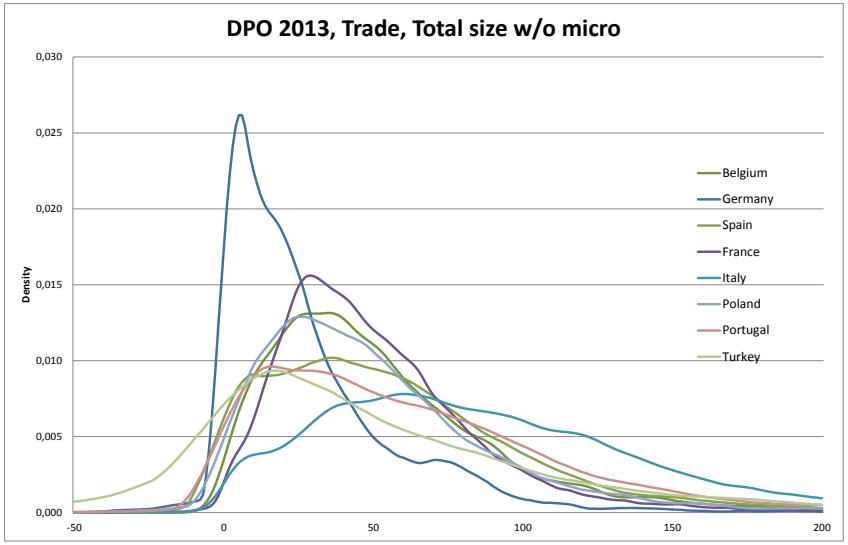


3. Empirical Results (XII)

…. and DPO

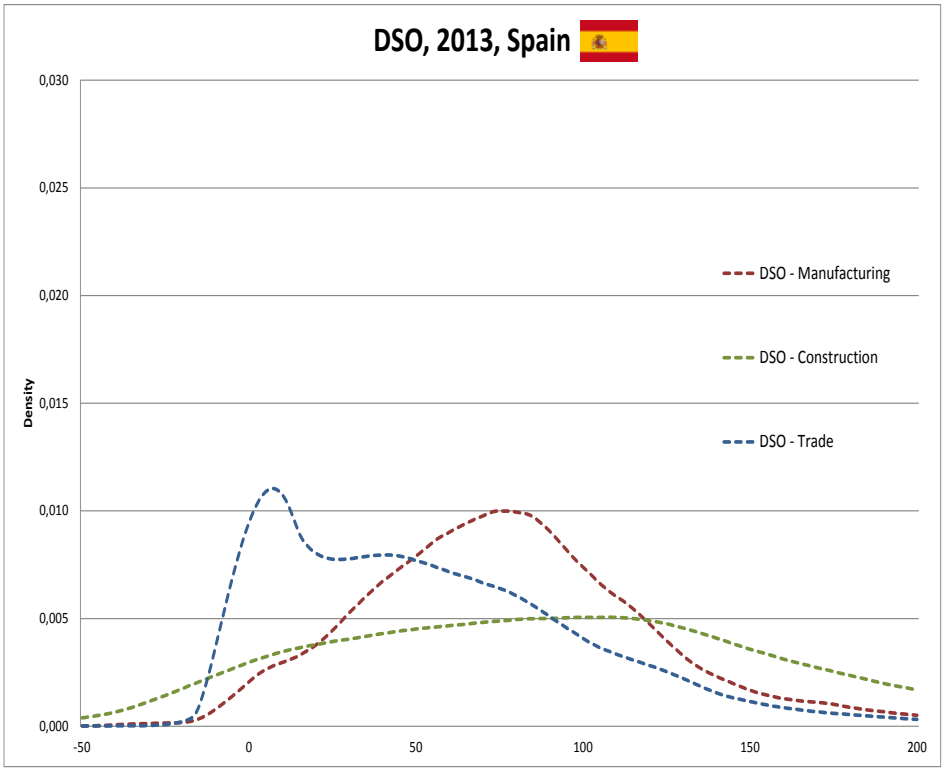


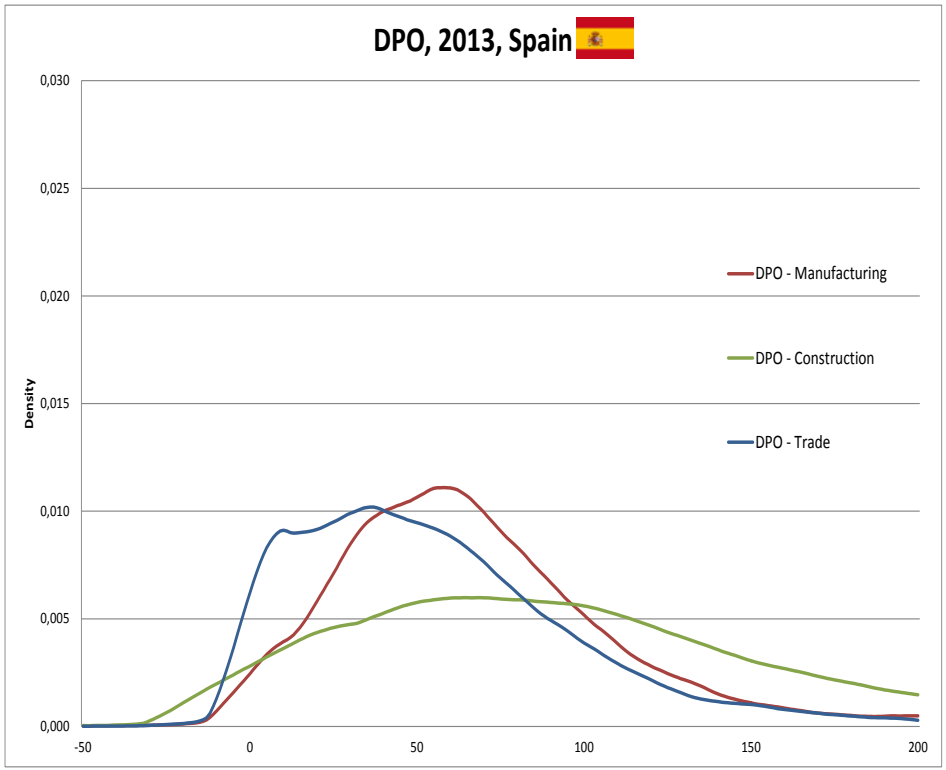




