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Study on price transmission in the sugar sector

STUDY ON PRICE TRANSMISSION IN THE SUGAR SECTOR

Final report

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Study on price transmission in the sugar sector – Final report

This study was conducted by Areté srl with the contribution of internal and external experts as listed below.

<i>Prof. Maurizio Aragrande</i> ⁽¹⁾	<i>University of Bologna</i>	<i>Project Leader</i>
<i>Dr. Enrica Gentile</i>	<i>Areté srl</i>	<i>Project Manager</i>
<i>Dr. Mauro Bruni</i>	<i>Areté srl</i>	
<i>Dr. Alberico Loi</i>	<i>Areté srl</i>	
<i>Dr. Nico Boldrin</i>	<i>Areté srl</i>	
<i>Dr. Martina Silimbani</i>	<i>Areté srl</i>	
<i>Dr. Ludovico Gruppioni</i>	<i>Areté srl</i>	
<i>Dr. Tommaso Micalella</i>	<i>Areté srl</i>	
<i>Dr. Linda Fioriti</i>	<i>Areté srl</i>	
<i>Dr. Roberto Esposti</i> ⁽²⁾	<i>Dep. of Economics and Social Sciences - Marche Polytechnic University of Ancona</i>	

(1) Author of chapters 2.2.2, 3 and 4.4.

(2) Contribution to the literature review.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP = Africa, Caribbean, Pacific
ALI = Adjusted Lerner Index
CMO = Common Market Organisation
EBA = Everything But Arms (EU initiative)
EU = European Union
HHI = Herfindahl-Hirschman Index
HPT = horizontal price transmission
LDC = Least Developed Country
MY = marketing year(s)
NMS = New Member States
PCM = perfect competition market
PT = price transmission
SCP = structure-conduct-performance (paradigm)
VAR = Vector Autoregression (Model)
VECM = Vector Error Correction Model
VPT = vertical price transmission
WTO = World Trade Organisation

1 Introduction

The Commission's Directorate-General for Agriculture and Rural Development (DG AGRI) commissioned the present study to **assess the influence of the 2006 reform of the EU sugar regime on price transmission in the sugar sector**. The investigations to be carried out had to focus on the different types of transmission of price changes, studying the reasons for any uneven or asymmetric price transmission between sugar producers and final consumers, and taking into account the intermediate stages of the production and marketing chain and any available information on competition and concentration in the sugar sector.

The study was centred around **three key questions**.

1. "To what extent has a change in the institutional price of sugar as a result of the reform resulted in a change of the retail price of sugar? *The answer to this question will also present the evidence found, if any, that the sugar market after the reform has been efficient*¹"
2. "To what extent has the Common Agricultural Policy (CAP) influenced the degree of competition and concentration in the sugar industry after the 2006 reform? And has this had an effect on consumer prices?"
3. "In the cereal sector, where the CAP reforms have reduced the distance between domestic and international prices, liberalization reforms (WTO – Uruguay Round) seem to have positively influenced price transmission. Did the same effect occur in the sugar sector? *The answer to this question will have to clearly distinguish the effects resulting from the CAP reform and the trade liberalisation following the WTO-Uruguay Round*"

The results of the study are illustrated in this report, which features 9 chapters:

1. **Introduction** (present chapter).
2. **Review of literature on price transmission in the sugar and other food sectors**, also featuring summaries of the most significant references for each of the three key questions.
3. **Theoretical analysis of the transmission of price changes** for the relevant types of transmission: vertical, horizontal and indirect horizontal.
4. **Preliminary theoretical assessment² of the new market rules in the EU sugar sector in relation to price transmission**, illustrating the results of an investigation on the expected effects of policy changes introduced by the reform on the relevant types of price transmission.
5. **Study methodology**, providing a concise description of the same with particular focus on the econometric methods and tools which were used for the assessment.
6. **Reply to question 1.**
7. **Reply to question 2.**
8. **Reply to question 3.**
9. **Conclusions** drawn on the findings from the three key questions.

The detailed list of references for literature review, the list of information sources and the detailed results of the econometric tests carried out are provided as annexes to the present report.

¹ According to the *Study on price transmission in the Agro-Food Sector* (Report for European Commission – Agriculture DG, Agra CEAS Consulting Ltd 2064/EHO/July 2003) "in an 'efficient' market any change in the institutional price of sugar would be reflected in a corresponding change in the retail price of sugar".

² Referred to as "preparatory assessment" in the Tender Specifications for the study.

SECTION A – INTRODUCTORY CHAPTERS

2 Review of literature on price transmission in the sugar and other food sectors

2.1 General approach

The identification of the relevant literature was carried out by applying a number of selection criteria, namely:

1. Pertinence to the study object, according to the scope defined in the Tender Specifications³.
2. Scientific value and authoritativeness of the authors.
3. Preference for recent references (i.e. published in the last ten years) over older ones.
4. Presence of linkages with the present study, i.e. presence of significant similarities or differences (in terms of objectives, sector and/or issues under investigation, methodology applied).

From the complete list of the relevant literature, a number of references featuring critical developments from a theoretical and/or a mathematical/statistical viewpoint were selected: a synthetic presentation of each of these references is provided at § 2.2.

2.2 Overview of the most relevant references

Each of the most relevant references identified by applying the criteria described at § 2.1 is referred to one of the three study questions, in the light of its linkages with the same. After a brief overview of the main linkages between the relevant references selected and the study question they are related with, a synthetic presentation of each reference is provided in a series of tables featured in the three paragraphs which follow (§ 2.2.1 for question 1, § 2.2.2 for question 2 and § 2.2.3 for question 3). Each table features the following items:

1. Identification of the reference ("Paper").
2. Objectives of the investigation ("Objective").
3. Methodology applied ("Methodology").
4. Results achieved ("Results").
5. Linkages with the present study, i.e. presence of significant similarities or differences in terms of objectives, sector and/or issues under investigation, methodology applied ("Diff./Sim.").

2.2.1 Overview of the relevant references for question 1

The issue under investigation in the framework of question 1 is quite straightforward from the standpoint of economic theory, and the general theoretical framework for its investigation is well established. However, empirical studies dealing with the food sector often use different econometric approaches for their investigations: as a consequence, literature review for question 1 was mainly focused at highlighting such differences, and at relating them to the methodology applied in the present study.

An overview of the most significant references is presented in the following tables.

³ "existing scientific literature analysing the transmission of price changes, at EU or Member State level, in the sugar and other food sectors. Particular attention should be given to the results of case studies" (Tender Specifications, § 2.4.2, Task 2.2 Literature Review).

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Paper	ABDULAI, A. (2002) “Using Threshold Cointegration to estimate asymmetric Price Transmission in the Swiss Pork Market”, Applied Economics Vol. 18(1), pp. 37-48.
Objective	Analysing the presence of asymmetry in the VPT mechanism between producer price and retail price in the Swiss pork market during the period 1988-1997.
Methodology	Econometric analysis based on Threshold Cointegration Method.
Results	Long-run negative shocks in producer prices cause a strong response of retail prices, while positive shocks are allowed to persist. Producer prices do not significantly react in the presence of long-run shocks. Retail prices respond significantly in the presence of contemporaneous and lagged changes in producer prices, but there is no statistical evidence about the opposite causal effects.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics.

Paper	GOODWIN, B. K. AND HARPER, D. C. (2000) “Price Transmission, Threshold Behaviour and asymmetric Adjustment in the U.S. Pork Sector” Journal of Agricultural & Applied Economics, Vol. 32, pp.543-553.
Objective	Analysing VPT between farm, wholesale and retail levels in the US pork sector during the period 1987-1998.
Methodology	Econometric analysis based on Threshold Cointegration Method.
Results	The degree of VPT varies according to threshold conditions; in particular, the transmission of shocks seems to be unidirectional (from farm to wholesale and then to retail level).
Diff./Sim.	The paper is mainly focused on long-run dynamics and effects generated by threshold-bounded shocks, while the present study tackles both long-run and short-run dynamics.

Paper	JENSEN, J. D. AND MOLLER, A. S. (2007) “Vertical price transmission in the Danish food marketing chain” Working paper, Institute of Food and Resource, University of Copenhagen.
Objective	Analysing VPT between primary production, processing, wholesale and retail levels in some Danish food marketing chains (pork, chicken, eggs, milk, sugar, apples).
Methodology	Econometric analysis based on Vector Error Correction Model.
Results	For most analysed commodities VPT tends to be asymmetric towards price increases and is mainly present in the short run. With a few exceptions, long-run VPT tends to be symmetric.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics. Both studies use Vector Error Correction Model (VECM).

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Paper	KARANTININIS, K., KATRAKYLIDIS K. AND PERSSON, M. (2011) “Price Transmission in the Swedish Pork Chain: Asymmetric non linear ARDL” Paper presented at the EAAE 2011 Congress, Change and Uncertainty Challenges for Agriculture, Food and Natural Resources, August 30-September2, Zurich.
Objective	Analysing VPT between producer, wholesale and retail levels in the pork sector for Sweden in the period 1995-2010.
Methodology	Econometric analysis based on asymmetric non-linear Autoregressive Distributed Lag Cointegration approach .
Results	VPT from producer to wholesaler is asymmetric both in the long and short run; VPT from producer to retailer is asymmetric in the short run, but is symmetric in the long run; VPT from wholesaler to retailer is symmetric in the short run, but is asymmetric in the long run.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics.

Paper	KUIPER, W. E., PENNING JOOST M.E. AND VERHEES FRANS J.H.M. (2011) “A new econometric test for asymmetric price adjustment by cointegrating vector restrictions with an application to the U.S. and Dutch pork chains” Paper presented at the EAAE 2011 Congress, Change and Uncertainty Challenges for Agriculture, Food and Natural Resources, August 30-September2, Zurich.
Objective	Analysing VPT between farm, wholesale and retail levels in the pork sector for Netherlands and USA in the period 2001-2009.
Methodology	Econometric analysis based on Vector Error Correction Model.
Results	VPT in terms of short run-adjustment generated by long-run cointegration relationships is: 1) asymmetric from farm to wholesale level, but is symmetric from wholesale to retail level in the Netherlands; 2) symmetric from farm to wholesale level, but asymmetric from wholesale to retail level in the USA.
Diff./Sim.	The paper is mainly focused on adjustment of short-run dynamics generated by long-run cointegration relationships, while the present study tackles both long-run and short-run dynamics.

Paper	REZITIS, A.N., STAVROPOULOS, K.S (2011) “Price Transmission and Volatility in the Greek Broiler Sector: A Threshold Cointegration Analysis” Journal of Agricultural & Food Organization, Vol. 9(1): Article 8.
Objective	Investigating the non-linear adjustment and price volatility between consumer and producer prices in the Greek broiler sector over the period January 1993-December 2009.
Methodology	Econometric analysis based on Threshold Vector Error Correction Autoregressive Model and GARCH Model.
Results	Asymmetry of VPT is detected when the threshold effects are considered. Producer and consumer broiler prices present significant levels of autoregressive persistence, i.e. volatility shocks tend to last long; producer price volatility shows higher persistence than consumer price volatility.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics. However, the econometric tools used differ (Threshold Vector Error Correction Autoregressive Model and GARCH Model vs. Vector Error Correction Model).

Paper	V. CRAMON-TAUBADEL, S. (1998) “Estimating asymmetric Price Transmission with the Error Correction Representation: An Application to the German Pork Market” European Review of Agricultural Economics, Vol. 25, pp. 1-18.
Objective	Analysing VPT between producer and wholesale prices in the pork market of northern Germany during the period 1990-1993.
Methodology	Econometric analysis based on Vector Error Correction Model
Results	Wholesale price does not respond immediately to producer price changes and shows asymmetric adjustment to the long-run relationship. Producer price results to be weakly exogenous with respect to the long-run relationship.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics.

2.2.2 Overview of the relevant references for question 2

Differently from question 1, the issue under investigation in the framework of question 2 is quite complex from the standpoint of economic theory, as it concerns the mutual linkages between concentration and competition, and between these and price transmission along the sugar supply chain. As a consequence, the general theoretical framework for the investigation is much less consolidated than in the case of question 1, and the number of empirical studies dealing with the issue is much lower. This had implications for the review of the relevant literature for question 2, inasmuch it had to be focused on both the overall theoretical framework for the investigation and the econometric approaches used. Prior to the illustration of the most significant references, it is opportune to highlight some considerations stemming from the review.

The link between concentration and price transmission (PT) is often treated in the literature on PT, in particular (but not exclusively) when vertical price transmission (VPT) is considered. According to the *Structure-Conduct-Performance (SCP) paradigm*, sector concentration is the most important factor determining the way prices are transmitted along the supply chain⁴. A wide range of studies developed since the '50s and '60s stems from this conceptual framework. Also *many empirical studies on PT refer to the SCP paradigm* to affirm that the concentration is the main factor determining the pattern of PT which was previously tested empirically. Such studies do not test empirically (i.e. by means of econometric tools) the relationship between concentration and PT, but they often refer to the SCP paradigm to explain their empirical findings.

In a number of recent studies the *analysis of PT is complemented by a deeper understanding of the role played by concentration and competition*. In this respect, an important methodological difference should be underlined. Quantitative studies try to integrate concentration in their econometric models. This occurs either by searching for statistical correlation between prices and concentration indexes, or by introducing behavioural parameters in more complex econometric models (see for instance the references by ESCB, 2011; Varga, 2007; Cavicchioli 2009). On the opposite side, the outcome of the empirical analysis of PT is embedded in a deeper understanding of the competitive environment of the supply chain. In such studies the calculation of concentration indexes is complemented by the analysis of the wide array of competitive strategies applied by the firms in the supply chain (see for instance Bukeviciute et Al., 2009), in a more “qualitative” approach.

⁴ Concentration, considered in this case as *exogenously determined*, allows firms in a particular sector to exert market power along the supply chain (oligopolistic/oligopsonistic conduct). According to this view, alteration of PT mechanisms is in itself a sign that market power is exerted at some level of the supply chain, and the extent of such alteration is a measure of such market power.

It is worth noting that *the explanation of PT according to the SCP paradigm is questioned by a relevant part of the scientific literature*. First of all, the causal relationship between structure (and hence concentration) and conduct would not be universally applicable, as firms' strategic behaviour can also be aimed at modifying sector/market structure to their advantage⁵. Moreover, a wide range of situations concerning the firm and its relation with the environment may also explain imperfect PT: such factors are often referred to as "adjustment costs", and fall within the wider category of the transaction. Also technical factors⁶ and organisational factors⁷, directly or indirectly linked to the transaction cost scheme, are often called into question. Finally, also the existence of scale economies at firm level in a given competitive environment may lead to question the relationship between structure/concentration and PT.

One relevant aspect of the scientific debate is the *possibility to empirically test the theoretical hypotheses by way of quantitative methodologies*. Indeed the recent evolution of the statistical and econometric models provides a series of tools which try to account for the complexity of the factors determining PT.

From 2009 onwards studies often investigate also the *effect of the agricultural prices inflation of 2007/08 on PT*. The relevance of these works for the present study stems from two aspects: (i) they provide useful empirical data on PT; (ii) they provide interesting insights on how PT changes in the national contexts within the EU.

The results of the review of relevant literature for question 2 can be summarised as follows.

- The number of empirical studies explicitly linking concentration and competition with PT in the EU food sector is very limited; studies dealing with the EU sugar sector are virtually non-existent.
- The conclusions stemming from such empirical studies are often highly articulated and sometimes controversial. Accuracy of statistical/econometric models used has improved over time, but continues to be highly dependent on a number of specific factors (dataset used, underlying hypotheses, etc.). Some hypotheses for explaining PT are very difficult to test empirically, because the required data (e.g. marginal costs to test the effect of scale economies) are virtually impossible to collect.
- Many authors agree on the need to complement empirical analysis through statistical/econometric models with a deeper knowledge of the functioning of the sector/market under study, as such knowledge allows better design of structural models, and permits – in the case of correlation models - to support or to confute the results achieved, or to complete them with qualitative considerations addressing possible drawbacks of the models themselves.

In the tables which follow, the section "Results" focuses on linkages between PT and concentration / competition.

⁵ In this case the structure of a sector would be *endogenously* determined.

⁶ Such as the nature of the product (e.g. its perishability), seasonal patterns of the production process, non-contemporaneity between production and demand, etc.

⁷ Such as the degree of vertical integration in the supply chain.

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Paper	BEN-KAABIA, M., GIL J. M., (2007) “Asymmetric price transmission in the Spanish lamb sector” European review of agricultural economics, 2007, vol. 34, n. 1, p. 53-80
Objective	Study of non-linear adjustment of prices between farm and retail prices in the lamb sector in Spain
Methodology	Three-regimes Threshold Vector Error-Correction Model (TVECM)
Results	The Authors mention the concentration of the retail sector and the management practices of the firms among the possible causes of price rigidity at retail level. Also transaction costs are evoked as a possible cause of asymmetric price transmission, but no empirical test is carried out in this respect.
Diff./Sim.	The paper differs from the present study for the use of threshold VECM

Paper	BUKEVICIUTE, L. ET AL. (2009) “Price transmission along the food supply chain in the European Union” 113th EAAE Seminar “A resilient European food industry and food chain in a challenging world”, Chania, Crete, Greece, date as in: September 3 - 6, 2009
Objective	Measuring and understanding VPT along food supply chains across EU Member States, in particular in relation to agricultural price spikes of 2007/08
Methodology	Error Correction Model
Results	The results are explained on the basis of a supply chain approach; different possible causes (fragmentation, concentration and consolidation, market power along the supply chain; institutional settings and business practices) are mentioned, but not tested empirically.
Diff./Sim.	Quantitative methods correspond in part with those applied to the present study (ECM related models). Qualitative methods (in particular the use of the supply chain approach) are also partly corresponding to the ones adopted in the present study. However, differently from the present study the relationship between degree of competition and PT is not empirically tested.

Paper	CAVICCHIOLI, D. (2009) “L’analisi di trasmissione del prezzo lungo la filiera agroalimentare per individuare l’esercizio del potere di mercato” Tesi della Scuola di Dottorato di Ricerca in Territorio, Ambiente, Risorse e Salute, Università di Padova (http://paduaresearch.cab.unipd.it/2134/) (Ph.D. thesis)
Objective	The study tries to detect the presence of market power along the milk supply chain in Italy during the period 1996-2008.
Methodology	Error Correction Model, based on the application of the model developed by Gardner (1975), modified according to Lloyd (2006) to take into account the hypothesis of non-competitive behaviour in the intermediate stages of the supply chain.
Results	The empirical results show that in general milk consumer price is positively related with production and marketing costs, and that market power was exerted within the Italian milk supply chain during the period 2000-2008.
Diff./Sim.	Despite some similarities (focus on a single sector, empirical assessment of the influence of market power on price transmission), the paper differs from the present study inasmuch it tries to detect the existence of market power through the estimation of milk demand and supply functions, not through an empirical assessment of the relationship between degree of competition and PT.

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Paper	EUROPEAN SYSTEM OF CENTRAL BANKS (ESCB) (2011) “Structural features of distributive trade and their impact on prices in the euro area” Occasional Paper Series No 128/September 2011, The European Central Bank
Objective	Assessing whether distribution determines price level and inflation differences across countries, through investigation of the relation between PT and concentration in the food sector.
Methodology	ARDL, HHI impulse response functions from vector autoregression (VAR) models
Results	Differences in PT appear to be related to the structural and organisational differences of the distribution sector at national level.
Diff./Sim.	The general focus of this paper and the adopted methodology differ from the ones for the present study, but there are also some similarities, like the attention paid to the distribution sector, the use of concentration indexes, and the investigation of the relation between concentration, competition and PT.

