Ensaio

Can Inventories Predict Production?

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Executive Summary

This article studies the relation between subsequent production and past inventories appropriateness by using qualitative data from business surveys. It is shown that after the financial crisis, output became more sensitive to inventories mismatches not only in Portugal but also in Spain and the Euro Area. Moreover, the magnitude of this effect is different across the countries under consideration. Specific industry analysis also reveals different dynamics across manufacturing sectors.

1. Introduction

In its 2015 1st quarter edition, the European Business Cycle Indicator[1] presented an analysis of the relationship between inventories and subsequent production for the Euro Area, based on survey data[2]. The main purpose of the current study is to replicate this research for Portugal.

> *"One of the main interests of macroeconomists is to understand which economic variables drive business cycle developments and to gauge the relative magnitude of their impacts. Since Abramowitz (1950)[3], it is well-known that inventories are an important determinant of economic fluctuations (…) A clear understanding of the relationship between inventories and economic output is thus key to grasping the underlying dynamics of the business cycle"*[4]

An increase in output, *ceteris paribus*, should be reflected in higher levels of inventories, therefore, past production has an impact on subsequent stock levels. If firms identify a misalignment between their supply of goods and the corresponding demand, they will probably adjust. This imbalance may be proxied by excessive (scarcity of) inventories and the corresponding adjustment would be a reduction (increase) in production, i.e. stocks above (below) equilibrium are related with a decrease (increase) in output, hence the expected relation is negative. In this research, the responsiveness of production to inventories is tested. Special attention is given to the impact of the financial and the later sovereign debt crisis on the magnitude of this link. Additionally, results for the Portuguese economy are compared with those for the Euro Area. The analysis is also extended to the Spanish economy, in order to better understand specific results for Portugal. This article is organized as follows: section two describes the inputs and how they are employed. The analysis for both the aggregate manufacturing sector and the industry groupings is presented in section three and four, respectively. Section five summarizes the conclusions.

*The opinions expressed in the article are author's own responsibility and do not necessarily match those of the institution. All errors and omissions are author's own responsibility.

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[1] http://ec.europa.eu/economy_finance/publications/cycle_indicators/2015/pdf/ebci_1_en.pdf

[2] European business cycle indicator is a quarterly publication made by European Commission's (EC) Directorate General for Economic and Financial Affairs (DG ECFIN). It presents a short-term analysis of economic conditions, based on business and consumer surveys.

[3] Abramowitz, M. (1950), *Inventories and Business Cycles.* National Bureau of Economic Research, New York.

[4] Reported by EC DG ECFIN in European Business Cycle Indicators (2015Q1).

2. Data

Qualitative data from the manufacturing survey of the joint European Union (EU) Business and Consumer Surveys[5] (BCS) available at European Commission's (EC) Directorate General for Economic and Financial Affairs (DG ECFIN) is used[6].

The suitability of stock levels is measured by the balance of responses to question 4 of EU harmonised manufacturing survey. Managers are supposed to evaluate current level of stocks as "above normal", "adequate" or "below". The assessment of the change in level of production is based on question 1 of the inquiry mentioned above, in which managers' report if production has "increased", "remained unchanged" or "decreased", during the last three months.

Question 1: How do you expect your production to develop over the next 3 months? It will...

(+) increase

(=) remain unchanged

(-) decrease

Question 4: Do you consider your current stocks of finished products to be…?

(+) more than sufficient (above normal)

(=) sufficient (normal for the season)

(-) too small (below normal)

The two questions refer to different time frames. The question on output change is related with the previous three months production levels whereas inventories appropriateness relates only with the current month. Consequently, for inventories assessment, in each month, three month moving averages are employed, so that a measure of the last three months inventories fit is obtained.

Despite using EC's setting as baseline, the research approach incorporated two main adjustments: instead of using quarterly data, monthly information is used, which allows for an enlarged number of observations and reinforces the real time properties of the exercise. Moreover, instead of quarter-on-quarter differences, year-on-year changes were employed, allowing for a better understanding of business cycle dynamics and reducing statistical noise. This new setting is, in addition, applied to the Euro Area and Spain in order to safeguard comparability.

In its 1st quarter 2015 Highlight, the EC related contemporaneous output with two month lagged inventories, with the objective of ensuring the causality between past inventories and subsequent production. Nevertheless, in this study, besides the EC's approach, inventories assessment lag is also adjusted depending on the higher absolute cross-correlation between the two variables studied.

Furthermore, this procedure is employed for the manufacturing sector as a whole, as well as for manufacturing specific segments, namely investment goods, intermediate goods (excluding mining and quarrying), consumer goods, durable consumer goods, non-durable consumer goods and foods and beverages industry. This level of detail is of upmost importance to judge the heterogeneity of the studied connection within sectors, given specific production processes and other particular industry factors.