3. Empirical Results (XIII)

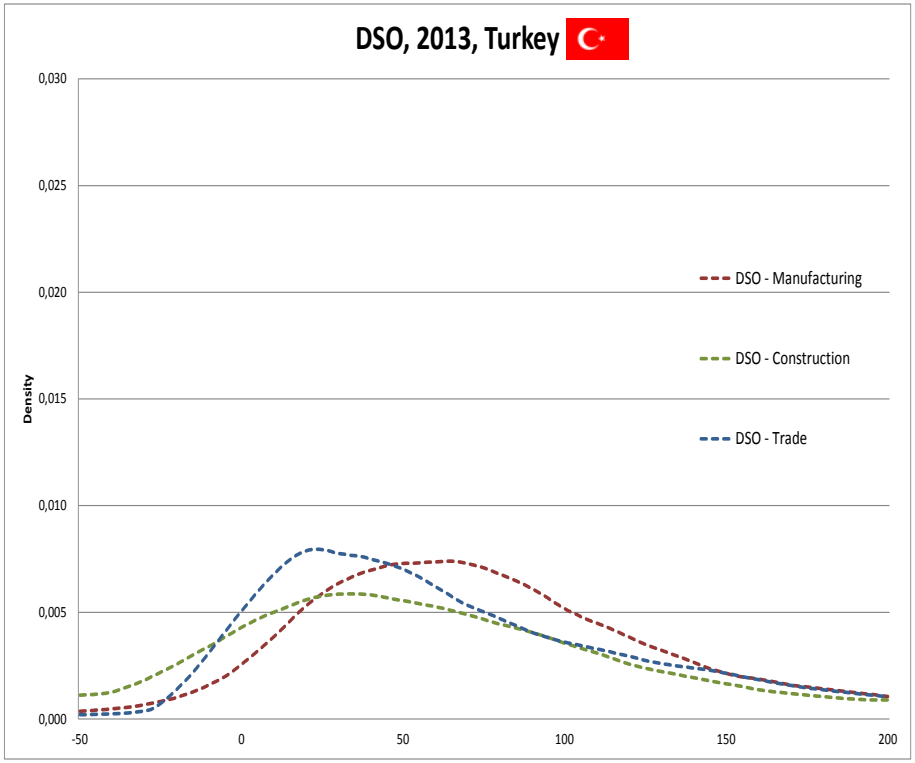
The sectoral differences are more obvious in the comparison for a specific country.
For example in Spain and Turkey.