Paper	LLOYD, T., MCCORRISTON, S., MORGAN, W., RAYNER, T. (2004) “Price transmission in imperfectly competitive vertical markets” Discussion Paper No. 04/09, University of Nottingham
Objective	Testing VPT in the beef sector through a vertically-related set-up where the retail stage may exercise oligopoly and/or oligopsony power.
Methodology	Vector Auto-Regressive (VAR) model
Results	The fall in demand for beef following the BSE crisis induces a differential effect on beef prices at the retail and farm stages. Market power of retailers and substitution effects exacerbate such asymmetry.
Diff./Sim.	The paper uses econometric tools (VECM) which are also used in the present study

Paper	VARGA, T (2007) “Vertical price transmission between market operators in Hungarian agricultural product chains” Studies in Agricultural Economics No. 106. p. 41-70. (2007)
Objective	Studying PT asymmetry for 18 food chains during the period 2000-2005 (product categories include raw materials, inputs and processed/final products for the following supply chains: pork meat and processed products; milk and dairy products; chicken; sunflower oil; sugar; wine).
Methodology	Error Correction Model (ECM)
Results	The study detects the existence of asymmetric VPT at the input supplier/agricultural producer level and at the agricultural producer/processor level, with several months (and even years) needed for restoring equilibrium (actually, in some cases no restoration is achieved after five years). Conversely, prices are transmitted more quickly and efficiently from processors to retailers (despite higher concentration of the retail sector). In general, the study concludes that “market dominance is not specific to either product chains or vertical levels”. In the sugar sector, agricultural producers are affected by asymmetric PT from both input suppliers and food processors, which are in turn affected by asymmetric PT from the retail sector.
Diff./Sim.	The study shares with the present study the interest for the analysis of the sugar sector and for measurement of PT at different levels of the supply chain

Paper	WANG, X., TADESSE, H., RAYNER, T. (2006) “Price transmission, market power and return to scale: a note”. Discussion Paper No. 06/07, University of Nottingham
Objective	Understanding the effect of non-constant return to scale on VPT in presence of market power (oligopoly/oligopsony) in the retail sector
Methodology	Quantity-setting conjectural variations model of the degree of PT
Results	Assumptions about return to scale add complexity to the way prices are transmitted. The firm’s decision to adapt to a price shock depends not only on its market power but also on the possibility to apply a mark-up variation. This possibility is mainly determined by the return to scale pattern of the firm. Increasing return to scale should theoretically weaken the effect of market structure on PT inasmuch a price variation (e.g. an input price increase) might be absorbed by a mark-up variation of opposite sign. However, the results of the investigations on this specific point remain ambiguous.
Diff./Sim.	The focus of the paper and the adopted methodology differ from the ones for the present study; however, the paper provides an interesting alternative explanation of VPT.

2.2.3 Overview of the relevant references for question 3

Question 3 is focused on horizontal price transmission (HPT), and hence on spatial market integration and the functioning of the Law of One Price, which constitute the theoretical cornerstones of the investigation. Among the various factors which can have an influence on the functioning of HPT, agricultural policies and trade policies are generally regarded as critical by scholars. The literature review for question 3 was hence especially focused on references:

- dealing with agricultural and food markets;
- investigating the influence of agricultural policies (with special attention to the CAP) and trade policies (with special attention to the transition from the GATT to the WTO, and successive developments) on the functioning of HPT.

The main considerations stemming from the review of the relevant literature for question 3 can be summarised as follows:

1. The number of studies focusing on the investigation of the influence of the CAP on HPT in the agricultural and food markets is not particularly high, and of these studies only a few deal with the sugar sector.
2. Many studies underline that it is extremely difficult to isolate the influence of agricultural and trade policies on HPT from the role played by a wide array of other factors: transaction costs (including transport costs), exchange rates, inflation rates, labour cost, energy prices, etc.
3. In recent times, authors have shown a particular interest in the investigation of the effect of agricultural price shocks of 2007/08 on HPT.

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Paper	BALCOME, K., BAILEY, A. AND BROOKS, J. (2007) “Threshold effects in price transmission: the case of Brazilian wheat, maize and soya prices” American Journal of Agriculture Economics, No 89, pp. 308-323.
Objective	Testing the presence and the form of threshold effects in HPT for wheat, maize and soya prices among the US, Argentina and Brazil over the period: May 1988-May 2001 for wheat, August 1986-May 2001 for maize and May 1988-April 2001 for soya.
Methodology	Econometric analysis based on Threshold Vector Error Correction Model.
Results	Wheat and soya price pairs appear to have smaller thresholds than maize price pairs; there is causality that flows from Argentine and US prices towards Brazilian prices.
Diff./Sim.	The paper is mainly focused on long-run dynamics, while the present study tackles both long-run and short-run dynamics. The employed econometric tool is different (Threshold Vector Error Correction Model vs. Vector Error Correction Model).

Paper	BARASSI, M. R. AND GHOSHRAI, A. (2007) “Structural Change and Long-run Relationship between US and EU Wheat Export Prices” Journal of Agricultural Economics, No. 58 (February 2007), pp. 76-90.
Objective	Analysing the nature of the long-run relationship between US and EU wheat export prices over the period 1981-2000.
Methodology	Econometric analysis based on Vector Error Correction Model.
Results	In absence of compelling evidence of a cointegration relationship between USA and EU wheat prices, the study concludes that EU price evolves independently in the 1981-1994 period. A change in the cointegration relationship emerges after the implementation of the CAP reform: a long-run relationship between EU and US prices appears, implying that the CAP reform has led to a stronger integration between EU and US wheat markets.
Diff./Sim.	The paper is mainly focused on long-run dynamics, while the present study tackles both long-run and short-run dynamics. The employed econometric tool is the same (VECM).

Paper	ESPOSTI, R., LISTORTI, G. (2011) “Agricultural Price Transmission Across Space and Commodities During Price Bubbles” Paper presented at the EAAE 2011 Congress, Change and Uncertainty Challenges for Agriculture, Food and Natural Resources, August 30-September 2, Zurich.
Objective	Investigating agricultural PT during price bubbles and assessing whether trade policy changes eventually played a role over the period May 2006-December 2010; studying cereal PT both across different marketplaces and across different commodities.
Methodology	Econometric analysis based on Vector Error Correction Model.
Results	Price bubbles which occurred in the cereal sector in recent years significantly increased HPT between markets. Increased HPT was however entirely compensated by the opposite effect of trade policies (i.e. temporary suspension of EU import duties on cereals). PT between commodities (e.g. between wheat and corn) is much weaker than HPT among spatially separated markets. The response to international price shocks tends to be weaker than the response to domestic price shocks.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics. The employed econometric tool is the same (VECM).

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Paper	GHOSHRAI, A. (2002) “Asymmetric price adjustment and the world wheat market” Journal of Agricultural Economics, Vol. 53(2), pp. 299-317.
Objective	Analysing price differentials in pairs for the international wheat market over the period July 1980-December 1998.
Methodology	Threshold Autoregressive Model and Momentum Threshold Autoregressive Model.
Results	The study finds that the international wheat market is highly integrated (with the notable exception of the Australian market). A long-run relationship between wheat price pairs seems to exist, as they tend to move in sync over time.
Diff./Sim.	The paper is mainly focused on long-run dynamics, while the present study tackles both long-run and short-run dynamics. The employed econometric tool is different ((Momentum) Threshold Autoregressive Model vs. Vector Error Correction Model).

Paper	GOODWIN, B. K. and PIGGOT N.E. (2001) “Spatial market integration in the presence of threshold effects” American Journal of Agricultural Economics, No. 83, pp. 302-317.
Objective	Assessing daily price linkages among four corn and four soybean markets in North Carolina over the period January 1992-March 2009.
Methodology	Econometric analysis based on Threshold Vector Error Correction Model.
Results	The investigated markets appear to be tightly integrated; threshold effects appear to be significant, and their presence influences spatial price linkages. There are also much faster adjustments in response to deviations from spatial equilibrium than is the case when threshold behaviour is ignored.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics. The employed econometric tool is different (Threshold Vector Error Correction Model vs. Vector Error Correction Model).

Paper	LISTORTI G. (2009) “Testing International Price Transmission under Policy Intervention. An Application to the Soft Wheat Market” Associazione Alessandro Bartola, PhD Studies Series, Vol 6/2009.
Objective	Analysing HPT between US Gulf FOB Hard Red Winter wheat price and French soft wheat price during the period 1978-2003.
Methodology	Econometric analysis based on Vector Error Correction Model.
Results	Integration among wheat markets has improved after 1993 as a consequence of CAP reforms and of trade liberalization reforms.
Diff./Sim.	The paper is mainly focused on long-run dynamics, while the present study tackles both long-run and short-run dynamics. The employed econometric tool is the same (Vector Error Correction Model).

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Paper	THOMPSON, S. R., AND BOHL, M. T. (1999) “International wheat price transmission and CAP Reform” Discussion paper No. 53, Institute of Agricultural Policy and Market Research, University of Giessen, Germany.
Objective	Obtaining reliable estimates of the international wheat PT elasticity for Germany over the period June 1976-December 1998.
Methodology	Econometric analysis based on Threshold Cointegration Model.
Results	The EU reforms of 1992 resulted in a noticeable increase in domestic price volatility while at the same time world price volatility decreased. A contributing factor to this “inverse relationship” in price volatility has been worldwide trade liberalization after WTO formation: price volatility in Germany fell only slightly, while world price volatility fell dramatically.
Diff./Sim.	The paper is mainly focused on long-run dynamics, while the present study tackles both long-run and short-run dynamics. The employed econometric tool is different (Threshold Cointegration Model vs. Vector Error Correction Model).

Paper	THOMPSON, S. R., SUL, D. AND BOHL, M. T. (2002) “Spatial market efficiency and policy regime change: seemingly unrelated error correction model estimation” American Journal of Agriculture Economics, Vol. 84(4), pp. 1042-1053.
Objective	Investigating spatial equilibrium between the wheat markets of France, Germany and the United Kingdom and assessing how CAP reforms affected the speed of convergence of the long-run relationship over the period February 1976-April 1999.
Methodology	Econometric analysis based on Seemingly Unrelated Regression Error Correction Model.
Results	CAP reform and WTO formation have reduced trade barriers between domestic wheat markets (which appear to be in spatial equilibrium) and have improved HPT between the international market and domestic markets by promoting convergence of domestic and international prices.
Diff./Sim.	Similarly to the present study, the paper is focused on both long-run and short-run dynamics. The employed econometric tool is different (Seemingly Unrelated Regression Error Correction Model vs. Vector Error Correction Model).

3 Theoretical analysis of the transmission of price changes

The theoretical background of price transmission is articulated and provides quite different explanations of the empirical results. This chapter will briefly recall the different typologies of price transmission (PT), also focusing on the issue of asymmetric PT; the most relevant theories will then be reviewed, to obtain elements (especially an identification of the factors which may influence PT) which can be extremely useful in explaining the findings of the empirical assessments carried out.

It is worth underlining that the interest in PT originally lies in the possibility to measure market efficiency. The perfect competition market (PCM) model elaborated by the Neoclassical theory is the most acknowledged explanatory scheme in this field, but it has also been criticised under many aspects. The present overview will start from the Neoclassical theory, and subsequently shift its attention towards alternative theories.

3.1 Types of price transmission and asymmetries

Markets may be either independent or linked, according to the technical and economic relationships among the exchanged products. Products may also substitute or complement each other, a kind of relationship which is often based on technical aspects. Economic relationships also hold for the same product exchanged in spatially separated markets, and chronological linkages between distinct markets for the same product must also be considered. The linkages among markets concerning PT can be classified under few relevant typologies, which are outlined in table 3.1 below.

Table 3.1 – Types of price transmission

Market relationship	Markets involved	Relevant economic problem
Vertical	Input market to output market	Price transmission along the supply chain The way in which an input cost is transmitted into the output price
Horizontal	Origin market to destination market	Price transmission across spatially separated markets The way in which the price of a product is transmitted across space
Indirect	Product market vs. technically related product markets	Price transmission between technically related products The way in which the price of a product is transmitted to substitute/complementary products

Under PCM assumptions, any price shock in a market should be perfectly transmitted to the related markets, given the costs of the technical processes that allow for vertical and horizontal product transfer. In this case price trends would reveal similar patterns and substantial symmetries in the two markets, although at different price levels. On the contrary, the presence of asymmetries would reveal some kind of market imperfection.

PT is measured according to some relevant dimensions:

1. magnitude or intensity (the extent to which a price variation in a market is transmitted to another market);
2. speed (how fast a price variation in a market is transmitted to another market);
3. nature (the sign, positive or negative, of price variation to be transmitted);
4. direction (from which market to which market the variation is transmitted).

Following Vavra and Goodwin⁸, “asymmetries can occur within any aspect of the adjustment process” and may concern any of the above mentioned dimensions.

It is important to underline that some kinds of asymmetries in horizontal and vertical PT are typical of the agro-food sector. In horizontal price transmission (HPT) the relevant problems concern the degree of spatial integration: (i) within the EU market; (ii) between the world and the EU market (within the political framework of liberalisation of international trade). Vertical price transmission (VPT) usually takes place in a more articulated context, and price variations may reveal different kinds of asymmetries. Input price variations are often transmitted downward the supply chain (with a lower or higher degree of intensity), but the opposite seldom occurs, thus revealing asymmetries in intensity and nature, according to the direction of PT. Input price rallies are often rapidly (and usually fully) transmitted downstream the supply chain, but input price reductions may take more time to be transmitted to the final markets. Vice versa, output price rallies may take more time to be transmitted backwards (possibly with a lesser intensity), or can even not be transmitted at all.

Theories explaining PT (and related asymmetries in particular) are briefly discussed in the following paragraphs; the focus is on the aspects which are relevant for explaining PT in the sugar sector, and for carrying out the preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to PT (§ 4).

A synoptic table of reference theories is provided at § 3.4.

3.2 Vertical price transmission

3.2.1 The Neoclassical scheme and related criticism

Assuming a PCM model, PT between separated markets must show equal *price dynamics* although *price levels* may differ because of technical factors. The general principle applies to both HPT and VPT, although the nature of the factors is different.⁹

The explanatory framework of the Neoclassical scheme (based on the PCM) has been criticised under some aspects. First of all, many scholars have observed that the actual structure of markets usually deviates from the PCM, concluding that violation of some of the assumptions of the PCM can explain asymmetries in PT¹⁰.

The structure of the market takes particular relevance in the so called *Structure-Conduct-Performance (SCP) paradigm*, which establishes a functional relationship between the structure of the market and the conduct of the players: the higher the concentration, the higher the risk of non-competitive conduct, which may lead to higher firm profits (performance). Specific marketing practices may hinder competition, and directly or indirectly affect PT; in such conditions, asymmetries in PT would appear.

⁸ “Price transmission might be asymmetric in its speed and magnitude, and could differ depending on whether the price shock is positive or negative and is being transmitted upwards or downwards along the chain.” (Vavra P., Goodwin B. (2005), *Analysis of the Price Transmission Along the Food Supply Chain*, OECD Food Agriculture and Fisheries Working Papers, No 3, OECD Publishing).

⁹ One of the outcomes of the PCM model is that profits are equal to zero in the long term. If so, (i) price differences between separated markets should only concern price levels, but not price dynamics; (ii) differences should be determined by the technical factors which are relevant at vertical level (e.g. processing and distribution costs). Should different demand curves apply in separated markets, making price rise in one market, PT might be affected but only in the short run: over time (instantaneously, in theory) price arbitrage would be offset by perfect PT between the markets.

¹⁰ Further theoretical refinements have however concluded that deviation from the PCM model does not automatically imply a lower degree of competition and a worsened functioning of price transmission: in a Bertrand oligopoly model, for instance, equilibrium price always stays at marginal cost level, thus reproducing a situation of perfect competition.

Further criticism to the Neoclassical scheme, stemming from the New Industrial Organisation (NIO) school, concerns the causal relationship leading from concentration to competition. According to NIO's standpoint, the structure of sector or industry is not given (like in the original SCP), but is instead the result of the strategies that firms adopt to increase their economic performance. The feedback of the conduct on the structure reverses the causal link assumed in the traditional studies on PT.

Another criticism to the Neoclassical scheme stems from the transaction costs approach, embedded in the Institutional Economics theory. In the literature concerning PT, relevant factors are generally referred to as "menu costs" or "adjustment costs": asymmetries in PT may be explained by the costs that a firm incurs for modifying product pricing; or by the method of accounting and stocking inputs (e.g. First-In-First-Out criterion) and other similar factors¹¹.

Also the approach based on hypotheses concerning the return to scale of the firm puts into question the Neoclassical scheme and the assumptions of the PCM. According to this approach, stable (and even increasing) input prices may couple with output price reductions if unit production costs decrease. Complementary hypotheses often complete this approach, in particular concerning the intensity of competition in the ending market and the competitive strategies applied by firms (e.g. cost leadership vs. product differentiation).

3.2.2 Complementary approaches

Other study approaches provide useful complementary tools for theoretical analysis of PT. Such tools are mainly focused on the study of the competitive environment (usually through a qualitative approach). The starting point for these complementary approaches is the following: considering concentration as the exclusive or most relevant indicator of the competition may lead to disregard the variety of means practically adopted by firms to compete. Two of such complementary approaches which can be useful also for the study of PT are the *Porter scheme* for the analysis of the competition and the *supply chain approach*. Adopting a wider investigation unit than the sector (respectively the enlarged sector and the *filière*), these approaches focus on the variety of solutions which can be adopted by firms, and on the complexity of the relationships which firms have with one another: these two factors concur to shape the firms' strategies. Such strategies may result - among others - in attempts to exert some kind of control on prices which is not necessarily in relation with the degree of concentration in the sector(s) in which the firms operate¹².

Another important feature of these complementary approaches is the attention for the institutional aspects (relevant regulatory framework) of the functioning of the industry / sector /supply chain under study. In the present study, the relevant regulatory framework is represented by the CAP in general, and the sugar regime in particular. Actually changes in the institutional environment caused by reforms of the relevant regulatory

¹¹ Kimmel S. (2009) *Why Prices Rise Faster than they Fall*, Economic Analysis, Antitrust Division, U.S. Department of Justice, clearly explains the role of various types of adjustment costs in PT asymmetries.

¹² The supply chain is characterised by an organisation and a structure, shaped by the technical, commercial, financial and institutional relationships among the firms at different stages of the chain. The various forms of vertical integration provide examples of the variety of relationships working within the supply chain, ranging from inter-sector agreements to outright acquisition of suppliers, passing through a wide array of solutions implying some kind of mutual dependence between purchaser and supplier (knowledge transfer, facilitated access to production means and financing, quality standards enforcement, etc.). Most of the above situations occur in the sugar supply chain, which is also characterised by an evolution in the competitive strategies of sugar producers (merger & acquisition, delocalisation, internationalisation, differentiation), in order to adapt to the reform of the sugar regime. Most of these strategies would not be reflected by the concentration index alone. This approach is adopted for the study of PT for instance in Bukeviciute et Al. (2009) *Price transmission along the food supply chain in the European Union*, 113th EAAE Seminar "A resilient European food industry and food chain in a challenging world", Chania, Crete, Greece, September 3 - 6, 2009.

framework introduce opportunities and constraints, direct and indirect incentives or threats for firms, which are pushed to adapt their strategies to the changing institutional environment (see § 4).