3. Aggregate Manufacturing Sector

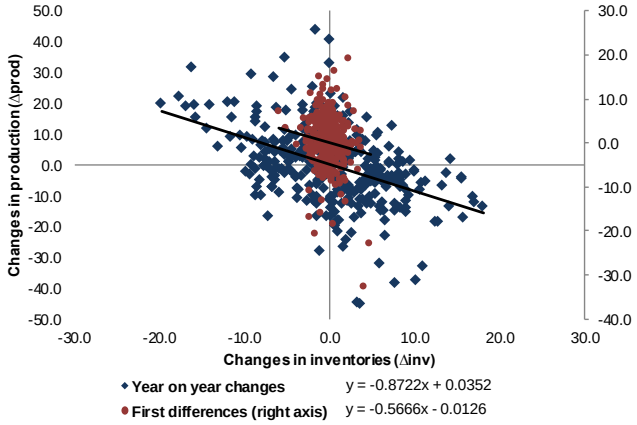
3.1. Portugal

Graph 1 displays the fitted relation between the year-on-year changes in production (∆prod) and the year-on-year changes in inventories[7] (∆inv) from January 1990 to January 2016.

[5]Surveys are grounded on a common methodology, since inquiries are harmonised and share the same time frame. All published confidence indicators from DG ECFIN are constructed as arithmetic means of balances of responses to a number of questions. BCS user programme methodological user guide available at:
http://ec.europa.eu/economy_finance/db_indicators/surveys/documents/bcs_user_guide_en.pdf

[6] In Manufacturing, for Portugal, 1242 firms are inquired, 2268 for Spain and 23940 for the entire Euro Area.

Graph 1 – Changes in production vs changes in inventories



Sources: DG ECFIN, author's calculations.

It illustrates that, as more firms admit having excessive stocks, the share of businesses reporting an increase in production over the previous 3 months diminishes. Likewise, Graph 1 also shows the results are not modified when first differences of production and inventories series are used[8].

The second step of this analysis consists in computing a bi-variate regression of the changes in production ($\Delta prod_t$) in a constant (β_0) and changes in inventories (Δinv_t):

$$\Delta prod_t = \beta_0 + \beta_1 * \Delta inv_t + \varepsilon_t$$

ε_t is the error term and *t* refers to the time period. The equation is estimated for 3 time frames: from 1990m01 to 2016m01, 1990m01 till 2007m12 and also between 2008m01 and 2016m01. The purpose of this segmentation is to understand if and how the responsiveness of production to stocks build-ups (β_1) muted with the financial crisis. Since, the cross-correlation between changes in output and inventories assessment is the highest when no lags are applied to stock level evaluations, this design is also tested.

Table 1 - Regression Results: Portugal (lag=2)

Lag=2	1990:01 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
β_0	-0.119	-0.371	0.601
Prob.	(0.817)	(0.480)	(0.726)
β_1	-0.732	-0.729	-1.705
Prob.	(0.000)	(0.000)	(0.000)
F	(0.000)	(0.000)	(0.000)
SE Regr.	11.418	7.512	16.764
Adj. Rsq	0.198	0.323	0.172

Sources: DG ECFIN, author's calculations.

Table 2 - Regression Results: Portugal (lag=0)

Lag=0	1990:01 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
β_0	-0.039	-0.205	0.928
Prob.	(0.950)	(0.677)	(0.573)
β_1	-0.980	-0.797	-2.030
Prob.	(0.000)	(0.000)	(0.000)
F	(0.000)	(0.000)	(0.000)
SE Regr.	11.083	7.208	16.069
Adj. Rsq	0.245	0.384	0.239

Sources: DG ECFIN, author's calculations.

Through Table 1 and 2, the negative link between stocks and production is confirmed, since with both lags and independently of sample specifications, β_1 is always negative and statistical significant at 99% confidence level. Thus, for a one percentage point (p.p.) increase in inventories balance of responses, production assessments decreases by 0.732 or 0.980 p.p., depending if the lag introduced equals 2 or 0, respectively. When a non-lagged specification is used, output becomes more sensitive to inventories misalign-

[7]Following EC (2015), changes in inventories are two month lagged.
[8] Moreover, the outcome is not modified when a non-lagged inventories specification is exploited.

ments while the estimation quality improves[9], since for all manufacturing industry groupings, the adjusted R squared increases and the standard error of the residuals diminishes.

Other important conclusion was that the dynamics between the two variables in study have changed with the financial crisis, independently of the lag employed. After the recession, β_1 became more negative (coefficient increased 134%, from -0.729 to -1.705, in 2 a month lagged setting), which implies a more volatile reaction of production given a change in stocks suitability.