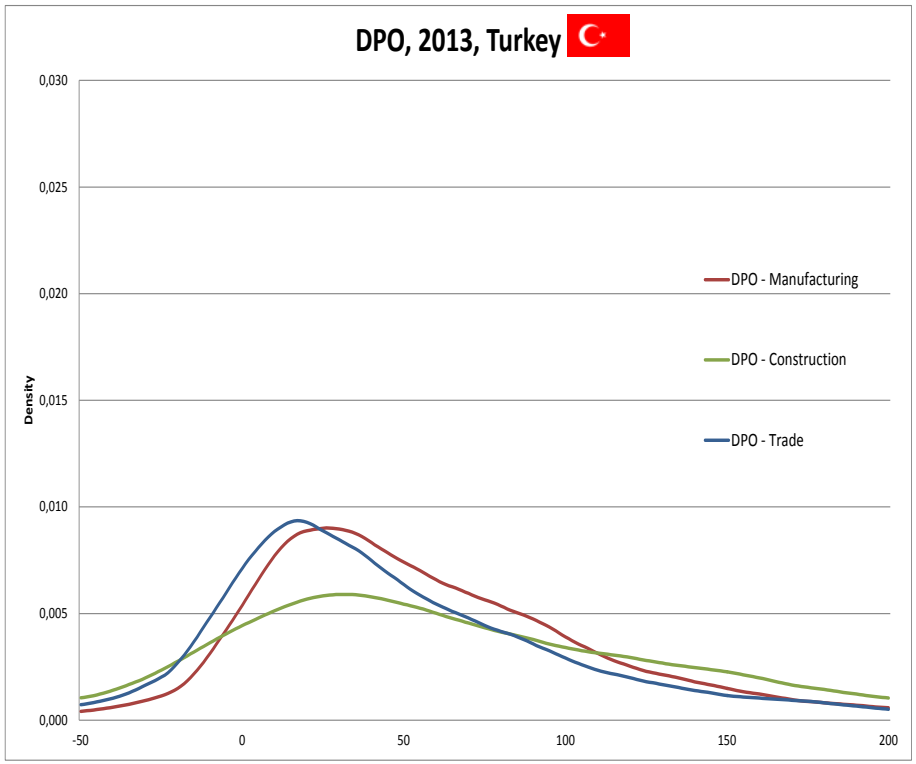




For the **Spanish firms**, across the sector of activity, the KDE depict that the longest DSO and DPO occurred in the construction sector, where the highest values of density are located above 100 days in 2013. The shortest payment and collection periods were in the trade sector (the peaks for DSO and DPO median was less than 10 and 40, respectively). On the other hand, collection periods tend to be longer than payment term at manufacturing companies,