3.3 Horizontal and indirect price transmission

3.3.1 Horizontal price transmission

According to the Neoclassical scheme, factors which may explain HPT may be divided into technical and economic factors:

- Technical factors are mainly to be identified in structure and infrastructure costs (transport, storage, commercial facilities, etc.), which should actually determine different price levels in separated markets, but similar price dynamics over time;
- Economic factors mainly concern the existence of spatially different demand curves: this may determine asymmetries in the short/medium term that would disappear in the long term, at least if markets work under the hypothesis of perfect competition.

In real-world conditions, the *structure* of the destination market may differ from that of the source market: in this case arbitrage between markets is possible, and allows for asymmetric PT, which may hold over time. Outcomes would be similar if information between the two spatially separated markets is asymmetric¹³.

Trade regulation may also concur to determine asymmetries in HPT. The relevant conceptual framework refers to the potential effect of institutional barriers to trade (in particular the various kinds of import tariffs and duties, tariff rate quotas, etc.) on PT between the world market and the EU market (see § 4).

3.3.2 Indirect horizontal price transmission

Indirect horizontal price transmission (IHPT) occurs between markets which are linked by way of technical and economic relationships characterising two products which can be considered as substitutes or complementary. In the sugar sector product substitution has indeed some relevance, given the existence of natural and synthetic sweeteners (isoglucose, inuline, etc.) which can more or less effectively substitute sugar as sweetener either in direct consumption or in the preparation of food products. The price of such substitutes may – in theory at least – be somehow related with sugar price.

Another type of techno-economic linkage which can determine IHPT in the sugar sector is the possibility to use sugar beet and sugar cane for producing ethanol (for both food and non-food uses, mainly fuel use in the latter case) instead of sugar. The price of sugar and the price of ethanol may – again, in theory at least – be somehow mutually related: yet it is plausible to assume that the price of fuel ethanol is more strongly linked with the price of oil and petrol (of which it can be either a substitute or a complement - this is the case of “antiknock” ethanol derivatives like ETBE).

The reference theories for the study of IHPT can be identified in the same ones which apply for the study of HPT (Neoclassical, Institutional Economics, other “mixed” approaches).

¹³ Similar to VPT, factors other than structure may explain asymmetries in HPT, if we consider that the exporting firm / sector / industry may be different from the importing one for economic and/or organisational and/or technical aspects. Transition costs and return to scale factors may apply also to HPT. Finally, it should be underlined that the study of firms’ strategies can also be usefully applied in the assessment of HPT, inasmuch such strategies may differ at geographical level and/or be aimed at influencing cross-border PT.

3.4 Synoptic table of reference theories for price transmission in the sugar sector

Table 3.2 below provides a synopsis of the different theories which are relevant for explaining PT in the sugar sector, and for carrying out the preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to PT (§ 4).

Table 3.2 - Synoptic table of reference theories for price transmission in the sugar sector

Theories & approaches	Explaining factors	Analytical tools Working mechanism
Vertical price transmission (VPT)		
Neoclassical + deviation from perfect competition model (PCM)	Structure => => Competition	<i>Market models; technical and behavioural assumptions; market efficiency</i> Concentration determines competition and performance (original SCP paradigm); PT is in itself an indicator of market efficiency; asymmetric PT reveals violation of PCM assumptions (existence of market power)
New Industrial Organisation school	Competition => => Structure	<i>Firm strategies</i> Firm strategies shape the structure of the market/sector in order to achieve better economic results (growth, profits) (revised SCP paradigm)
Institutional economics	Transaction costs Adjustment costs	<i>Firm organisation (internal and external); institutional environment</i> Adjustment costs may justify time asymmetries of PT
Porter approach & Supply chain approach	Firm strategies Supply chain relationships	<i>Enlarged sector; supply chain</i> Firm strategies are studied in the context of the vertical and horizontal relationships along the supply chain
Return to scale	Scale economies	<i>Firm equilibrium</i> Scale economies and competitive environment in downstream sectors may explain price variations independently from concentration
Horizontal price transmission (HPT)		
Neoclassical	Technical costs Demand curves	<i>Market equilibrium; spatial arbitrage</i> Differences in demand curves and asymmetric information may explain time asymmetries of PT. Logistic costs and similar costs determine price differentials, not price trend asymmetries
Institutional economics	Trade regulation	<i>Microeconomic economic analysis of regulations</i> Trade regulation mechanisms may determine PT, either directly or indirectly
Other approaches	Mixed	<i>Mixed</i> Transaction costs, local market power, spatial firm strategies may determine asymmetries in HPT

4 Preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to price transmission

The present chapter is structured in three parts. First, the evolution of the rationale (objectives and functioning mechanisms) of the EU sugar regime from the pre-WTO period to the present situation is synthetically outlined. Then, a brief description of the changes in the individual elements of the regime (measures) introduced by the 2006 reform is provided. Finally, an assessment of potential effects of the reform on price transmission (PT) in the sugar sector is carried out, in the light of the findings of the theoretical analysis carried out at § 3.

4.1 Evolution of the rationale of the EU sugar regime

The sugar CMO was originally set up in 1968 with the objectives of granting availability of supply to the Community (then constituted by just six Member States) and of ensuring a fair income to Community sugar beet growers. To achieve these goals, a system based on domestic support via guaranteed prices for both sugar and sugar beets was set up, combined with strong import protection (achieved through a system of variable duties) from the competition of low-cost third-country producers. A number of policy tools aimed at stabilising the Community market through supply management were also implemented:

- Support was limited to pre-defined national production quotas (further allocated to individual producers by national governments), organised in a two-tier system (full support for “A” quota, reduced support for “B” or “specialisation” quota).
- Two main alternative outlets were implemented for quota sugar which found no adequate placement on the domestic market: Community buying-in of sugar (at a pre-defined “intervention price”), and subsidised exports on the world market (via a system of export refunds).
- Sugar production exceeding the quota limits (“C” sugar) had to be exported to the world market without export refunds or could be carried forward to the following marketing year (but only within pre-defined limits).

The rationale and functioning mechanisms of the sugar CMO remained basically unchanged (in a Community which had grown over time from 6 to 15 Member States) until the closure of the Uruguay Round of the GATT and the formation of WTO at the end of 1994. The resulting reform of world trade agreements was characterised by a push towards trade liberalisation and improved access on domestic markets also for sugar. Two elements of the EU sugar regime were especially affected by the transition to the WTO:

1. Variable import duties had to be converted in fixed tariffs (which were set however at levels which could still effectively protect the EU market from non-preferential sugar imports). A special safeguard clause still allowed the EU to charge additional duties.
2. Both the financial ceiling and the eligible quantities for export refunds had to be reduced, according to a pre-defined time schedule.

The combined effect of a number of internal and external factors set the ground for a radical revision of the rationale and functioning mechanisms of the EU sugar regime; in particular:

1. The need to improve the coherence between the sugar regime and the new CAP framework set in 2003 (in particular for what concerned the transition from coupled to decoupled support to farmers).
2. Starting from 2001, the award of a special preferential regime for sugar imports to the Least Developed Countries (LDC), through the Everything But Arms initiative (EBA). The full implementation of such agreements would allow unlimited duty-free sugar imports from LDCs to the EU, with associated potential risks of severe imbalance of the domestic market affecting quota production, as

such imports would add to traditional preferential imports of the Community, the bulk of which took place under the “ACP sugar protocol”¹⁴.

3. Last but not least, the 2005 WTO ruling on the maximum allowed volume of EU subsidised exports (the limit for such exports is set at 1,374 million tonnes in the framework of the Union’s WTO commitments). The WTO Appellate Body concluded that C sugar sold on the world market was cross-subsidised (due to support granted to quota sugar) and had hence to be combined with EU subsidised exports of quota sugar. Moreover, also re-export of a quantity of quota sugar corresponding to imports from ACP countries was to be considered as subsidised when assessing EU compliance with its WTO commitments. The EU was found to have systematically exceeded the limit to a substantial extent, and had therefore to drastically decrease its subsidised exports.

The need to cope with the evolution outlined above resulted in a radical reform of the EU sugar regime, to be gradually implemented starting from 2006/07 marketing year.

The main objectives of the 2006 reform were, among others:

1. bringing the EU system of sugar production and trading in line with WTO commitments, by reducing EU subsidised exports;
2. stabilising the domestic sugar market in a changing international context, by decreasing the level of price support (to prevent massive import flows), and by reducing production of quota sugar (to counterbalance the effects of reduced alternative outlets via subsidised exports and of increased imports);
3. ensuring future competitiveness of the EU sugar sector (at both agricultural and industrial level) through radical restructuring;
4. guaranteeing adequate supply of EU markets for sugar end-users and final consumers at a reasonable price.

The reform sought to meet the above objectives mainly through:

1. a radical revision of the market management tools, with special focus on price support and the intervention system (which was closely related to the former);
2. the implementation of a restructuring scheme aimed at the less competitive sugar producers who were willing to renounce their quotas.

The system of national quotas was maintained, but “A” and “B” quotas were merged in a single “basic quota”. The most significant changes introduced by the reform to individual elements of the EU sugar regime are briefly outlined at § 4.2.

4.2 The EU sugar regime before and after the 2006 reform

In order to outline synthetically the changes concerning individual elements (measures) of the EU sugar regime following the 2006 reform, such elements have been grouped according to the relevant market context (domestic market and trade with third countries, respectively) and, within each context, according to the specific nature of the measures.

The evolution of the concerned measures is described in table 4.1 which, except where otherwise noted, refers to white sugar.

¹⁴ Since 1975 sugar produced in a number of former European colonies in the African, Caribbean and Pacific areas had been granted access at preferential conditions on the Community market – within certain limits – by virtue of the “ACP Sugar Protocol”: the Community was committed to import a fixed quantity of sugar (1,3 million tonnes per year) duty free, at a guaranteed price linked to the EC institutional price.

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Table 4.1 – The EU sugar regime before and after the 2006 reform

	Measures	Pre-reform ¹⁵	Post-reform ¹⁶	Evolution
Domestic market	Guaranteed price system	Intervention price (IP) 631,90 €/T Minimum price for sugar beet (MPB) 46,72 €/T for A beet	Reference price (RP) 631,90 €/T (2006/07; 2007/08); 542,00 €/T (2008/09); 404,40 €/T (2009/10 to 2014/15)	Reduction of price support
			Intervention price (IP) 80% of RP of the following MY Minimum price for sugar beet (MPB) From 32,86 €/T (2006/07) to 26,29 €/T (2009/10 to 2014/15) for in-quota beet	
	Production quotas	A Quota <ul style="list-style-type: none"> Subject to a production levy (max 2% of IP) Eligible for: declassification, export refunds 	Basic quota <ul style="list-style-type: none"> Merge of former “A” and “B” quotas Set at 17,44 million T (EU-25) for 2006/07 Subject to a production charge of 12 €/T To be reduced on a voluntary basis; see “restructuring aid” Quotas allocated to individual firms may be subject to further adjustment in the framework of national quota re-allocation (up to 25% in 2006/07 and 2007/08; up to 10% from 2008/09 onwards) Individual firms may request to Member States additional quotas, subject to a one-off payment of 730€/T; quantitative limits for the granting of additional quotas are set at Member State level 	Promotion of reduction of both in-quota and out-of-quota production
		B Quota <ul style="list-style-type: none"> Subject to a production levy (max 30% of IP) Eligible for: declassification, export refunds C sugar production <ul style="list-style-type: none"> C sugar exceeding the limits for carry forward must be exported on world market and is not eligible for export refunds Eligible for: carry forward to the following campaign (within defined limits) 	Out of quota production <ul style="list-style-type: none"> Eligible for: carry forward to the following campaign; specific industrial uses; supply of EU outermost regions; export within the quantitative limits set by the Commission in compliance with the WTO thresholds. Quantities exceeding carry forward and other possible uses are subject to the payment of a surplus amount, set at a level which can effectively avoid their accumulation 	

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¹⁵ Council Regulation (EC) 1260/2001 and successive modifications.

¹⁶ Council Regulation (EC) 318/2006; 320/2006; 1234/2007; 1261/2007.

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	Measures	Pre-reform ¹⁷	Post-reform ¹⁸	Evolution
Domestic market	Market withdrawals	<p>Public intervention</p> <ul style="list-style-type: none"> National intervention agencies of sugar-producing Member States are required to purchase at intervention price any quantity of white and raw sugar produced under quota 	<p>Public intervention</p> <ul style="list-style-type: none"> National intervention agencies of sugar-producing Member States are required to purchase at intervention price white and raw sugar produced under quota, up to a limit of 600.000 T at EU level; from 2010/11 onwards, sugar ceases to be eligible for public intervention <p>Private storage</p> <ul style="list-style-type: none"> Contribution to private storage can be granted in case of serious market imbalance <p>Withdrawal of sugar</p> <ul style="list-style-type: none"> Firms may be required to withdraw until the beginning of the following marketing year a defined percentage of quota sugar - common to all Member States - to safeguard market balance; firms must store the concerned quantities at their own expense during the period of withdrawal 	Termination of public intervention
	Restructuring	<p>Adaptation aids</p> <ul style="list-style-type: none"> Granted to Portugal, Italy, Spain and Finland (in the form of increased price support) to promote actions aimed at improving efficiency and competitiveness of sugar beet cultivation and sugar production 	<p>Restructuring aids</p> <ul style="list-style-type: none"> Granted to promote renunciation of quotas and reduction of production capacity by the less profitable sugar producers Amounts paid per T of renounced quota differ according to the restructuring pattern (three possible options), and decrease between 2006/07 and 2009/10 The whole system of incentives to quota renunciation was modified in 2007 ("reform of the reform") to make it more attractive for both sugar producers and beet growers, and hence to promote additional reduction of sugar production capacity Temporary restructuring aids granted to full-time refiners (UK, SLO, FIN, P, F) 	Radical change in the approach (from "helping laggards" to "selecting the best")

Continued in the next page

¹⁷ Council Regulation (EC) 1260/2001 and successive modifications.

¹⁸ Council Regulation (EC) 318/2006; 320/2006; 1234/2007; 1261/2007.

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	Measures	Pre-reform ¹⁹	Post-reform ²⁰	Evolution
Trade	Regulation of imports	Fixed import duty 419,00 €/T for white sugar and 339,00 €/T for raw sugar (full third-country most favoured nation (MFN) duty) Additional variable duty <ul style="list-style-type: none"> Applied automatically if world market price is below the trigger price (531 €/T for white sugar and 418 €/T for raw sugar for refining)²¹ 	Fixed import duty 419,00 €/T for white sugar and 339,00 €/T for raw sugar (full third-country MFN duty) Additional variable duty <ul style="list-style-type: none"> Applied automatically if world market price is below the trigger price (531 €/T for white sugar and 418 €/T for raw sugar for refining)²² 	Unchanged
		Tariff exemption or reduction Granted within pre-defined limits (Tariff Rate Quotas - TRQs) and at particular conditions to third countries benefiting from preferential trade agreements with the EU: <ul style="list-style-type: none"> ACP Protocol countries and Republic of India (exemption) LDCs in the framework of the EBA initiative (exemption) Western Balkan Countries in the framework of the Balkan initiative (exemption) CXL sugar for supply of Member States which joined the EU in 1995 (Finland and Sweden) (reduction) 	Tariff exemption The pre-reform framework applies, with the following remarkable exceptions: <ul style="list-style-type: none"> Sugar exported from LDCs in the framework of the EBA initiative is granted unlimited duty free access to the EU from 01/10/2009. With the transition from the ACP Sugar Protocol to the Economic Partnership Agreements (EPAs), sugar from non-LDC ACP countries is granted unlimited duty free access to the EU from 01/10/2009; however, until 2014/15 duty-free access for such imports may be suspended when particular conditions apply²³ 	Improved market access for sugar produced in LDCs and in non-LDC ACP countries
	Export refunds (ER) ²⁴	<ul style="list-style-type: none"> Granted to quota sugar and re-exports of ACP preferential imports WTO limitation to subsidised exports = 1,374 million T 	<ul style="list-style-type: none"> Granted to sugar WTO limitation to subsidised exports = 1,374 million T <i>Following the 2005 ruling of WTO's Dispute Settlement Body, both re-export of quantities corresponding to those imported from ACP countries and exports of out of quota sugar are to be included in the above limitation</i> 	Greatly reduced room for recourse to subsidised exports

¹⁹ Council Regulation (EC) 1260/2001 and successive modifications.

²⁰ Council Regulation (EC) 318/2006; 320/2006; 1234/2007; 1261/2007.

²¹ Under the WTO agreements, recourse to the safeguard clause allows the EC to charge additional import duties in case the import volume of the product exceeds a trigger level or if the value of the imported product falls below a trigger price. The amount of the duty varies according to the extent of the difference between the import price and the trigger price (NEI, 2000).

²² See previous note.

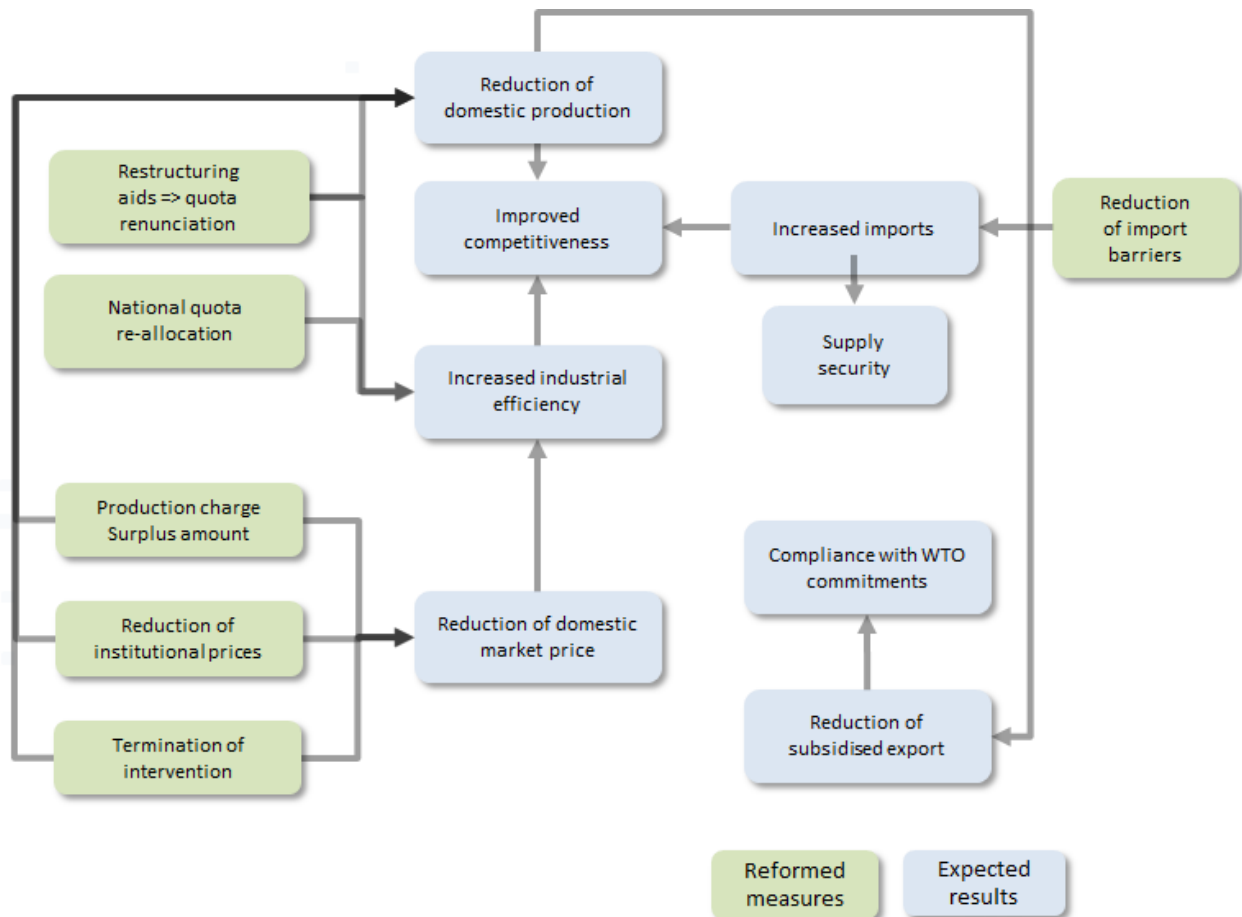
²³ Duty-free access from ACP non-LDC countries may be suspended when two conditions are met simultaneously:

- imports originating from non-LDC ACP countries exceed 1,6 million tonnes;
- imports originating from all ACP countries, LDCs included, exceed 3,5 million tonnes.