3.2. Euro area and Spain

This impact is more visible when the analysis is extended to the Euro Area, as presented in Table 3. β_1 has increased in absolute terms, more than 70%, when both pre and post crisis periods are compared. The most remarkable difference in the results for Portugal and the Euro Area is that the sensitivity of production to inventories is considerably higher for the Euro Area. This suggests the existence of country specific effects.

Table 3 - Regression Results: Euro Area (lag=2)

Lag=2	1990:01 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
β_0	-0.111	0.154	-0.607
Prob.	(0.816)	(0.737)	(0.508)
β_1	-2.220	-1.736	-2.985
Prob.	(0.000)	(0.000)	(0.000)
F	(0.000)	(0.000)	(0.000)
SE Regr.	8.433	6.727	8.989
Adj. Rsq	0.738	0.706	0.849

Sources: DG ECFIN, author's calculations.

To cross-check this hypothesis, the exercise is extended to Spain, which is expected to have a production context closer to the Portuguese one.

Table 4 - Regression Results: Spain (lag=2)

Lag=2	1990:01 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
β_0	-0.498	-0.991	0.244
Prob.	(0.378)	(0.094)	(0.848)
β_1	-1.671	-1.519	-2.068
Prob.	(0.000)	(0.000)	(0.000)
F	(0.000)	(0.000)	(0.000)
SE Regr.	9.777	8.645	11.550
Adj. Rsq	0.685	0.701	0.691

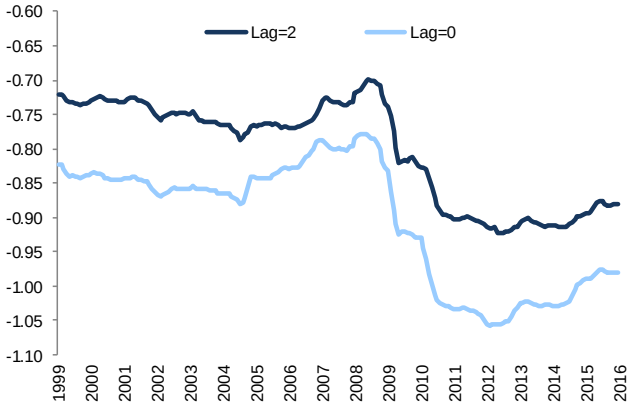
Sources: DG ECFIN, author's calculations.

As reported in Table 4, β_1 is smaller for Spain than for the Euro Area (-1.671 and -2.220, respectively), although substantially higher when compared with that of Portugal (-0.732). Moreover, the goodness of the fit and the volatility of the residuals of the regressions suggest inventories imbalances are a worse indicator of subsequent production for Portugal. For Spain the link between inventories and production has also become more negative with the crisis (-1.519 vs -2.068).

At a first glance, the financial crisis may have caused an increase in firms risk aversion. Nonetheless, factors like technological progress (e.g. allowing for just-in-time inventories management) or the increase in the perception of the opportunity costs of holding higher stocks may also be at play. Therefore, following EC (2015), expanding window estimations are employed to infer on the evolution of inventories changes coefficient. The objective is to understand if there was a shock in stocks-output dynamics with the financial crisis or a gradually modification, underpinning a long-term trend.

[9]Nonetheless, a 2 month lagged inventories specification is always tested and presented because the relevance depends of this study also depends on inventories ability to predict production. Moreover, the marginal gain of using a non-lagged approach is slight. In addition, it is not clear if better estimations in the context of a non-lagged setting are related with reverse causality, since inventories assessment may be a result of past production and not the opposite.

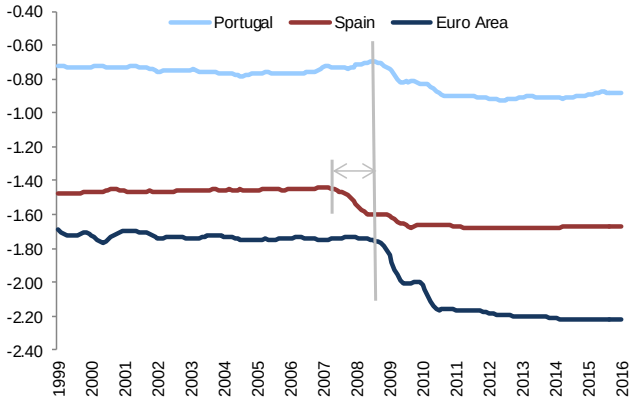
Graph 2 - β1 expanding window estimations for the aggregate manufacturing sector: Portugal



Sources: DG ECFIN, author's calculations.