3. Empirical Results (XIV)

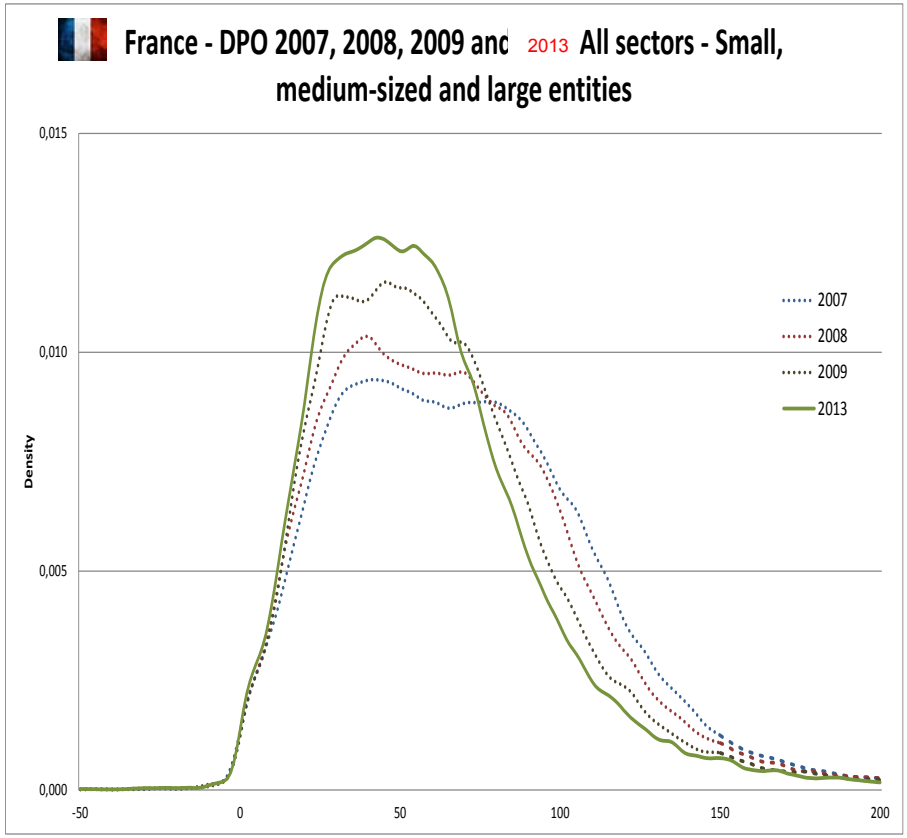


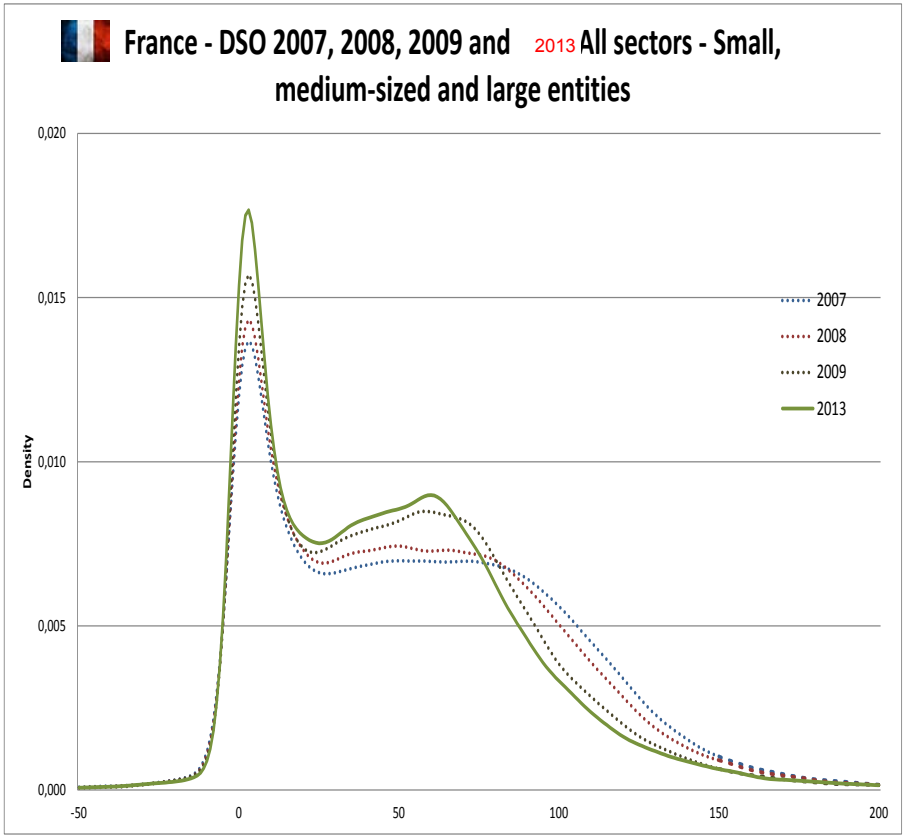


In **Turkey**, like Spanish firms, KDE shows the longest DPO and DSO in the construction sector. However, the highest value of density is way above the Spanish figures, up to 700 days. Although smoother than Spanish figure, the shortest payment and collection period can be seen in trade sector. Collection and payment term difference is also valid for Turkey in terms of manufacturing firms.