²⁴ Aimed at covering price differential between EU domestic price and world price of sugar.

The expected impacts of the 2006 reform and of the related changes in the regulation of EU sugar trade are outlined in Figure 4.1, which focuses on the sole aspects which can (in theory at least) have an influence on price transmission mechanisms, i.e. those concerning the **system of guaranteed prices**, **management of domestic sugar production**, and **management of import and export flows**.

Figure 4.1 – Expected impact of the reform* on aspects which have relevance for price transmission



* Only the elements of the reform which may have relevance for price transmission are represented in the figure

Three elements of the 2006 reform and of the related changes in the regulation of EU sugar trade appear to have particular relevance for an assessment of their influence on PT:

1. The **reduction of price support** to both the industrial and the agricultural stages of the EU sugar sector, in combination with the termination of public intervention (and hence the removal of the “floor” constituted by intervention price), as they should allow for greater downward variations of the domestic sugar price.
2. The **system of incentives and measures aimed at improving the competitiveness** of the EU sugar sector, as they should have effects on both competition and concentration which might have an influence on PT mechanisms.
3. The **improved access to the EU market granted to sugar imports** from ACP countries and LDCs, as this might result in a stronger linkage between domestic price of sugar and international sugar price, and also have effects on competition and concentration in the EU sugar sector which might finally have an impact on PT.

4.3 Implications of the 2006 reform for the economy of sugar production in the EU

Before assessing the potential effects of the 2006 reform on PT, it is important to highlight its main implications for the economy of sugar production in the EU.

Incentives to quota renunciation combined with other measures aimed at reducing domestic production have quite straightforward implications on the possibility for sugar producers to pursue scale economies, putting additional emphasis on external growth and rationalisation of production capacity via mergers and acquisitions (of additional quotas - associated or not to additional production capacity – and/or of competing firms). This in turn implies a more severe selection process of viable sugar producers, based on high-level cost-effectiveness in sugar production.

Improved access on the EU market for ACP and EBA sugar imports, greatly reduced room for subsidised exports, and outright termination of intervention purchases imply that proficiency in sugar marketing becomes of paramount importance for EU sugar producers, and also provides an incentive to EU sugar producers to pursue geographical diversification strategies focused on ACP countries and LDCs, in order to exert some control on the related import flows.

4.4 Potential effects of the reform of the EU sugar regime on price transmission

The following paragraphs describe the results of the preliminary assessment of the new market rules in the EU sugar sector in relation to PT. The assessment was carried out in a theoretical perspective, but some linkages with the present operational reality of the EU sugar sector are also provided, in order to put the findings of the assessment in a real-world context.

Prior to the description of the reasoning followed and of the related findings, it is of paramount importance to underline that the assessment was carried out having in mind that:

- The *reformed EU sugar regime was not explicitly designed to have specific effects on PT*; this notwithstanding, improvements in the functioning of PT in the sugar sector were also expected by policymakers, as a consequence of more free-floating prices within much larger ranges than before (elimination/reduction of limitations to PT). In the following paragraphs, the term “*direct influence/effects*” will be used wherever a policy tool is intentionally and specifically designed to influence the functioning of the PT mechanisms; the term “*indirect influence/effects*” will be instead used wherever a policy tool, albeit explicitly devised to obtain specific effects of other kind, can also modify the context where PT takes place, in a way to help (or to hinder) its functioning.
- In the framework of the EU sugar regime, there is a number of different measures which can – in theory at least – have a direct or indirect influence on PT. The relevance of the sugar regime for PT may stem from individual measures and/or from groups of measures combined.

Potential effects were analysed separately for horizontal price transmission (HPT) and vertical price transmission (VPT); the outcomes of the assessment are described at § 4.4.1 and § 4.4.2, respectively.

Three different aspects were usually considered in the assessment:

- **price level**, i.e. the absolute level of price in a defined market at a given time;
- **price variation**, i.e. the variation of price level in a defined market over a certain time span;
- **price transmission proper**, which is the relation between prices occurring in two distinct markets over a certain time span.

4.4.1 Potential effects on horizontal price transmission (HPT)

HPT is particularly affected by measures that establish some kind of relationship and/or barrier between the international and the domestic market, in such a way that cross-border PT is affected. In the framework of the

EU sugar regime, such measures are mainly the ones forming the system of institutional prices and the system of import regulation.

4.4.1.1 Effects of the institutional price system

In the pre-reform sugar regime intervention via market withdrawals limited downward sugar price variations at the level of the **intervention price**, which acted as a “floor price” (national intervention bodies were committed to purchase any market surplus at that price: see Figure 4.2 a). The 2006 reform phased out public intervention for sugar after a transition period, ending with 2009/10 marketing year (see § 4.2). As a consequence, *downward variations of domestic sugar price do not face an absolute limit anymore*.

The reform introduced a new institutional price (reference price), for which a three-step reduction was foreseen (see § 4.2). Even if the **reference price** can in no way be deemed a guaranteed price, its progressive reduction can be interpreted as the “acknowledgement” of a possible downward shift of the domestic price variation range (Figure 4.2 b).

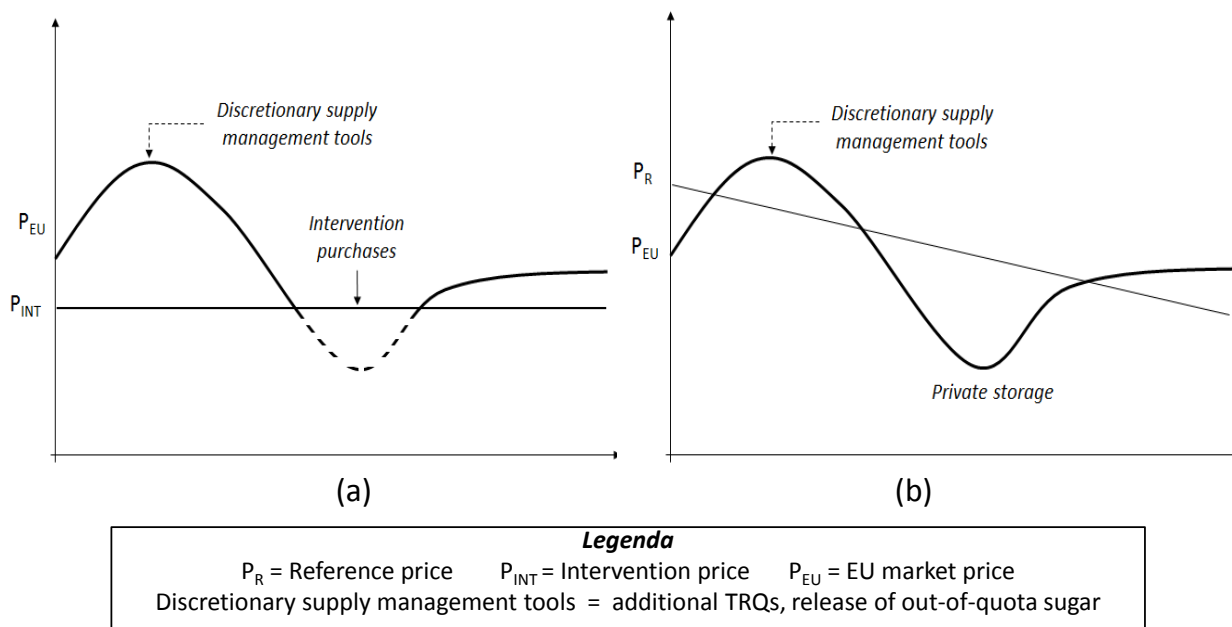
In the framework of the EU sugar regime, *upward variations of domestic sugar price may be somehow limited through the operation of discretionary supply management tools* (opening of additional tariff-rate quotas for preferential imports, release of out-of-quota sugar on the domestic market, etc.) which however constitute a *non-automatic control mechanism*. This implies that no institutional “ceiling price” is established in the context of the reformed sugar regime (Figure 4.2).

In conclusion, the reform allowed:

- a widening of domestic sugar price variation range;
- a downward shift of the price level around which variations should usually take place.

Even if no direct effect on HPT proper can be attributed to the reform of the institutional price system in itself (at least in terms of intentional intervention on the relation between prices occurring in two distinct geographical markets over a certain time span), such reform indeed *removed existing constraints to price variation within the EU, thus promoting more favourable conditions for the functioning of HPT (indirect influence)*.

Figure 4.2 – The institutional price system and domestic price variations



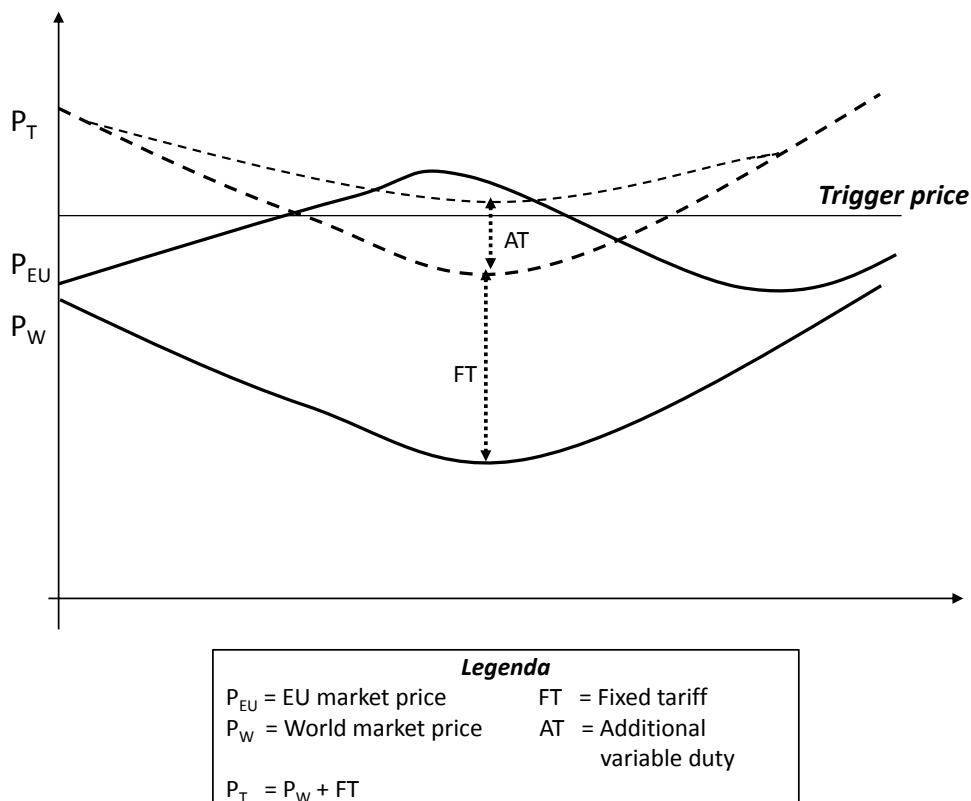
4.4.1.2 Effects of the import tariff system

The system of import tariffs is the element of the EU sugar regime showing the most straightforward linkage with HPT proper, inasmuch it operates in a way to avoid (to a certain extent) that variations in the world sugar price are automatically and fully transmitted to the domestic sugar price.

The reform left basically unchanged the tariff system applied to sugar imports in the framework of the Generalised System of Preferences (fixed tariff plus additional variable duty, if applicable), while greater room for preferential imports (duty-free or at reduced duty) was opened especially in the framework of the EBA initiative and of the transition from the ACP Sugar Protocol to the EPAs (see § 4.1 and 4.2).

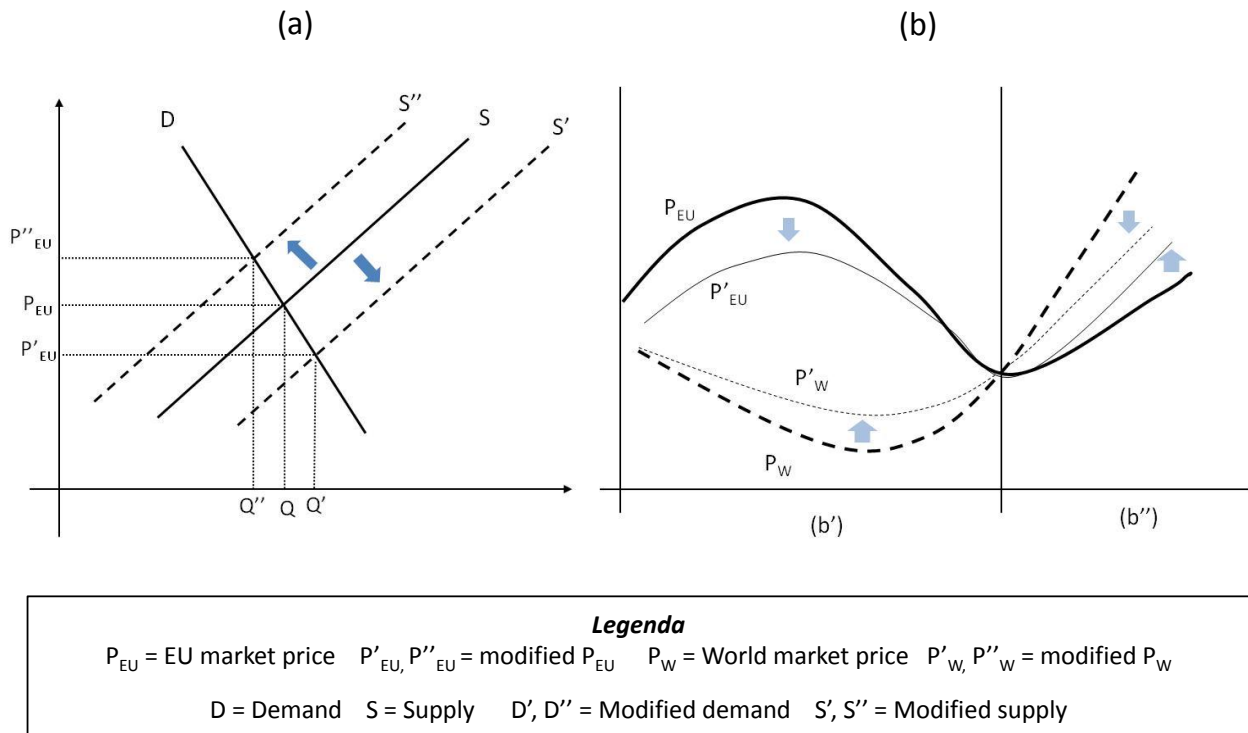
The **fixed tariff** adds to the world market price a constant amount. In ordinary market conditions, the level of such tariff is enough to effectively discourage non-preferential imports of sugar to the EU, and hence to affect HPT between the world market and the EU domestic market (see figure 4.3). When the differential between the EU price and the world price is higher than the fixed import tariff, the **additional variable duty** (applied under a special safeguard clause whose amount depends on the level of the world market price) provides extra protection from imports, thus further affecting HPT between the world market and the EU domestic market (see figure 4.3).

Figure 4.3 – Effects of fixed import tariff and of additional variable import duty



Preferential imports in regime of tariff exemption (or reduction) can have effects on HPT between the world market and the EU market, and can also affect the dynamics of domestic prices; both effects are indirect, inasmuch their extent is linked to the relative importance of imported volumes vs. domestic production, and to the equilibrium between total supply and total demand in the EU. According to the classical market scheme, an increase in preferential sugar imports should affect the dynamics of domestic price (decrease from P_{EU} to P'_{EU} in Figure 4.4 a; vice versa for a reduction of preferential imports). Considering the phenomenon in the context of relative price levels and trends in the EU and world market, when $P_{EU} > P_W$ (Figure 4.4 b') sugar from third countries covered by preferential import agreements should be preferably exported towards the EU; after an adaptation period, this would result in a decrease of EU sugar price and in a (probably less important) world price increase (it all depends on the relative importance of preferential imports to the EU in the overall sugar international trade). Opposite outcomes would occur when $P_{EU} < P_W$ (Figure 4.4 b'').

Figure 4.4 – Effect of preferential imports on HPT



4.4.1.3 Effects of the quota system

The reduction of the overall EU sugar quota promoted by the reform might have *indirect effects on HPT* between the EU and world market, but *only in combination with the other relevant changes* (termination of public intervention, reduced rooms for export refunds, improved access for preferential imports). Again, no direct effect on HPT proper can be attributed to the reduction of EU quota (at least in terms of intentional intervention on HPT relations); however, quota reduction –by altering the pre-existing equilibrium between EU production and demand - *made room for greater import flows, promoting stronger integration between the EU market and the international market and hence improving the conditions for better functioning of HPT* (indirect influence).

The importance of such indirect effects is linked to the ratio between the overall EU sugar quota (Q_{EU}) and total EU demand for human consumption (D_{EU}):

1. If $Q_{EU} > D_{EU}$, the EU would be in a situation of structural sugar surplus, and would hence be a structural net exporter of sugar to the world market (this was actually the situation applying in the pre-reform period²⁵).

²⁵ In this specific case, the indirect effect would mainly be related to the impact of EU's sugar exports - which traditionally were constituted by white sugar for their near-totality - on the level of international prices for white sugar. The importance of such impact is determined by the relative weight of EU sugar exports on world white sugar trade, and also by the composition of EU's white sugar exports (in-quota sugar exported with refunds versus out-of quota sugar).

2. If $Q_{EU} < D_{EU}$, the EU would be in a situation of structural sugar deficit, and would hence be a structural net importer of sugar from third countries (this is actually the situation applying over most of the post-reform period).

This said, it is important to underline once again that *the elements of the EU sugar regime showing the most straightforward linkage with HPT proper are the system of import tariffs and the associated agreements for import of sugar at preferential conditions.*

4.4.2 Potential effects on vertical price transmission (VPT)

The sugar industry traditionally plays a pivotal role in the EU sugar regime. The measures concerning sugar price and production have always been primarily targeted at this sector, but support to the sugar industry has always been conditional to the payment of a minimum sugar beet price to EU farmers, which are the final beneficiaries of the support granted by the regime. The 2006 reform maintained a **minimum price for quota sugar beets**, albeit at a reduced level (see § 4.2): as a consequence, downward variations of sugar beet prices (which are usually set annually in the framework of inter-industry agreements) still face an absolute limit, but the “floor” for such variations has been lowered. This shows a *clear direct influence of the reform* of the sugar regime on *upstream* VPT.

On the contrary, no element of the reformed sugar regime can exert a direct influence on *downstream* VPT, but some measures can anyway have an *indirect influence* on VPT via effects on competition and concentration in the EU sugar industry, which can be analysed on the conceptual background of the SCP paradigm (see § 3). In the next paragraphs, the assessment of the indirect influence of the reform on VPT via effects on concentration is mainly based on microeconomic concepts (especially firm equilibrium and market structure), while indirect influence of the reform on VPT via effects on competition is investigated according to the Porter approach to strategic analysis of competition.