As presented in Graph 2, data confirms the link has indeed suffered a transformation with the financial crisis, whether the lag applied equals 2 or 0. Likewise the lag specification has mostly a level effect while the evolution of the coefficient estimation is rather similar through time.

Graph 3 - β1 expanding window estimations for the aggregate manufacturing sector (Lag=2)



Sources: DG ECFIN, author's calculations.

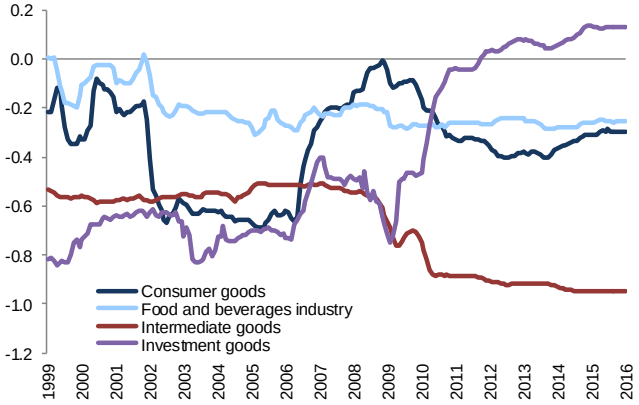
When testing with survey data from the Spanish and Euro Area manufacturing sector (Graph 3), the impact of the crisis is discernible and especially deep for the Euro Area[10]. In addition the outcome of the recession in this context seems to happen sooner for the Spanish economy. Using unit root breakpoint tests the financial crisis effect is detected for Spain in the 10th month of 2007 and in 10th month of 2008 for the Euro Area and Portugal[11]. Through specific manufacturing industry grouping examination, the drivers of this anticipation may be detected.

4. Industry Specific Analysis

At industry level, it is possible to identify some heterogeneity for Portugal, not only in the sensitivity of production to stock build-ups or shrinkages but also in the magnitude of this relation through time (Graph 4).

[10] Hence, there must be other countries where there was a counter weighting effect (was stronger).
[11] When using Quandt-Andrews breakpoint test, the crisis effect is detected in the 3rd month of 2008, in the 4th month of 2009 and in the 12th month of 2009, for Spain, the Euro Area and Portugal, respectively. Quandt-Andrews breakpoint test corresponds to the application of the Chow test at all dates while in unit root breakpoint test, break selection depends on Dickey-Fuller t-statistic.

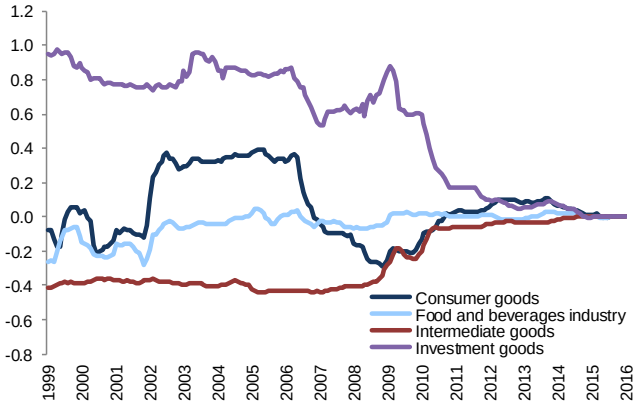
Graph 4 - β1 expanding window estimations by industry: Portugal (lag=2)



Sources: DG ECFIN, author's calculations.

The crisis shock can be identified for all industries, despite in a lesser magnitude for food and beverages industry (Graph 4). In fact, for this industry the relation between inventories and output is very stable throughout the entire sample (Graph 5).

Graph 5 – Difference between β1 estimated for the whole sample and using expanding window procedure (lag=2)

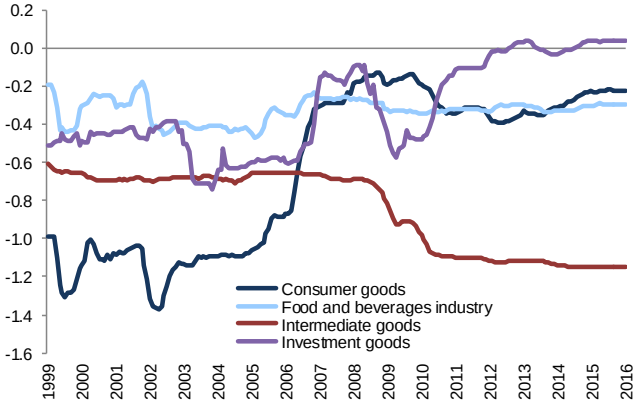


Sources: DG ECFIN, author's calculations.