3. Empirical Results (XV)

Differences over time: (i) KDE graphs have been set up for the years 2007, 2008, 2009 and the most recent year 2013.





Example for France: The French DSO and DPO have also improved, likely, because of the introduction of the LME law to reduce payment terms.

3. Empirical Results (and XVI)

(ii) using the chi-square test of homogeneity in order to determine if these distributions are similar or different by 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 **chi-square test** for the DSO ratio for the **French samples**. If the significance level is 5%, then we would conclude that there **is statistically significant difference in the proportion of firms** by the six categories of DSO between 2012 and 2013.

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4. Conclusions

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

- The **collection and payment periods** of trade credit are assessed, obtained from accounting data, by means of two key financial ratios:
  - Days sales Outstanding (DSO)
  - Days Payables Outstanding (DPO).

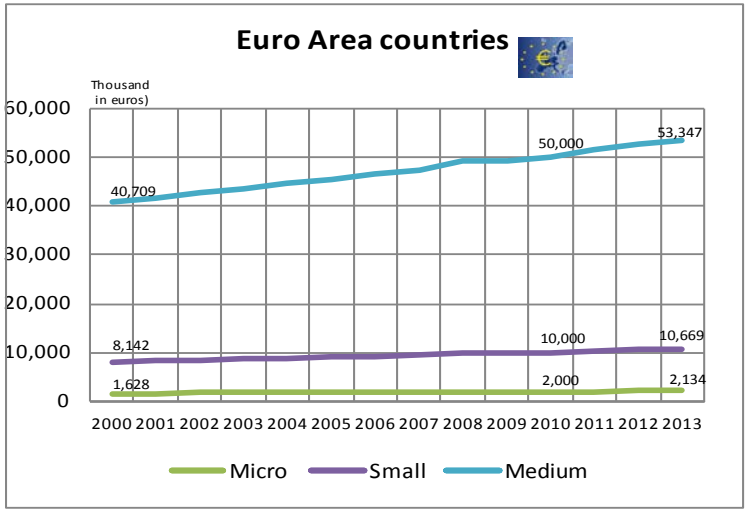
- The results reveal **differences** in DSO and DPO between **countries and sectors**.

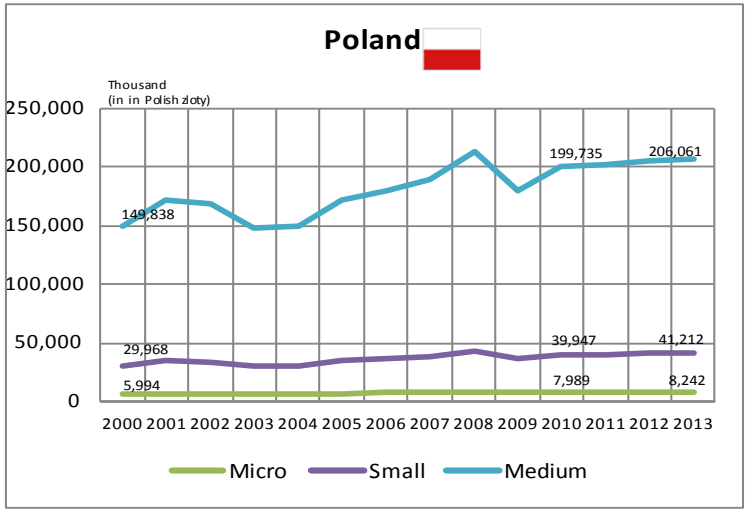
- Identifying **heterogeneous trends** in the evolution of DSO and DPO in the aftermath of the 2008-2009 financial crisis.