4.4.2.1 Indirect influence via effects on concentration

The analysis developed in table 4.2 shows that most of the changes introduced by the 2006 reform should concur to increase the concentration in the EU sugar sector, at least if we reason in terms of production capacity²⁶.

²⁶ Indeed if we reason in terms of shares on final markets, improved access to the EU for sugar companies operating in the ACP countries and in the LDCs covered by the EBA initiative might – in theory at least - also result in de-concentration of the EU sugar market. The actual outcomes would however be determined by the extent to which EU-based sugar producers can exert effective control on preferential sugar imports, via supply agreements with or outright ownership of ACP and LDC-based sugar firms.

Table 4.2 – Potential effects of the 2006 reform on concentration in the EU sugar sector

Measure	Effects on concentration	
	Sugar industry	Downstream industries (industrial users of sugar) ²⁷
Institutional price system	Reduction of price support determines an increased economic pressure on EU sugar producers, which are forced to improve their cost-effectiveness . Depending on the level of price reduction, the comparison between the consolidated marginal cost (Km) and new market price (P) should force the less efficient firms ($P \leq Km$) to exit the sector. Only the most efficient firms ($P > Km$) would continue production. As a result of this cost-based selection process, concentration in the EU sugar sector should increase .	Reduction of sugar price support should benefit downstream industries. Their margins should increase (depending on the extent of sugar price reduction and on the importance of sugar as input), new competitors could be attracted, and concentration might decrease . This however would greatly depend on barriers to entry specific to each industry, and also on the competition on final markets for sugar-containing products.
Production quota	The reduction of production quota forces sugar producers to revise their production plans . At firm level, some plants will have to be closed, usually the less performing ones (rationalisation of production capacity: see above). Growth will have to be pursued mainly via mergers and acquisitions (production of out-of-quota sugar has become a way less appealing option in the reformed sugar regime). As a result, technical concentration (average size of production units) and overall concentration in the EU sugar sector should increase .	Quota reduction <i>per se</i> might result in a sugar supply shortage for sugar users. However, as the reform also includes measures aimed at ensuring adequate sugar supply (above all improved market access for third-country suppliers in the framework of preferential agreements), no effect on concentration should be expected.
National quota reallocation	Promotion of national quota reallocation allows some producers to increase their production quota , and hence to achieve scale economies at plant and firm level. On the other hand, purchase of additional quota is costly (one-off payment of 730 €/T): higher fixed costs would increase unit production cost. Additional costs could only be offset through additional scale economies, which will have to be pursued via external growth (mergers and acquisitions) and rationalisation of production capacity. The final outcome might be further increase in the concentration of the EU sugar sector	National quota reallocation should have no direct effects on the concentration of the downstream industries.
Import barriers	Increased imports of preferential sugar could cause reductions in domestic prices, putting additional pressure on sugar producers and getting them to pursue scale economies (see above boxes in the column). The final outcome might be further increase in the concentration of the EU sugar sector	(See above the first box of the column)

Assuming that scale economies (reduction of unit production costs via increases in production scale) are of paramount importance in sugar production, two aspects of the reform are the most likely to result in increased concentration in the sugar sector:

- i) The **reduction of price support**, as it starts a cost-based selection among sugar producers, leading to the exit of marginal and extra-marginal plants/firms.
- ii) The **reduction of production quota** (together with the associated mechanisms concerning reallocation of national quota), as it induces sugar producers to pursue scale economies through rationalisation of production capacity and external growth via mergers and acquisition (internal growth via out-of quota sugar production is seldom an economically viable option in the context of the reformed sugar regime).

²⁷ The same effects outlined for downstream sugar-using industries may theoretically apply to the distribution sector.

Also **improved access to the EU market for ACP and LDC sugar** in the framework of preferential import agreements might put additional pressure on EU sugar producers, sparking processes leading to increased concentration in the EU sugar sector.

According to the SCP paradigm, ***increased concentration in the EU sugar sector could exert an influence on the functioning of VPT*** (especially with downstream sugar-using industries): however, as underlined at § 3, and as discussed in the following paragraph, such an outcome is ***far from being automatic***.

4.4.2.2 Indirect influence via effects on competition

An increase in the concentration of a sector may determine changes in its competitive environment and in the strategic behaviour of the firms operating in it. According to the Neoclassical scheme, concentration is in itself a factor that increases, *ceteris paribus*, the bargaining power of the more concentrated sector versus less concentrated upstream and/or downstream sectors. When this occurs, price formation is influenced, and some forms of imperfect VPT may take place, to the advantage of the more concentrated sector.

According to Porter's approach to competitive analysis, firms may adopt different strategies to take advantage of their position, and/or to improve it.

Some firms might be influenced by the relevant policy environment for their sector. In the context of a traditional CAP market management model²⁸, combined with a rigid quota system (pre-reform EU sugar sector would fit well such a description), ***firms have limited incentives to compete within the sector (internal competition)***; they can profit from high guaranteed prices and domestic market protection *but* cannot expand their production, and are ***forced to grow mostly via mergers and acquisitions***. As seen at § 4.4.2.1, such behaviour increases the concentration of the sugar sector, and hence its ***bargaining power against sugar purchasers***.

Bargaining power of sugar producers is also sustained by the high entry barriers (capital intensive industry; paramount importance of scale economies; production quotas) and by the presence of substantial protection from extra-EU competitors (high import tariffs), which greatly ***limit the threat posed by potential competitors*** (and with it the possibility for sugar purchasers to find alternative suppliers).

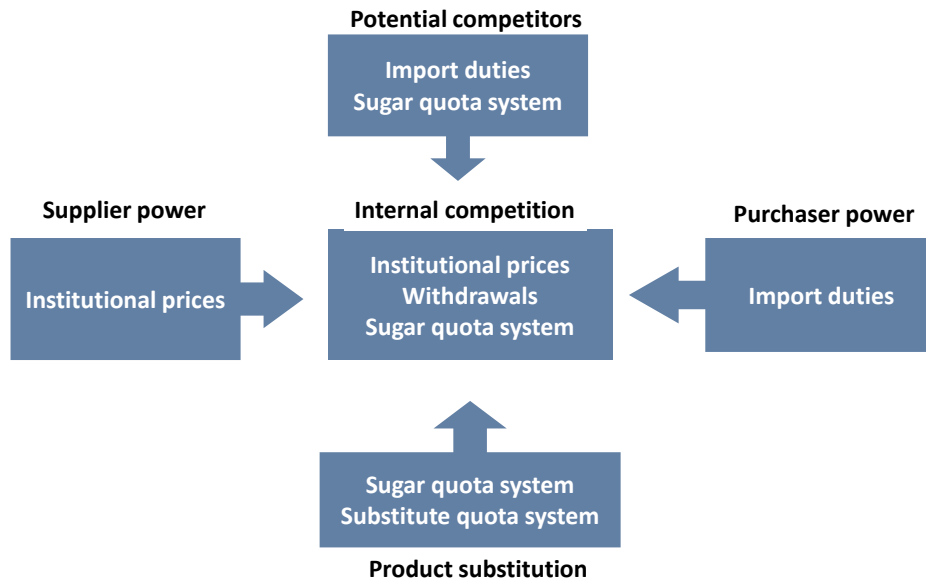
The ***competitive threat posed by sugar substitutes is limited*** by the operation of a production quota system for both isoglucose and inuline, which adds to technical barriers to product substitution.

Finally, ***no competitive threat might come from sugar beet growers*** - which are the main *suppliers* of the sugar industry - because they receive CAP-related support via the sugar industry itself (minimum beet prices) and also because they actually own a substantial portion of the EU sugar production capacity.

Figure 4.5 below summarises the implications of the pre-reform sugar regime for competition in the sugar sector through Porter's well-known "five forces" competition scheme.

²⁸ A traditional CAP market management model is characterised by a remunerative institutional price system, sustained by public intervention, substantial trade barriers and subsidised exports.

Figure 4.5 – Elements of the EU sugar regime influencing competition, according to Porter's scheme



The **2006 reform of the sugar regime** and the **evolution of preferential agreements for sugar import** appear to have some important implications for the state of competition in the EU sugar sector, especially linked to specific aspects.

1. **Reduced price support** (via reduction of institutional prices and elimination of public intervention) should have important implications for *internal competition*; also the **reduction of production quotas** should play a role in this respect. Indeed the two aspects combined should *improve cost-based competition among producers*.
2. **Improved access to the EU market** for ACP and LDC-based producers should increase the pressure coming from *potential competitors*, and also provide some alternative suppliers to downstream sugar users, thus improving *bargaining power of purchasers* versus domestic sugar producers²⁹.
3. On the other hand, the evolution described at points 1 and 2 above might further *reduce the attractiveness of the sector for newcomers*, as entry barriers of various nature would tend to be greater³⁰.

All considered, the above changes should anyway determine an **increased degree of competition in the EU sugar sector**, and **more balanced vertical competition between the sugar industry and downstream sugar-using industries**.

²⁹ This would however be the case only when preferential sugar imports:

1. are not constituted by raw sugar destined to EU refiners, but by white sugar suitable for the needs of the EU food industry;
2. are not controlled by EU sugar producers via supply agreements with or outright ownership of ACP and LDC-based sugar firms.

³⁰ Reduced profitability due to reduced price support; technical barriers posed by an increased need to pursue scale economies; financial barriers posed by the substantial costs for acquisition of production capacity (the size of firms and plants has been constantly increasing since the start of the sugar CMO in 1968) and for purchase of additional quotas; administrative barriers (greenfield start of sugar production activities is impossible in the EU without acquiring production quotas).

4.4.2.3 Global effect on concentration and competition and implications for price transmission

Summing up the result of the analysis, the reform of the sugar regime should increase both concentration and competition. This might reduce the overall positive effect of the reform on competition, as increased concentration is considered by most scholars a factor which can potentially (albeit not necessarily) hinder competition.

If we shift the focus on how the reform can indirectly affect VPT via its effects on concentration and competition, the answer is destined to be somewhat undetermined at this stage of the assessment (which is based on theoretical analysis): the actual indirect effects of the reform on VPT will indeed greatly depend on how its effects on concentration and competition combine in the real world, and in particular on how EU sugar producers actually react to such a radical change in the relevant regulatory framework for their sector.

More precise conclusions in this respect can be drawn in the context of the empirical assessment proper, where all the relevant elements concerning the actual evolution of concentration and competition before and after the reform in the different Member States will be analysed for the purposes of answering Question 2.

4.4.3 Synoptic table of the results of the preliminary theoretical assessment

The main findings of the preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to PT are outlined in the synoptic table hereunder (table 4.3), which links the main aspects of the reform to their potential effects on PT.

Table 4.3 – Synoptic table of the potential effects of the reform on price transmission

Aspects of the reform	Effects on price transmission	
	Horizontal price transmission	Vertical price transmission
Reduction of price support (reduction of institutional prices; termination of public intervention)	No direct effects <i>per se</i> , but plays a role if combined with increased duty-free imports (see “Improved access..”) and promotion of reduction of production quotas	Direct influence on upstream VPT (towards sugar beet growers); lowered “floor” for transmission of downward variations (due to decrease of minimum sugar beet price) Indirect effects on downstream VPT (towards sugar users) via: <ul style="list-style-type: none"> Increased concentration in the EU sugar sector. Increased internal competition in the EU sugar sector.
Promotion of reduction of production quotas (voluntary quota renunciation; national quota re-allocation; purchase of additional quotas)	Indirect effects only, in combination with termination of public intervention, reduced rooms for export refunds, improved access for preferential imports.	Indirect effects on downstream VPT (towards sugar users) via: <ul style="list-style-type: none"> Increased concentration in the EU sugar sector. Increased internal competition in the EU sugar sector.
Improved access on the EU market for sugar produced in LDCs and in non-LDC ACP countries (full implementation of EBA initiative and transition from ACP Sugar Protocol to EPAs => increased duty-free imports)	Can reduce the direct adverse effect of tariff protection (fixed tariff + additional variable duty) on HPT between the EU sugar market and the world market, in combination with reduced price support	Indirect effects on downstream VPT (towards sugar users) via: <ul style="list-style-type: none"> Increased concentration in the EU sugar sector. Increased pressure on EU sugar producers from potential extra-EU competitors + improved bargaining power of sugar purchasers versus domestic producers.
Reduced room for recourse to subsidised exports (following the 2005 WTO ruling)	Indirect effects only, in combination with termination of public intervention, reduction of production quotas and improved access for preferential imports.	No significant effects

SECTION B – METHODOLOGY & ANALYSIS

5 Study methodology

5.1 Data collection strategy and methods

As time series of quantitative data (suitable for mathematical/econometric treatment) played a crucial role for the carrying out of the required investigations, the data collection strategy devised for the study was *mainly centred on desk research; interviews to selected stakeholders and independent experts played a more complementary role*, and were mostly aimed at collecting the experts' views on the actual influence of certain factors on price transmission (see also § 4.2 and 4.3).

For a number of relevant items (e.g. ex-work prices of sugar; retail prices of sugar and sugar-containing consumer products) *no centralised source exists* which can provide full coverage in both geographical (EU level plus individual Member State level) and chronological (adequate time span and/or data frequency) terms. This implies that *a combination of sources had to be used*. Data at Member State level were often collected directly from national sources (especially National Statistical Offices).

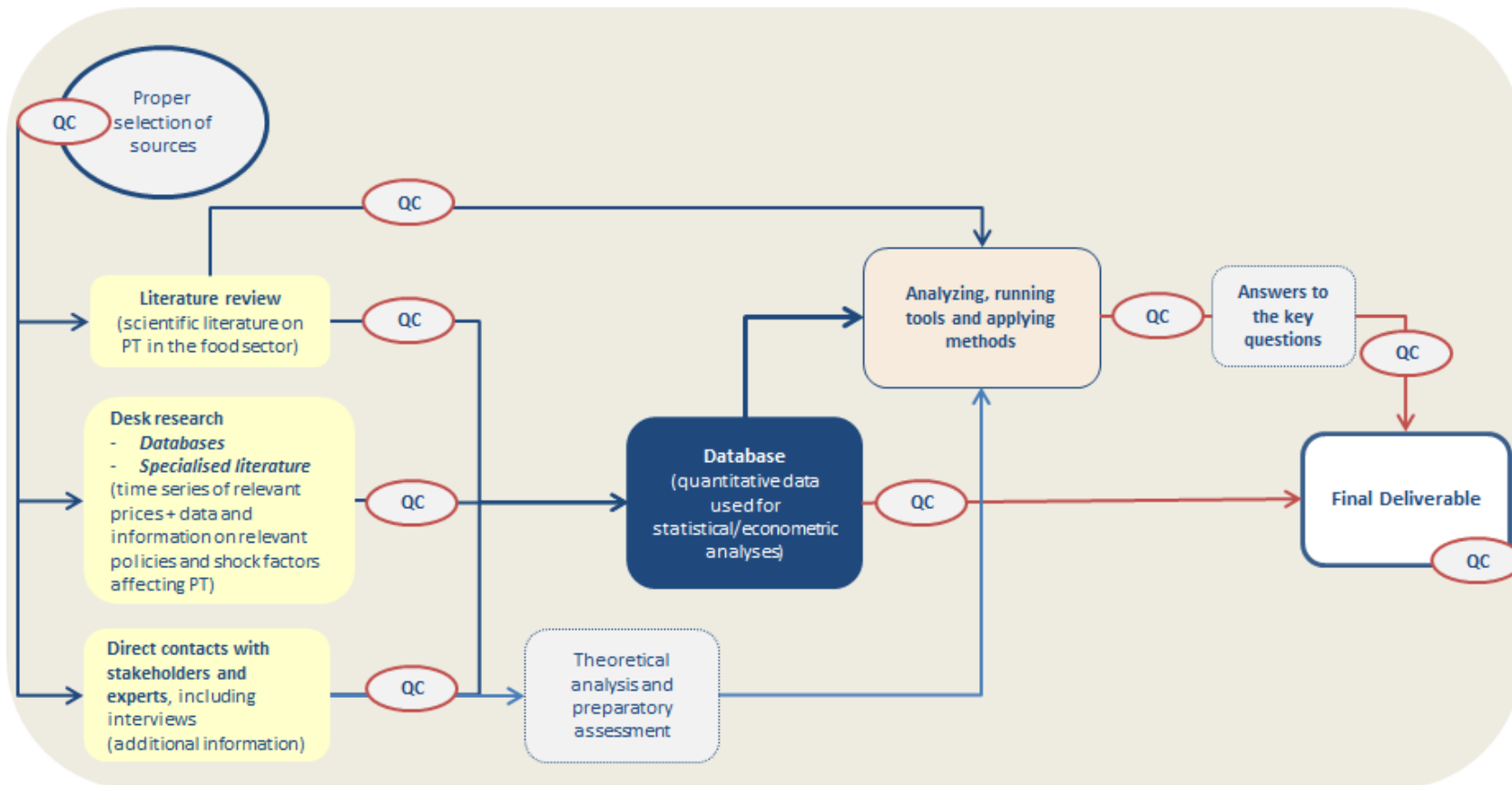
Whenever the collection of a complete dataset for the carrying out of specific quantitative analyses and/or for the application of specific statistical/econometric methods and tools proved unfeasible, a more qualitative approach and/or a simplified quantitative methodology was adopted (after approval by the Steering Group).

All the quantitative data used for the statistical/econometric analyses carried out in the framework of the study were organised in a database in MS-Excel format, provided as a stand-alone study output.

The entire data collection strategy devised for the study is outlined in figure 5.1 below, which also illustrates:

- the linkages between data collection activities and the other study tasks;
- the organisation of quality checks.

Figure 5.1 – Overall organisation of data collection, linkages with the other study tasks and quality checks



Note: QC = quality checks

5.2 Methodology for answering the study questions

5.2.1 General approach

The general approach followed to provide an answer to each of the three study questions was based on the following key steps:

1. Identification of the *relevant issues* posed by the study question and *definition of the meaning of the key terms* featured in its wording.
2. Identification, analysis and description of the *relevant policy measures*.
3. Definition of the *rationale of the question* through *theoretical analysis*, focused on:
 - *structuring the overall framework* for the carrying out of the empirical analyses;
 - defining the *expected influence of relevant shock factors* (both policy-related and not) on the functioning of price transmission mechanisms.
4. Definition of the *statistical/econometric procedures and tests* needed for the carrying out of empirical analyses (see § 5.2.2 for details).
5. Carrying out of *empirical analyses* through statistical/econometric elaboration of the collected data and information.
6. *Critical review of the results of the elaborations* carried out, in order to:
 - explain the inherent *limitations of the analysis* (stemming from limited availability and/or poor quality of data and information, from assumptions made, etc.) and their influence on the validity of the findings and conclusions;
 - highlight the *main findings* of the analysis, and interpret them by comparing the expected outcomes (as defined by theoretical analysis) with the actual results (obtained through empirical analysis).
 - draw reasoned *conclusions*.

The above approach is systematically adopted to tackle all the three study questions.

5.2.2 Econometric aspects

In order to answer the three key questions posed by the study, an empirical assessment was carried out, aimed at verifying the theoretical expected impacts of the reform by measuring the relationships existing between the relevant economic variables. For this purpose, appropriate econometric models and tools were adopted, taking into account the specific objectives of the investigation as well as the type of variables to be treated.

The empirical assessment for questions 1, 2, 3 was developed by Vector Autoregression Model (VAR henceforth)³¹ or Vector Error Correction Model (VECM henceforth)³².

In the VAR model variables are treated symmetrically by including for each variable an equation explaining its evolution based on its own lags and the lags of all the other variables in the model.

³¹ The reference paper for VAR is: **Christopher Sims (1980)**, "Macroeconomics and reality", *Econometrica*, 48(1), 1-48.