From a theoretical point of view the observed link in investment goods segment is not intuitive. After 2009 the negative association between changes in production and inventories assessment becomes less negative and at some point positive. When the optimal inventories lag is applied[12], the results indicate that in this segment, the link stabilizes around 0, which is closer to the level observed before 2008 (Graph 6).

[12] The industry specific estimations results, for all sample and lag specifications, are shown in annex.

Graph 6 - β1 expanding window estimations by industry: Portugal (adjusted lags)



Sources: DG ECFIN, author's calculations.

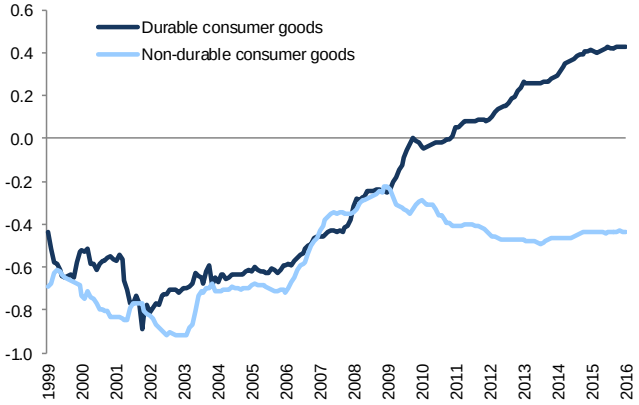
It is however important to highlight that except for the intermediate goods industry (r-squared of 34.2% and 50.3% for the entire sample estimations, using a 2 month lagged setting or adjusted lags, respectively), the results obtained for Portugal suggest the regressions are not well specified[13], even if they are significantly improved with the lag tuning. Specifically, the r-squared of the estimations is rather poor (r-squared close to zero) in consumption goods, mainly because of non-durables segment. In some other industry groupings (investment goods and durable goods), when using the entire sample, estimations with r-squared close to zero are obtained, but this is related with a transformation in the $\beta_{1,}$ which was negative before the crisis and positive thereafter.

Nowadays, intermediate goods industry appears to have the most responsive link (most negative coefficient), which may be related with the drivers of globalization, specifically with the reduction in trade costs and technological progress that allowed for the international segmentation of production processes, resulting in an increase in the integrated nature of production in international trade and global value chains.

Both consumer goods and food and beverages segments are shown to have lower responsiveness. In addition, developments in consumer goods industry before the crisis were driven by both durable and non-durable goods. However, the recession looks to have triggered a different dynamic, since the non-durable consumer goods segment started to follow a very different path while in the case of durable goods there is a positive trend that started before 2008 (Graph 7). In fact, after 2008 the coefficient on inventories assessment becomes positive (-0.409 to 0.579).

[13] By "not well specified", it is meant that the exogenous variables have low explanatory power over the endogenous one. Hence, for all estimations, to measure how well the model fits the data and the accuracy of the predictions, the adjusted R squared and the standard errors of the regression are presented. This may be due to unrepresentative samples for Portugal in some sectors since the best quality estimations are for intermediate goods sector, which is more significant in Portugal. Estimations for the investment goods sector, when using the entire sample, should have no economical interpretation, given the existence of structural changes, between the 2 periods considered. This is clear when the results for the pre and post-crisis sample estimations are compared, given the signal of the coefficient of inventories assessment was initially negative and became positive after the crisis. The r-squared of the estimation when using the entire sample is null, while it increases 5% both in pre and post crisis sample estimations (2 month lag setting). The same applies to durable goods sector in which the r-squared equals 2.3%, 9,1% and 14,2%, when using all observations , pre or post crisis samples, respectively.

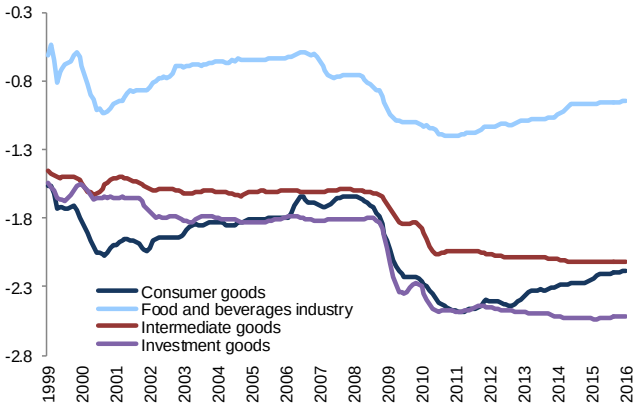
Graph 7 - β1 expanding window estimations in consumer goods segments: Portugal (lag=0)



Sources: DG ECFIN, author's calculations.