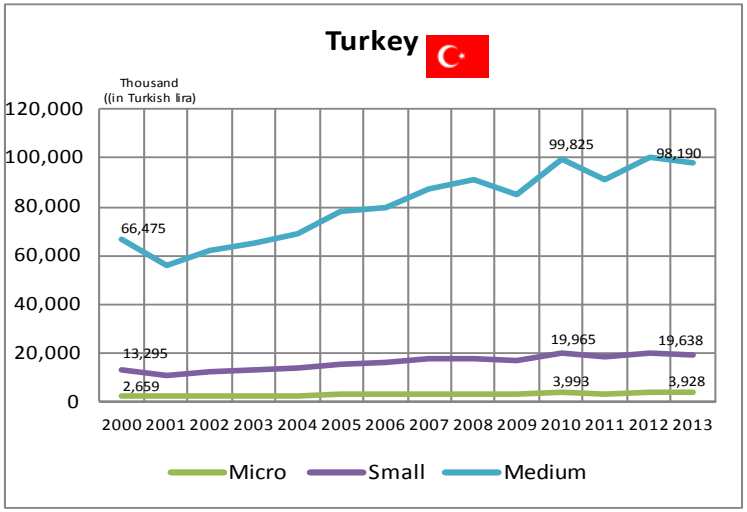
- Future plan → To set up this study on DSO and DPO as **a permanent ECCBSO database of collection and payment periods**
  - Weighted average
  - KDE
  - Statistics test of homogeneity (by year, by country, etc.)

THANK YOU FOR YOUR ATTENTION.
QUESTIONS?

ANNEX (I): DEFLATED CUT-OFF POINTS FOR TURNOVER







ANNEX (II): CORRELATION COEFFICIENTS DSO VS DPO AT FIRM LEVEL

Correlation Coefficients DSO vs DPO in 2012

Sector	Size	Belgium(1)	Germany	Spain
1 Manufacturing	1 Micro	0,28	0,23	0,83
1 Manufacturing	2 Small	0,31	0,19	0,28
1 Manufacturing	3 Medium	0,27	0,14	0,15
1 Manufacturing	4 Large	0,35	0,07	0,15
1 Manufacturing	Total w/o Micro	0,30	0,16	0,21
2 Construction	1 Micro	0,14	0,26	0,00(Δ)
2 Construction	2 Small	0,26	0,27	0,10
2 Construction	3 Medium	0,33	0,22	0,66
2 Construction	4 Large	0,27	0,11(Δ)	-0,08(Δ)
2 Construction	Total w/o Micro	0,30	0,25	0,12
3 Trade	1 Micro	0,14	0,28	0,01
3 Trade	2 Small	0,36	0,29	0,38
3 Trade	3 Medium	0,37	0,10	0,50
3 Trade	4 Large	0,42	0,04	0,88
3 Trade	Total w/o Micro	0,37	0,20	0,44

Subsectors Trade

Sector	Size	Belgium(1)	Germany	Spain
Motor Vehicle Trade	1 Micro	0,20	0,30	0,01(Δ)
Motor Vehicle Trade	2 Small	0,33	0,27	0,47
Motor Vehicle Trade	3 Medium	0,33	0,30	0,59
Motor Vehicle Trade	4 Large	0,39	-0,02(Δ)	0,07(Δ)
Motor Vehicle Trade	Total w/o Micro	0,34	0,24	0,49
Retail Trade	1 Micro	0,12	0,20	0,03
Retail Trade	2 Small	0,27	0,30	0,33
Retail Trade	3 Medium	0,27	-0,20	0,16
Retail Trade	4 Large	0,27	0,06(Δ)	0,02(Δ)
Retail Trade	Total w/o Micro	0,26	0,12	0,31
Wholesale Trade	1 Micro	0,14	0,33	0,01(Δ)
Wholesale Trade	2 Small	0,39	0,32	0,38
Wholesale Trade	3 Medium	0,39	0,27	0,59
Wholesale Trade	4 Large	0,44	0,12	0,07(Δ)
Wholesale Trade	Total w/o Micro	0,41	0,28	0,47

(1) Correlation coefficients relate to year 2013.

(Δ) Correlation coefficients are not significantly different from 0 at the 95% threshold.

First results about correlations at firm level, confirm the positive relation between DSO and DPO.

(*working in progress*)