³² The reference papers for VECM are: **Granger Clive (1981)**, "Some properties of time series data and their use in econometric model specification", *Journal of Econometrics*, 16, 121-130; **Engle Robert and Granger Clive (1987)**, "Co-integration and Error Correction: Representation, Estimation and Testing", *Econometrica*, 55, 251-276.

VECM can be considered as an extension of VAR model allowing the distinction between short run and long run dynamics. In the context of the present study, the *short-term time horizon* is defined by the maximum number of monthly lags (nine) considered for the purposes of the assessment (this choice stems from economic considerations linked to duration of supply contracts in the sugar sector). As for the *long-term time horizon*, this is defined by a period spanning the entire length of each subsample, which varies from six to eleven years, according to the key question considered (see § 6.1 for question 1, § 7.1 for question 2, and § 8.1 for question 3).

Possible presence of both short-term and long-term PT was systematically investigated through econometric tests in the framework of the three key questions. Details on the specific methodology adopted for each question are provided in the following paragraphs.

5.2.2.1 Question 1

Question 1 refers to vertical price transmission (VPT) mechanisms, which were investigated to understand whether the reform has increased or reduced the efficiency of the market. Sample data go from 1999 to 2011 and have monthly frequency. To assess the role played by the reform, the sample was divided into two subsamples, respectively spanning the pre- and post-reform periods³³.

All the reasoning presented below with reference to a hypothetical EU average level was actually applied at individual Member State level.

The analysis in each subsample³⁴ was performed by means of VECM³⁵. The general structure of the problem, aimed at detecting PT average effects, can be represented by the following VECM reduced form³⁶:

$$\Delta p_{dow,t} = \gamma_1 + \rho_1 \Delta p_{dow,t-1} + \dots + \rho_9 \Delta p_{dow,t-9} + \delta_1 \Delta p_{up,t-1} + \dots + \delta_9 \Delta p_{up,t-9} + \alpha_1 R_{t-1} + \mu_t$$

$$\Delta p_{up,t} = \gamma_2 + \omega_1 \Delta p_{up,t-1} + \dots + \omega_9 \Delta p_{up,t-9} + \pi_1 \Delta p_{dow,t-1} + \dots + \pi_9 \Delta p_{dow,t-9} + \alpha_2 R_{t-1} + \lambda_t$$

$$R_{t-1} = p_{dow,t-1} - \theta - \beta p_{up,t-1}$$

where

$p_{up,t}, \dots, p_{up,t-10}$ is the EU average sugar ex-factory price index observed at time t,...,t-10;

$\Delta p_{up,t}, \dots, \Delta p_{up,t-9}$ is the first difference of the EU average sugar ex-factory price index observed at time t,...,t-9³⁷;

³³ To evaluate potential anticipated or postponed effects of the policy shock, a sensitivity analysis was performed, by analysing possible variations of results due to shifts of the mark which divides the 1999-2011 sample into two subsamples (see § 6.1 for details).

³⁴ The estimation process was developed by estimating the specified equations in each subsample to measure how all the coefficients have changed before and after the policy shock.

³⁵ If the involved time series were not cointegrated, the analysis was developed by means of the VAR model.

³⁶ The estimation was made with reference to the VECM (or VAR) reduced form, in which are not present the contemporaneous effects between Δp_{up} and Δp_{dow} .

³⁷ This variable has to be stationary (for example, if the original variable is integrated of order 1, i.e. not stationary, it is considered in first difference).

$p_{dow,t}, \dots, p_{dow,t-10}$	is the EU average white sugar retail price index at time $t, \dots, t-10$;
$\Delta p_{dow,t}, \dots, \Delta p_{dow,t-9}$	is the first difference of the EU average white sugar retail price index observed at times $t, \dots, t-9$ ³⁸ ;
$\gamma_1, \gamma_2, \theta$	are constants;
$\rho, \delta, \omega, \pi$	are coefficients;
R_{t-1}	is the error correction term (this term expresses the cointegration relation);
β	is the cointegration factor;
α_1, α_2	are adjustment coefficients;
μ, λ	are error terms.

Whenever PT average effects were detected, a decomposition analysis was implemented to separate the net effects on the explained variable generated by increases and decreases of the explanatory variable. For example, assuming that a PT average effect from ex-work price to retail price is detected at lag $t-1$, the general structure of effect decomposition analysis can be represented by the following equation:

$$\Delta p_{dow,t} = \chi_1 D \Delta p_{up,t-1} + (\delta_1 - \chi_1)(1-D)\Delta p_{up,t-1}$$

where

D	is a dummy variable which is equal to 1 if $\Delta p_{up,t-1} \geq 0$, or is equal to 0 otherwise;
δ_1	is the PT average effect estimated by the previous equation;
χ_1	is the coefficient concerning the PT effect in the case of $\Delta p_{up,t-1} \geq 0$.

5.2.2.2 Question 2

Question 2 refers to the relationship between sugar price at different levels of the supply chain and the degree of competition in the sugar sector. Sample data go from 1999 to 2011 and have monthly frequency. To assess the role played by the reform, the sample was divided into two subsamples, respectively spanning the pre- and post-reform periods³⁹.

Also in this case, all the reasoning presented below with reference to a hypothetical EU average level was actually applied at individual Member State level.

The analysis in each subsample⁴⁰ was performed by means of VECM⁴¹. The general structure of the problem can be represented by the following VECM reduced form⁴²:

³⁸ For this variable the same indication about stationarity, expressed with reference to Δp_{up} , has to be considered (for details see footnote 37).

³⁹ To evaluate potential anticipated or postponed effects of the policy shock, a sensitivity analysis was performed, by analysing possible variations of results due to shifts of the mark which divides the 1999-2011 sample into two subsamples (see § 7.1 for details).

⁴⁰ The estimation process was developed by estimating the specified equations in each subsample to measure how all the coefficients have changed before and after the policy shock.

$$\Delta p_t = \gamma_1 + \rho_1 \Delta p_{t-1} + \dots + \rho_9 \Delta p_{t-9} + \delta_1 \Delta LI_{t-1} + \dots + \delta_9 \Delta LI_{t-9} + \alpha_1 R_{t-1} + \mu_t$$

$$R_{t-1} = p_{t-1} - \theta - \beta LI_{t-1}$$

where

$p_{t,...}, p_{t-10}$	is the EU average sugar ex-factory price ⁴³ index observed at time $t,...,t-10$;
$\Delta p_{t,...}, \Delta p_{t-9}$	is the first difference of the EU average sugar ex-factory price index observed at time $t,...,t-9$ ⁴⁴ ;
$LI_{t-1,...}, LI_{t-10}$	is the Lerner index at time $t-1,...,t-10$;
$\Delta LI_{t-1,...}, \Delta LI_{t-9}$	is the first difference of the Lerner index observed at time $t-1,...,t-9$ ⁴⁵ ;
γ_1, θ	are constants;
ρ, δ	are coefficients;
R_{t-1}	is the error correction term (this term expresses the cointegration relation);
β	is the cointegration factor;
α_1	is the adjustment coefficient;
μ	is the error term.

5.2.2.3 Question 3

Question 3 refers to horizontal price transmission (HPT) mechanism. This mechanism was analysed to understand whether WTO formation and the reform of the sugar regime have increased or reduced the degree of international sugar markets integration. Sample data go from 1985 to 2011 and have monthly frequency. To assess the role played by the aforementioned policy changes the sample was divided into three subsamples, respectively spanning the pre-WTO period, the period between WTO formation and the reform of the sugar regime, and the post-reform period⁴⁶.

⁴¹ If the involved time series were not cointegrated, the analysis was developed by means of the VAR model.

⁴² The estimation was made with reference to the VECM (or VAR) reduced form, in which are not present the contemporaneous effects between Δp and ΔLI . The assessment focused on the sole relation considering relevant prices as a dependent variable, as this was consistent with the object of the investigation (influence of competition on prices).

⁴³ The same procedure was applied also to retail sugar price and to retail prices of sugar-containing products.

⁴⁴ This variable has to be stationary (for example, if the original variable is integrated of order 1, i.e. not stationary, it is considered in first difference).

⁴⁵ For this variable the same indication about stationarity, expressed with reference to Δp , has to be considered (for details see footnote 44).

⁴⁶ To evaluate potential anticipated or postponed effects of the policy shock, a sensitivity analysis was performed, by analysing possible variations of results due to shifts of the marks which divide the 1985-2011 sample into three subsamples (see § 8.1 for details).

Again, the whole reasoning presented below with reference to a hypothetical EU average level was actually applied at individual Member State level for the purposes of the assessment.

The analysis in each subsample⁴⁷ was performed by means of VECM⁴⁸. The general structure of the problem can be represented by the following VECM reduced form⁴⁹:

$$\Delta EU_t = \gamma_1 + \rho_1 \Delta EU_{t-1} + \dots + \rho_9 \Delta EU_{t-9} + \delta_1 \Delta W_{t-1} + \dots + \delta_9 \Delta W_{t-9} + \alpha_1 R_{t-1} + \mu_t$$

$$R_{t-1} = EU_{t-1} - \theta - \beta W_{t-1}$$

where

EU_t, \dots, EU_{t-10}	is the EU average sugar ex-factory price index observed at time t,...,t-10;
$\Delta EU_t, \dots, \Delta EU_{t-9}$	is the first difference of the EU average sugar ex-factory price index observed at time t,...,t-9 ⁵⁰ ;
W_{t-1}, \dots, W_{t-10}	is the London LIFFE white sugar price index at time t-1,...,t-10.
$\Delta W_{t-1}, \dots, \Delta W_{t-9}$	is the first difference of London LIFFE white sugar price index at time t-1,...,t-9 ⁵¹ ;
γ_1, θ	are constants;
ρ, δ	are coefficients;
R_{t-1}	is the error correction term (this term expresses the cointegration relation);
β	is the cointegration factor;
α_1	is the adjustment coefficient;
μ	is the error term.

⁴⁷ The estimation process was developed by estimating the specified equations in each subsample to measure how all the coefficients have changed before and after the policy shocks.

⁴⁸ If the involved time series were not cointegrated, the analysis was developed by means of the VAR model.

⁴⁹ The estimation was made with reference to the VECM (or VAR) reduced form, in which are not present the contemporaneous effects between ΔEU and ΔW . The assessment focused on the sole relation considering EU ex-works prices as a dependent variable.

⁵⁰ This variable has to be stationary (for example, if the original variable was integrated of order 1, i.e. not stationary, it was considered in first difference).

⁵¹ For this variable it has to be valid the same indication about stationarity expressed with reference to ΔEU (for details see footnote 50).

SECTION C – REPLIES TO THE STUDY QUESTIONS

6 Reply to Question 1

“To what extent has a change in the institutional price of sugar as a result of the reform resulted in a change of the retail price of sugar?

The answer to this question will also present the evidence found, if any, that the sugar market after the reform has been efficient⁵²”

<p>Key terms:</p> <p><i>Institutional price of sugar:</i> the term includes all prices at the different stages of the sugar supply chain which are (or were) set by EU provisions over the relevant period for the study, i.e. 1985-2011 (minimum price of sugar beets; reference price for white and raw sugar; intervention price for white and raw sugar; etc.).</p> <p><i>Retail price of sugar:</i> price of sugar sold to final consumers (households) in retail outlets</p>	<p>Reference theories and related approaches:</p> <ul style="list-style-type: none"> - Neoclassical theory (market forms: oligopoly, monopolistic competition, etc.; “Law of symmetric price transmission”) and institutional economics - Supply chain approach; structure-conduct-performance paradigm; Porter approach to the analysis of competition
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The reply to this question is based on analyses (and econometric tests in particular) carried out for all Member States for which data were available (see § 6.3). For sake of conciseness, evidence provided in the following paragraphs, as well as the related reasoning, are mostly focused on a selection of five Member States⁵³ (France, Germany, Spain, United Kingdom and Poland). Additional elements on other Member States are provided whenever they can improve the completeness of the reply.

The sugar sector is always considered as viewing point of vertical price transmission along the supply chain.

6.1 Relevant policy measures and overall rationale

The focus of Question 1 is on the possible influence of the 2006 reform of the EU sugar regime on vertical price transmission (VPT) along the sugar supply chain (in other terms, on the linkages between the institutional price of sugar and all other potentially related prices).

According to the preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to price transmission (PT)⁵⁴, policy changes which can have the most **straightforward influence on the functioning of VPT along the sugar supply chain** are the following:

1. **Reduction of sugar intervention price;** after termination of intervention from 2010/11, such price can be considered equal to zero.
2. **Reduction of reference price** (differently from intervention price, reference price does not act anymore as a “guaranteed minimum price” for sugar producers).

⁵² According to the *Study on price transmission in the Agro-Food Sector* (Report for European Commission – Agriculture DG, Agra CEAS Consulting Ltd 2064/EHO/July 2003) “in an ‘efficient’ market any change in the institutional price of sugar would be reflected in a corresponding change in the retail price of sugar”.

⁵³ France and Germany kept their importance as sugar-producing Member States both before and after the 2006 reform. Spain experienced a substantial reduction of its sugar production capacity after the reform. United Kingdom is peculiar inasmuch it produces sugar from both domestic beets and imported raw cane sugar (the split has roughly been a 55-45 one for most of the 2000-2011 period). Finally, Poland is by far the most important sugar-producing NMS-12.

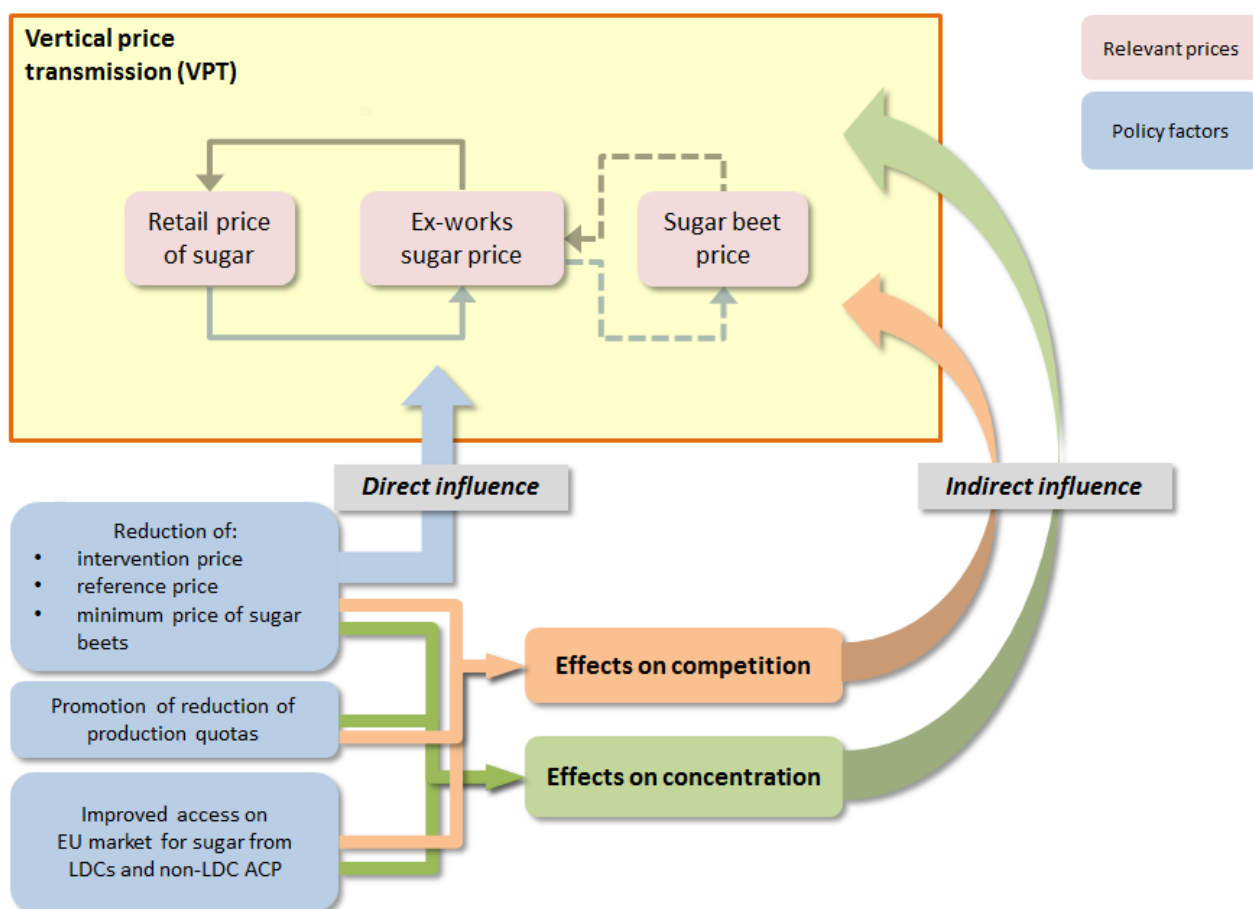
⁵⁴ For a complete description of the results of the preliminary theoretical assessment, please refer to §4.

3. Reduction of minimum price of sugar beet.

Other changes introduced by the reform (promotion of reduction of production quotas; improved access on the EU market for sugar produced in LDCs and in non-LDC ACP countries) can have – alone or in combination with reduction of price support – only an **indirect influence on downstream VPT** (always considering the sugar sector as viewing point in the supply chain), exerted **via effects on concentration and competition in the EU sugar sector** (see question 2, and § 7.1 in particular).

Figure 6.1 below outlines the overall rationale of the question.

Figure 6.1 – Overall rationale of question 1



Important notice: for a complete description of the preliminary theoretical assessment, please refer to §4

The dynamics of the variables which are more directly affected by the reduction of price support (sugar ex-works prices; sugar beet prices) introduced by the 2006 reform are outlined against the variation of institutional prices at § 6.2 (with the aid of a series of graphs); the time span considered is 2000-2011.

The results of the empirical assessment of VPT along the sugar supply chain before and after the 2006 reform (carried out by applying econometric methods and tools) are illustrated at § 6.3, also with the aid of a series of tables and graphs. The 2006 reform of the EU sugar regime was considered as the **policy-related break** for the assessment; three hypotheses were considered for the timing of such break:

- achievement of a political compromise on the content of the reform (November 2005);
- publication of the implementing regulation on the Official Journal (March 2006)

- c. entry into force of the regulation (July 2006 – start of the first EU sugar MY under the reformed regime).

Definition of the short-term lag structure was made by considering a time span of 1 to 9 months, on the basis of economic considerations linked to duration of supply contracts in the sugar sector.

Reasoned conclusions on the findings of all the aforementioned investigations are drawn at § 6.4, in order to provide an answer to the question.

6.2 Evolution of relevant variables and of policy-related shock factors

The dynamics of the relevant variables over the 2000-2011 period were studied against the evolution of policy-related shock factors in order to assess whether the **reduction in the institutional prices of sugar and sugar beets** introduced with the reform resulted in a **correspondent reduction** of, respectively, **sugar ex-works prices and sugar beet prices paid** to farmers at Member State level.

The results of the analysis are illustrated at § 6.2.1 (for sugar ex-works prices) and § 6.2.2 (for sugar beet prices).

As a preliminary step to the empirical assessment proper via econometric methods, the evolution of the **relation between retail prices and ex-works prices** was also studied in terms of ratio between the two variables (both expressed as indexes). This qualitative analysis was aimed at investigating the relation between the two prices **in simultaneous terms**, whereas econometric testing proper (see § 6.3) focused on lagged responses of each price to variations of the other. The results of this preliminary analysis are illustrated at § 6.2.3.