For the Euro Area (Graph 8), apart from the unavoidable influence of the financial crisis, β_1 within sample estimations are highly stable. This may be connected with considerably better specified regressions. Besides, the food and beverages industry is significantly less sensitive to inventories suitability than in the other manufacturing segments. Once more, subsequent production is shown to be more reactive to stocks imbalances at Euro Area level.

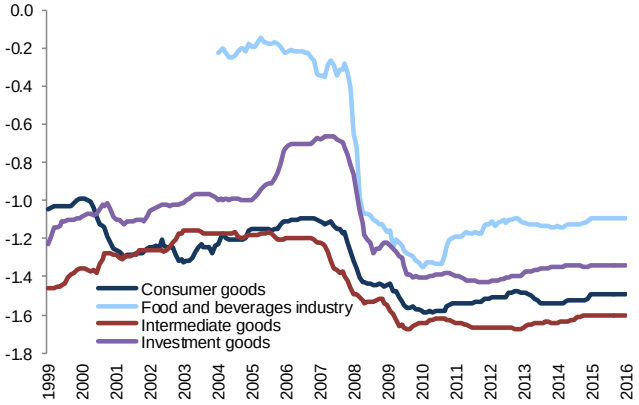
Graph 8 - β1 expanding window estimations by industry: Euro Area (lag=2)



Sources: DG ECFIN, author's calculations.

For January 2016, Δinv coefficient for the Euro Area is estimated to be twice the size of the one estimated for the Portuguese economy (-2.063 and -0.948, respectively). For the same time period, estimated β_1 for Spain is -1.603. In general, when considering the link concerning past inventories and subsequent output, Spain can be seen as a middle case. Less intuitive results for some Portuguese industries are not corroborated by results obtained using survey data of the Spanish economy (Graph 9). The intermediate goods industry, when compared with the others manufacturing segments, looks to be the one that firstly captures the effects of the financial crisis effect. As seen in last section, Spain forestalls the impact of the crisis on stocks-output dynamics (Graph 3). Consequently, Spanish anticipation of the recession in this context should be highly influenced by this specific industry. The underlying rationale should be associated with the sector's higher susceptibility to global economic conditions, given the international segmentation of production.

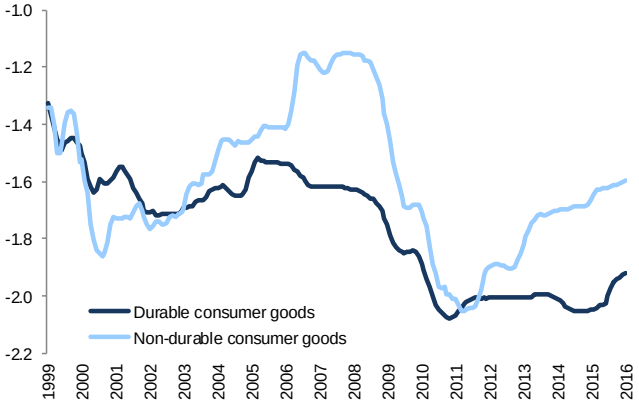
Graph 9 - β1 expanding window estimations by industry: Spain (lag=2)



Sources: DG ECFIN, author's calculations.

When examining the intra-dynamics of consumer goods for the Euro Area (Graph 10), despite the typical shock in 2008, β_1 looks to be slightly increasing in durable goods segment after 2009, while this process is not identifiable in Spain (Graph 11).

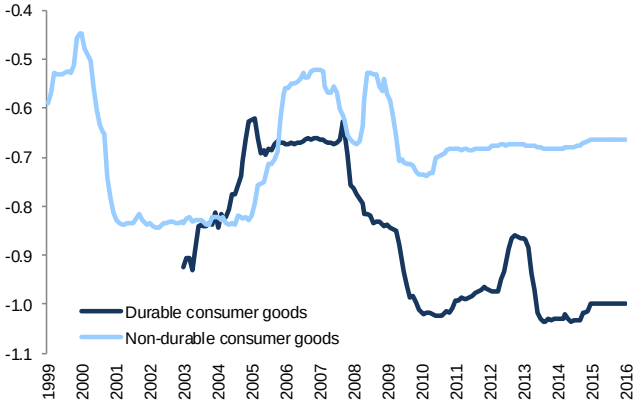
Graph 10 - β1 expanding window estimations in consumer goods segments: Euro Area (lag=2)



Sources: DG ECFIN, author's calculations.

Per last, for the Spanish economy and in the durable goods industry (Graph 11), there is some erratic behaviour. Specifically, an abrupt reduction in estimated β_1 is perceptible in 2007, followed by an opposing effect in 2008 and again a fast decrease in 2009, with subsequent stabilization.

Graph 11 - β1 expanding window estimations in consumer goods segments: Spain (lag=2)



Sources: DG ECFIN, author's calculations.

5. Conclusion

The present study confirms the negative relation between production and past inventories evaluation. This link is more pronounced for the Euro Area than for Portugal, while Spain is an intermediate case. As in the 2015 1st quarter edition of the European Business Cycle Indicator, the most striking remark is the impact of the financial crisis on stocks-output dynamics, given that after the recession firms became more sensitive to inventories imbalances. Furthermore, this effect looks to be permanent, as the studied relation stabilizes after the crisis.

In Portugal, there is considerably heterogeneity among manufacturing industry groupings. Intermediate goods is the sector where production is more responsive to stocks misalignments, while food and beverages industry appears to have the more stable link. Meanwhile there are some sectors where the relation and its evolution is not intuitive (consumer and investment goods).

In the Euro Area, food and beverages industry stands for low responsiveness to stock mismatches, when compared with others industry groupings. Investment goods is the sector where output is more sensitive to stocks assessments. Additionally, the effect of the financial crisis is rather homogeneous among sectors.

The intermediate goods industry anticipated the crisis effect in Spain. Like in Portugal, this sector appears to be the one where inventories evaluation has more impact on future production. Overall, Spain looks to be an intermediate case between Portugal and the Euro Area.

In future research, it would be relevant to understand how uncertainty may affect the relation between stocks and production, since demand volatility or dispersion may have an influence on optimal inventories management practices. Besides, this impact may be different across industry groupings. Studying the link between inventories and output while controlling for other factors, like expectations, would also incorporate additional value, especially for Portugal, given difficulties in explaining future production with current assessment of stocks in some manufacturing segments.

6. Annex

Table 5 – Optimum number of lags* applied to inventories assessment changes series

Industry	Inventories assessment lag
Consumption goods	0
Non-durable goods	0
Durable goods	0
Investment goods	1
Intermediate goods	0
Food and beverages	4

Sources: DG ECFIN, author's calculations.

*Based on the highest cross correlation with production changes series.

Table 6 - Regression results by industry: Portugal (lag=2)

Lag=2	1995:10 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
Consumption goods			
β0	-0.756	-0.873	-0.753
Prob.	0.298	0.230	0.614
β1	-0.297	-0.191	-0.393
Prob.	0.025	0.195	0.101
F	0.025	0.195	0.101
SE Regr.	11.326	8.719	14.490
Adj. Rsq	0.016	0.005	0.018
Durable goods			
β0	-0.608	-1.499	2.047
Prob.	0.687	0.248	0.502
β1	0.233	-0.409	0.579
Prob.	0.011	0.000	0.000
F	0.010	0.000	0.000
SE Regr.	23.430	15.649	29.450
Adj. Rsq	0.023	0.091	0.142
Non-durable goods			
β0	-0.539	-0.986	0.151
Prob.	0.447	0.202	0.911
β1	-0.166	-0.134	-0.211
Prob.	0.193	0.353	0.363
F	0.193	0.353	0.363
SE Regr.	11.015	9.284	13.288
Adj. Rsq	0.003	-0.001	-0.002
Food and beverages industry			
β0	0.231	0.843	-0.724
Prob.	0.783	0.442	0.581
β1	-0.257	-0.200	-0.349
Prob.	0.005	0.087	0.015
F	0.004	0.087	0.015
SE Regr.	13.007	13.142	12.822
Adj. Rsq	0.029	0.013	0.051
Intermediate goods			
β0	0.516	0.321	1.022
Prob.	0.580	0.696	0.566
β1	-0.948	-0.543	-1.594
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	14.527	9.949	17.447
Adj. Rsq	0.342	0.269	0.497
Investment goods			
β0	0.021	0.010	-2.110
Prob.	0.987	0.994	0.441
β1	0.131	-0.478	0.604
Prob.	0.378	0.005	0.018
F	0.378	0.005	0.018
SE Regr.	20.750	15.069	26.292
Adj. Rsq	-0.001	0.046	0.048

Table 7 – Regression results by industry: Portugal (Adjusted lags)