6.2.1 Evolution of sugar ex-works price vs. variation of institutional prices

The **policy-related variables** against which the evolution of **sugar ex-works price** was studied are the following:

- **intervention price for white sugar** (applied until termination of public intervention purchases of sugar with the start of 2010/11 MY)
- **reference price for white sugar** (introduced by the 2006 reform and applied from 2006/07 MY onwards).

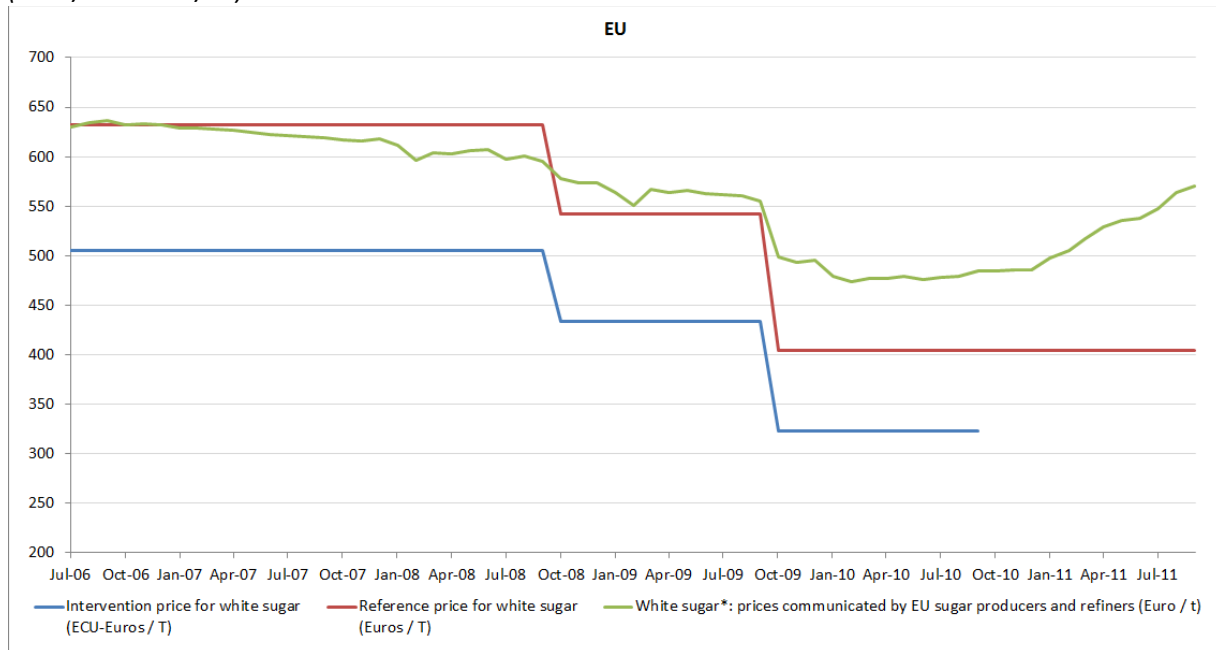
Looking at the dynamics of the EU average of national sugar ex-works prices⁵⁵ (figure 6.2) in the post-reform period, it is worth noting that such average indeed decreased in the first four marketing years (MY) after the reform, but:

- stayed well above the intervention price until the termination of public intervention purchases in the sugar sector at the end of the 2009/10 MY;
- never went below the reference price from MY 2008/09 onwards.

In this respect, it is also extremely important to underline that the average EU ex-works sugar price has remarkably increased over the first months of 2012 in comparison with late 2011 levels (711 Euros/T in May 2012 against 654 Euros in December 2011), further confirming the above trends.

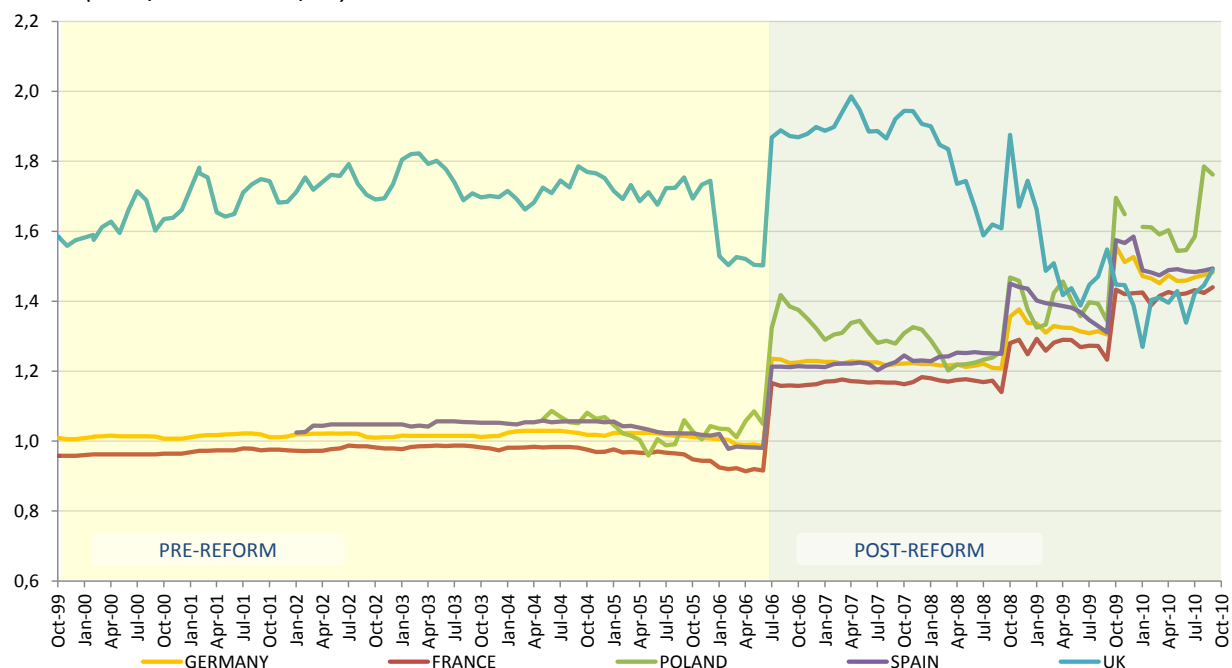
⁵⁵ As published in the CIRCA database of the EU Commission, DG Agriculture.

Figure 6.2 - European Union: evolution of sugar ex-works price (EU average) vs. reduction of institutional prices (2006/07 – 2010/11)



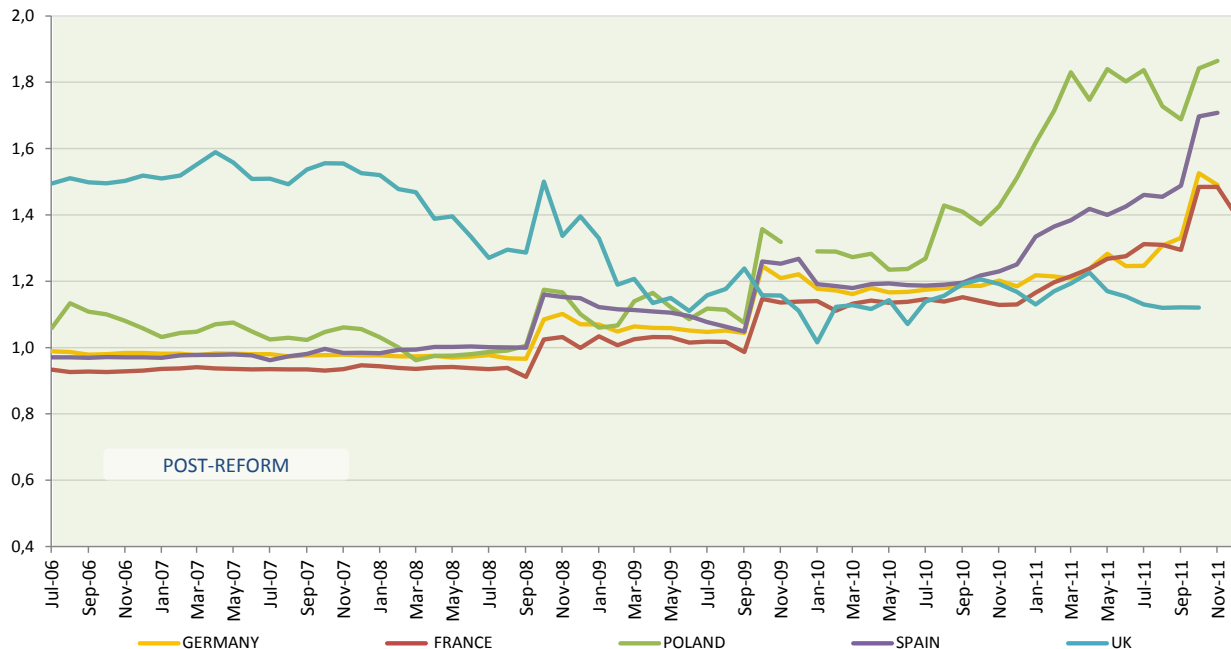
Figures 6.3 and 6.4 outline the evolution of the ratio between sugar ex-works price and – respectively – intervention price and reference price. An increase in such ratio over time implies that the reduction in institutional prices of sugar did not result in an equal reduction in sugar ex-works price.

Figure 6.3 – Evolution of the ratio between sugar ex-works price* and intervention price** in some Member States (1999/2000 – 2009/10)



* For France, pre-reform prices in absolute value were obtained by chaining absolute values collected by the EU Commission – DG Agriculture to an index of producer prices of sugar which includes sugar for industrial uses; for the United Kingdom, the series concerns an ex-works delivered price (DEFRA opted for a change in the source of primary data for ex-works sugar price from 2009 onwards).

Figure 6.4 - Evolution of the ratio between sugar ex-works price* and reference price in some Member States (2006/07 – 2010/11)



* For France, pre-reform prices in absolute value were obtained by chaining absolute values collected by the EU Commission – DG Agriculture to an index of producer prices of sugar which includes sugar for industrial uses; for the United Kingdom, the series concerns an ex-works delivered price (DEFRA opted for a change in the source of primary data for ex-works sugar price from 2009 onwards).

Ex-works sugar prices at Member State level generally experienced a steep decline after the second step in the reduction of intervention price (from 505,52 to 433,60 Euros/T), albeit with some exceptions (e.g. Poland).

The evolution of sugar ex-works prices in the post-reform period shows similar patterns in most Member States (see figures 6.3 and 6.4)⁵⁶: the trend towards an increase in the ratio shows that the **reduction of institutional prices of sugar did not result in an equal decrease of sugar ex-works prices at Member State level**. Indeed domestic sugar prices have started to increase again between 2010 and 2011; in this respect, it is also worth noting that price rallies took place on the international sugar market in the same period (see question 3, § 8.4.1).

⁵⁶ The apparently anomalous levels of pre-reform ex-works sugar prices in France (systematically below intervention price) and United Kingdom (much higher than intervention price) can be so explained:

- France: pre-reform prices in absolute value were obtained by chaining absolute values collected by the EU Commission – DG Agriculture to an index of producer prices of sugar which includes sugar for industrial uses.
- United Kingdom: besides the effect of Euro/UK£ exchange rate and the spatial separation from continental sugar markets (which in itself justifies the existence of a price differential), the time series featured in the graph concerns ex-works delivered sugar prices. Such data have been collected by DEFRA, which in 2009 opted for the switch to a more robust source: data for the previous period might hence be not perfectly representative.

6.2.2 Evolution of sugar beet price vs. variation of institutional prices

Sugar beet prices were not included in the empirical assessment at § 6.3 for lack of suitable data series (available time series had a yearly frequency instead of a monthly one); however, the evolution of sugar beet prices paid to farmers in some Member States between 2000 and 2011 was studied against the evolution of **EU sugar beet minimum price** and of ex-works sugar price, in order to assess:

- whether the reduction of EU sugar beet minimum price resulted in an equal decrease in sugar beet prices at Member State level;
- the extent to which the evolution of sugar beet prices at Member State level followed the dynamics of sugar ex-works prices (or diverged from them).

Figure 6.5 outlines the evolution of the ratio between sugar beet prices paid to farmers and the EU minimum price for beets. An increase in such ratio over time implies that the reduction in the institutional price of sugar beets did not result in an equal reduction in sugar beet prices at Member State level.

Figure 6.6 instead outlines the evolution of the ratio between sugar beet prices and sugar ex-works prices at Member State level.

Figure 6.5 - Evolution of the ratio between sugar beet prices (average between A, B and C / out-of-quota beets) and EU sugar beet minimum price (A / in-quota beets) in some Member States (1999/2000 – 2010/11)

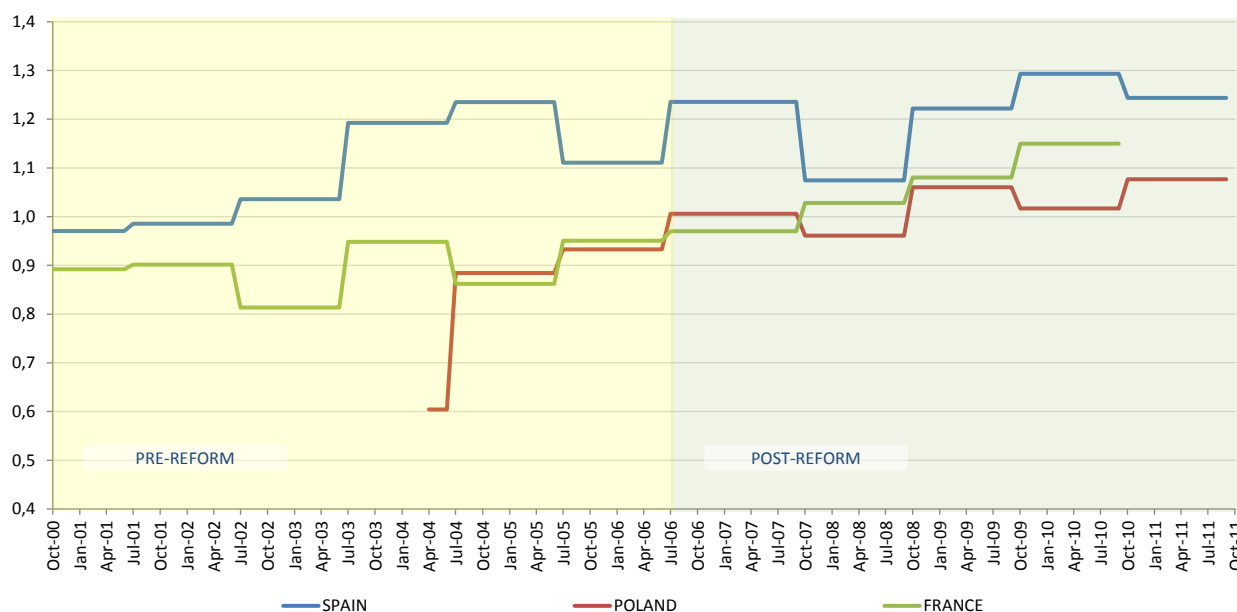
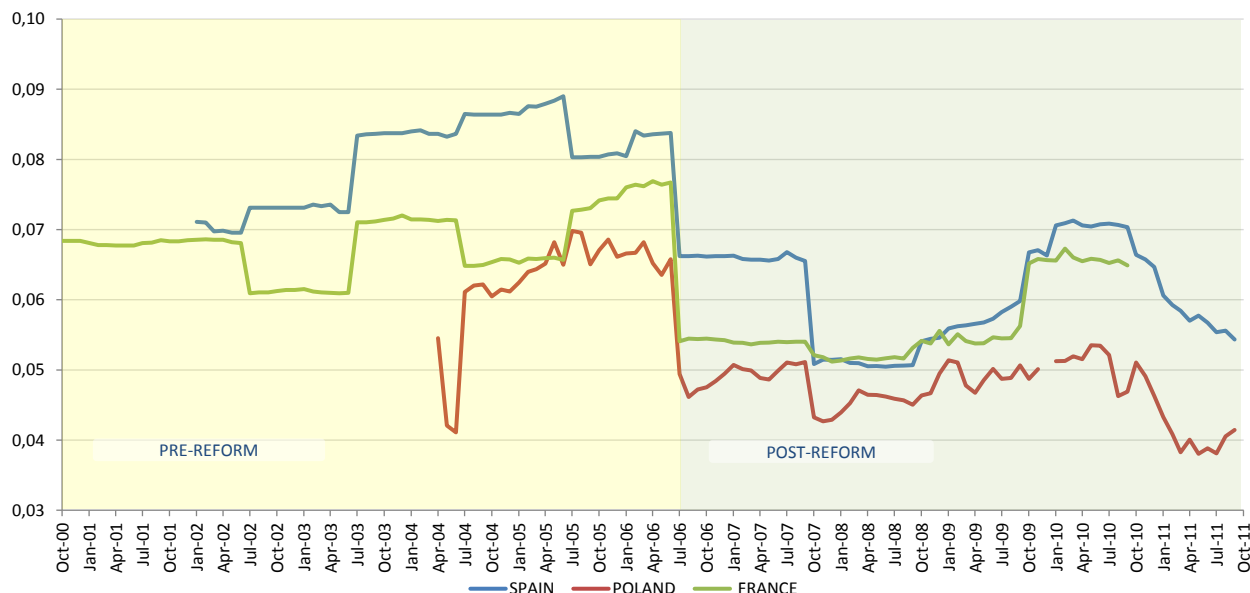


Figure 6.6 - Evolution of the ratio between sugar beet prices (average between A, B and C / out-of-quota beets) and sugar ex-works prices in some Member States (1999/2000 – 2010/11)



The evolution of sugar beet prices paid to farmers (average prices between A, B and C / out-of-quota beets) in relation to the post-reform reduction of EU sugar beet minimum price for in-quota beets and the dynamics of ex-works sugar prices was investigated in three Member States, which differed for a number of features:

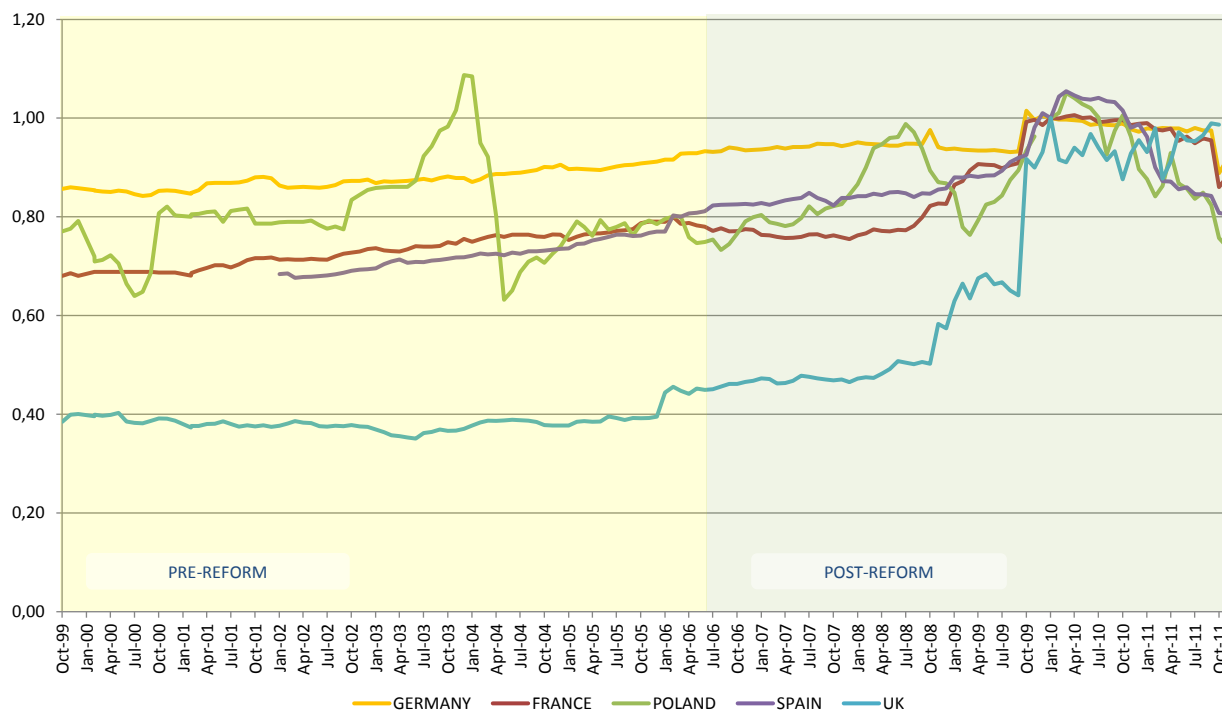
- France: cost-efficient sugar producer, which remained among the top sugar producing Member States after the 2006 reform.
- Spain: less cost-efficient sugar producer, which saw a remarkable reduction of production capacity after the 2006 reform.
- Poland: NMS which became part of the EU in April 2004, i.e. about 2 years before the implementation of the 2006 reform.