Adj. Lags	1995:10 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
Consumption goods			
β0	-0.747	-0.878	-0.518
Prob.	0.306	0.223	0.730
β1	-0.221	-0.241	-0.192
Prob.	0.098	0.086	0.448
F	0.098	0.086	0.448
SE Regr.	11.379	8.681	14.652
Adj. Rsq	0.007	0.013	-0.004
Durable goods			
β0	-0.403	-1.533	2.637
Prob.	0.782	0.240	0.325
β1	0.425	-0.380	0.881
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	22.677	15.742	25.953
Adj. Rsq	0.085	0.080	0.334
Non-durable goods			
β0	-0.647	-1.113	0.105
Prob.	0.351	0.143	0.937
β1	-0.433	-0.352	-0.546
Prob.	0.001	0.013	0.018
F	0.001	0.013	0.018
SE Regr.	10.789	9.117	12.958
Adj. Rsq	0.043	0.035	0.047
Food and beverages industry			
β0	0.270	0.893	-0.567
Prob.	0.747	0.413	0.670
β1	-0.296	-0.274	-0.348
Prob.	0.001	0.018	0.019
F	0.001	0.018	0.019
SE Regr.	12.959	13.060	12.910
Adj. Rsq	0.040	0.032	0.047
Intermediate goods			
β0	0.539	0.320	1.139
Prob.	0.506	0.656	0.417
β1	-1.148	-0.696	-1.872
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	12.624	8.672	13.724
Adj. Rsq	0.503	0.445	0.689
Investment goods			
β0	0.426	1.100	-0.468
Prob.	0.749	0.385	0.871
β1	0.041	-0.126	0.177
Prob.	0.780	0.458	0.499
F	0.780	0.458	0.499
SE Regr.	20.624	14.883	27.287
Adj. Rsq	-0.004	-0.003	-0.006

Sources: DG ECFIN, author's calculations.

Table 8 – Regression results by industry: Euro Area (lag=2)

Lag=2	1995:10 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
Consumption goods			
β0	-0.344	-0.193	-0.271
Prob.	0.385	0.614	0.727
β1	-2.131	-1.593	-2.647
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	6.157	4.594	7.599
Adj. Rsq	0.527	0.475	0.592
Durable goods			
β0	0.241	0.144	0.800
Prob.	0.751	0.835	0.609
β1	-1.920	-1.627	-2.640
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	11.848	8.363	15.270
Adj. Rsq	0.460	0.591	0.414
Non-durable goods			
β0	-0.440	-0.156	-0.737
Prob.	0.299	0.710	0.382
β1	-1.597	-1.149	-1.870
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	6.581	5.048	8.249
Adj. Rsq	0.382	0.252	0.457
Food and beverages industry			
β0	0.065	0.443	-0.293
Prob.	0.879	0.361	0.713
β1	-0.890	-0.708	-1.183
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	6.718	5.841	7.777
Adj. Rsq	0.208	0.186	0.236
Intermediate goods			
β0	0.067	0.299	-0.220
Prob.	0.930	0.712	0.852
β1	-2.063	-1.542	-2.810
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	11.932	9.811	11.560
Adj. Rsq	0.710	0.664	0.834
Investment goods			
β0	-0.465	0.040	-1.094
Prob.	0.494	0.953	0.379
β1	-2.465	-1.755	-2.832
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	10.593	8.240	12.192
Adj. Rsq	0.726	0.558	0.815

Table 9 – Regression results by industry: Spain (lag=2)

Lag=2	1995:10 - 2016:01	1990:01 - 2007:12	2008:01 - 2016:01
Consumption goods			
β0	-0.697	-1.515	0.250
Prob.	0.258	0.048	0.807
β1	-1.495	-1.269	-1.902
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	9.271	9.152	9.250
Adj. Rsq	0.375	0.303	0.505
Durable goods			
β0	0.082	-5.482	5.315
Prob.	0.972	0.069	0.124
β1	-1.000	-0.757	-1.534
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	30.601	28.347	31.664
Adj. Rsq	0.183	0.156	0.265
Non-durable goods			
β0	-0.256	-1.139	1.369
Prob.	0.696	0.161	0.243
β1	-0.663	-0.663	-0.565
Prob.	0.000	0.000	0.002
F	0.000	0.000	0.002
SE Regr.	9.797	9.805	9.768
Adj. Rsq	0.133	0.120	0.094
Food and beverages industry			
β0	-0.608	-2.202	0.962
Prob.	0.510	0.093	0.442
β1	-1.093	-0.406	-1.556
Prob.	0.000	0.229	0.000
F	0.000	0.229	0.000
SE Regr.	12.213	12.347	11.527
Adj. Rsq	0.137	0.005	0.320
Intermediate goods			
β0	-0.298	-1.348	1.127
Prob.	0.742	0.152	0.543
β1	-1.603	-1.459	-1.721
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	13.731	11.358	16.926
Adj. Rsq	0.560	0.523	0.597
Investment goods			
β0	-1.352	-1.507	-0.323
Prob.	0.242	0.251	0.875
β1	-1.341	-0.813	-1.983
Prob.	0.000	0.000	0.000
F	0.000	0.000	0.000
SE Regr.	17.321	15.447	18.934
Adj. Rsq	0.292	0.132	0.496

Sources: DG ECFIN, author's calculations.