Sugar beet prices paid to farmers more or less followed the reduction of EU sugar beet minimum price in all the three Member States (see figure 6.5), albeit to a varied extent, and not completely. Beet prices do not seem to have followed the increases of ex-works sugar price between 2010 and 2011 (see figure 6.6).

6.2.3 Evolution of the relation between sugar ex-works prices and retail prices

The study of the evolution of the ratio between sugar retail prices and ex-works prices at Member State level is aimed at highlighting the presence of simultaneous responses of each price to variations in the other price. The closer the ratio between retail price index and ex-works price index is to one, the clearer the presence of the aforementioned kind of response. Figure 6.7 below illustrates the results of such investigation for a selection of Member States.

Figure 6.7 – Evolution of the ratio between retail price indexes and ex-works price indexes at Member State level, 1999/00 to 2010/11



It can clearly be seen from the figure that – except for France and Germany over a relatively short period between October 2009 and October 2010 – the ratio is usually lower than 1: such result highlights the **absence of simultaneous adjustments between the two prices** over the most part of the period considered in the assessment.

6.3 Empirical assessment of price transmission in the sugar sector before and after the reform

The results of the empirical assessment of VPT between ex-works sugar prices and retail prices at Member State level are illustrated at § 6.3.1 (for the EU-15 Member States) and at § 6.3.2 (for the NMS-12).

The structure of the sub-paragraphs dedicated to individual Member States at § 6.3.1 and 6.3.2 is organised in two parts:

- Description of the **evolution of sugar ex-works price and of sugar retail price** (both expressed as indexes) **against the relevant changes in the EU sugar regime** occurred over the 2000-2011 period. Time series in the graphs which illustrate such evolution all use the same base month; such graphs allow to appreciate “at a glance” (albeit in a qualitative way) to what extent ex-works price and retail price of sugar react to each other’s variation over time. It is worth underlining that - being based on index numbers (instead of absolute values⁵⁷) - the two series do not allow to appreciate the extent of the margin between ex-works price and retail price.
- Illustration of the **results of the econometric tests**, which were aimed at assessing empirically in a dynamic perspective:
 - the functioning of VPT from sugar ex-works price to sugar retail price, and vice versa;

⁵⁷ Illustration of series of sugar ex-works price at Member State level in absolute value is not possible due to confidentiality reasons.

- possible alterations in VPT mechanisms (considering direction, intensity, speed and symmetry/asymmetry of relationships) occurring before and after the 2006 reform;
- the efficiency of the EU sugar market before and after the 2006 reform.

The **econometric tests** could be performed on 19 sugar-producing Member States: 12 EU-15 Member States and 7 NMS-12 countries (see table 6.1). Datasets allowed comparison between pre-reform and post-reform situation for 9 Member States out of 19, (in three cases the datasets for the pre and/or post-reform situation were of sub-optimal length).

Table 6.1 – Geographical coverage of econometric tests performed for Question 1

Question 1	EU-15		NMS-12		Total
	Countries	N°	Countries	N°	N°
Econometric tests performed	Austria, Belgium, France, Finland, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom	12	Bulgaria, Czech Republic, Hungary, Lithuania, Poland, Romania, Slovakia	7	19
<i>of which on suboptimal datasets</i>	<i>Austria, Belgium, Finland, Italy, Netherlands, Portugal, Spain, Sweden</i>	8	<i>Bulgaria, Hungary, Lithuania, Romania, Slovakia</i>	5	13
Comparison pre- / post-reform possible	France, Germany, Greece, Netherlands, Spain, United Kingdom	6	Czech Republic, Poland, Romania	3	9
<i>of which on suboptimal datasets</i>	<i>Netherlands, Spain</i>	2	<i>Romania</i>	1	3

The presence and features of PT were investigated in both directions (from ex-works price to retail price and vice versa); in both cases, separate assessments were made for the situations where the leading price was increasing and the situations where it was instead decreasing⁵⁸.

The **overall findings of the assessment** are highlighted at § 1.3.3. As no adequate time series of **sugar price at intermediate stages of the marketing channel** were available for econometric testing, the assessment concerning this stage of VPT was carried out by means of a qualitative approach; the results of such assessment are illustrated in Box 1 at § 6.3.3.3.

It is important to underline that the time series which underwent econometric testing are updated to the end of 2011; as a consequence, **the assessment does not cover possible effects of ex-works price increases occurred in the first months of 2012.**

⁵⁸ In a limited number of cases, PT was detected but it was impossible to make a clear distinction between the two different situations in the assessment; in such cases, the intensity of PT in the two situations is defined as “undetermined”, and consequently also the asymmetry (towards price increases or decreases) is defined in the same way.

6.3.1 Results of the assessment for the EU-15

The results of the econometric tests performed are summarised at tables 6.2 (transmission from ex-works price to retail price) and 6.3 (transmission from retail price to ex-works price).

Econometric tests also checked for the presence of **long-term relations** between ex-works prices and retail prices; however, these **were never detected**.

As for the **short-term effects**, **VPT from ex-works price to retail price was detected more often than VPT in the opposite direction**, both before and after the reform. The picture concerning changes in intensity (in the two situations where prices are increasing and decreasing) and speed of VPT is quite mixed, while **asymmetry towards price increases clearly prevails both before and after the reform**.

The paragraphs which follow provide a more detailed description of the most significant results for specific Member States, complemented by possible explanations of some peculiarities.

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Table 6.2 – VPT from ex-works price to retail price: summary of results of econometric tests for the EU-15

Member State	Situations where ex-works price is increasing				Situation where ex-works price is decreasing				Speed of VPT		Asymmetry			
	VPT present		Intensity		VPT present		Intensity		Increased after the reform	Decreased after the reform	towards price increases		towards price decreases	
	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform			Pre-reform	Post-reform	Pre-reform	Post-reform
France	x	x		x	x				x		x	x		
Germany	x	x	x		x	x	x		x		x	x		
Greece	x	x	x								x	x		
Netherlands	x	x		x	x	x		x		x	x	x		
Spain	x				x						x			
United Kingdom	x				x						x			
TOTAL	6	4	2	2	5	2	1	1	2	1	6	4		

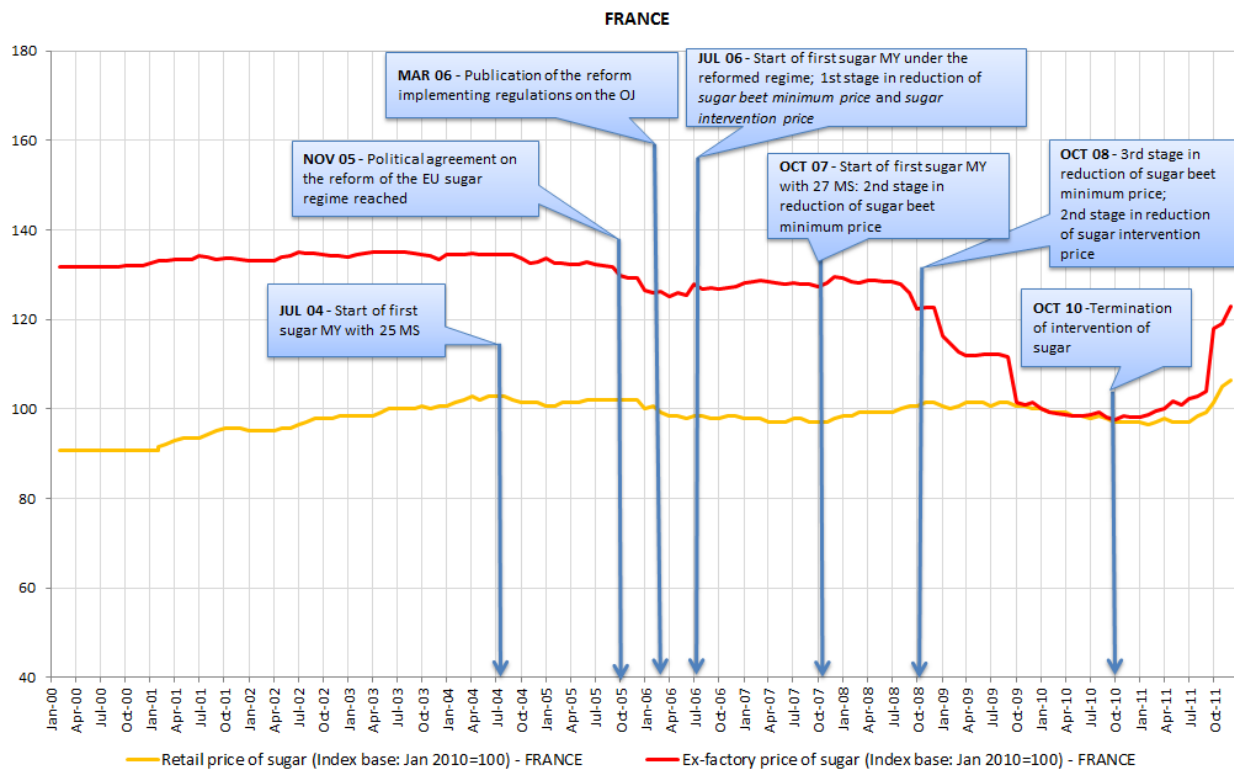
Table 6.3 – VPT from retail price to ex-works price: summary of results of econometric tests for the EU-15

Member State	Situations where retail price is increasing				Situation where retail price is decreasing				Speed of VPT		Asymmetry			
	VPT present		Intensity		VPT present		Intensity		Increased after the reform	Decreased after the reform	towards price increases		towards price decreases	
	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform			Pre-reform	Post-reform	Pre-reform	Post-reform
France	x				x						x			
Germany														
Greece	x	x	x			x				x	x	x		
Netherlands														
Spain	x	x	x		x				x		x	x		
United Kingdom														
TOTAL	3	2	2		2	1			1	1	3	2		

6.3.1.1 France

From a preliminary qualitative assessment (figure 6.8), it can be seen that retail price tends to follow the variations of ex-works price for most of the pre-reform period, and from October 2009 onwards in the post-reform period.

Figure 6.8 - France: evolution of sugar ex-works price index and sugar retail price index vs. main policy changes (2000-2011)



Econometric tests for France were performed on datasets of optimal length.

VPT from ex-works to retail price (see table 6.4) was detected both before and after the reform in the situations where ex-works price is increasing, albeit with slight instability (the time pattern of PT – i.e. the lags at which it is present - varies with the timing of the policy-related break); it was instead present in the pre-reform period only in the situations where ex-works price is decreasing. In the situations where ex-works price is increasing, the intensity of PT decreased after the reform. There is an increase in PT speed after the reform. From the comparison of the intensity of PT in the two situations considered (increasing vs. decreasing ex-works price), a clear asymmetry towards price increases emerges both before and after the reform; the presence of such asymmetry has contributed to widen the gap between retail price and ex-works price, as the former did not follow the latter in case of decreases, while the contrary happened in case of increases (even if upward variations of retail price were much less than proportional in the post-reform period).

Table 6.4 – VPT from ex-works price to retail price: results of econometric tests for France

Period*		France short term; Ex-works price => Retail price				
		Ex-works price increasing		Ex-works price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	0,466586	YES	0,009594	Asymmetry + 2
Pre-reform (2)		Undetermined		Undetermined		Undetermined 2-3
Pre-reform (3)		YES	0,584437	YES	0,544100	Asymmetry + 2-3
Post-reform (1)		YES	0,286801	YES	0,018265	Asymmetry + 1-4
Post-reform (2)		YES	0,280332	NO		Asymmetry + 1
Post-reform (3)		YES	0,277659	NO		Asymmetry + 1
Summary of results	Pre-reform	Presence of price transmission (slightly unstable)		Presence of price transmission (slightly unstable)		Asymmetry towards price increases
	Post-reform	Presence of price transmission (slightly unstable); intensity lower than in pre-reform period		Absence of price transmission		Asymmetry towards price increases; speed higher than in pre-reform period

* Period: Pre-reform (1), (2), (3) and Post-reform (1), (2), (3) = timing hypotheses 1 (Nov 2005), 2 (Mar 2006), 3 (Jul 2006)
“Undetermined” = no distinction possible between the situations where ex-works price is increasing and the situations where ex-works price is decreasing

VPT from retail to ex-works price (table 6.5) was detected before the reform only for the two situations considered (increasing vs. decreasing retail price); the intensity of PT was higher in the situations where retail price was increasing (even if it was extremely low in both situations). The resulting asymmetry towards price increases (which implies that ex-works sugar price tends to follow – with a certain delay – upward variations of retail price) could be explained by the presence of greater market power of sugar producers vis-à-vis retailers in the pre-reform period (see on the matter also § 7.2).

Table 6.5 - VPT from retail price to ex-works price: results of econometric tests for France

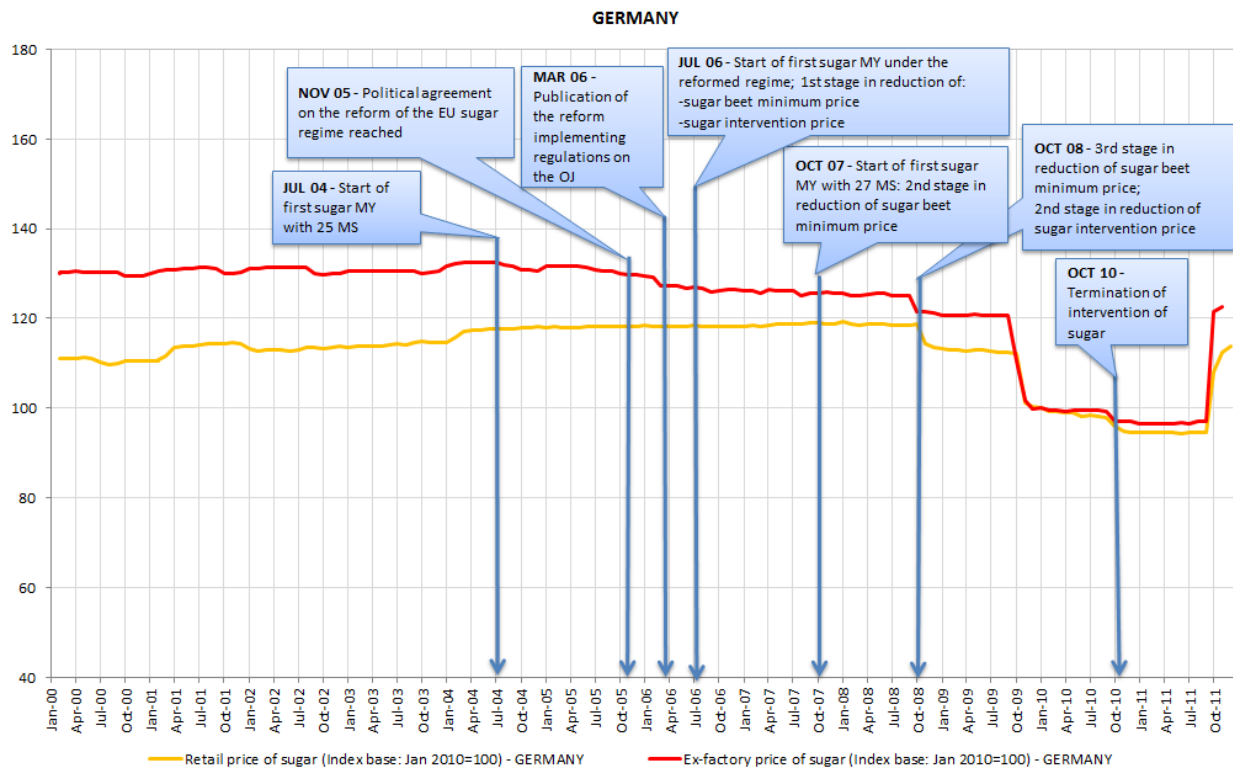
Period*		France short term; Retail price => Ex-works price				
		Retail price increasing		Retail price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	0,173317	YES	0,087805	Asymmetry + 9
Pre-reform (2)		YES	0,109575	NO		Asymmetry + 4-9
Pre-reform (3)		Undetermined		Undetermined		Undetermined 4-9
Post-reform (1,2,3)		NO		NO		
Summary of results	Pre-reform	Presence of price transmission (slightly unstable)		Presence of price transmission (slightly unstable)		Asymmetry towards price increases
	Post-reform	Absence of price transmission		Absence of price transmission		

* Period: Pre-reform (1), (2), (3) and Post-reform (1), (2), (3) = timing hypotheses 1 (Nov 2005), 2 (Mar 2006), 3 (Jul 2006)
“Undetermined” = no distinction possible between the situations where ex-works price is increasing and the situations where ex-works price is decreasing

6.3.1.2 Germany

The results of the preliminary qualitative assessment (figure 6.9) show that retail price tends to follow the variations of ex-works price for most of the pre-reform period, and from September 2008 onwards in the post-reform period.

Figure 6.9 - Germany: evolution of sugar ex-works price index and sugar retail price index vs. main policy changes (2000-2011)



Econometric tests for Germany were performed on datasets of optimal length.

VPT from ex-works to retail price (see table 6.6) was detected both before and after the reform for the two situations considered (increasing vs. decreasing ex-works price), with remarkable stability. A slight increase in the speed of PT occurred after the reform. The post-reform increase in the intensity of PT was greater in the situations where ex-works price was decreasing; as a consequence, asymmetry towards price increases – which was extremely evident in the pre-reform period - became weaker after the reform.

Table 6.6 - VPT from ex-works price to retail price: results of econometric tests for Germany

Period*		Germany short term; Ex-works price => Retail price				
		Ex-works price increasing		Ex-works price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	0,744068	YES	0,016878	Asymmetry + 1-3
Pre-reform (2)		YES	0,750589	YES	0,011910	Asymmetry + 1-3
Pre-reform (3)		YES	0,703221	NO		Asymmetry + 1-3
Post-reform (1)		YES	1,076404	YES	0,935158	Asymmetry + 1-2
Post-reform (2)		YES	1,081771	YES	0,946314	Asymmetry + 1-2
Post-reform (3)		YES	0,597054	YES	1,473058	Asymmetry - 1-2
Summary of results	Pre-reform	Presence of price transmission (stable)		Presence of price transmission (slightly unstable)		Asymmetry towards price increases
	Post-reform	Presence of price transmission (stable); intensity higher than in pre-reform period		Presence of price transmission (stable); intensity higher than in pre-reform period		Prevailing asymmetry towards price increases; speed higher than in pre-reform period

VPT from retail to ex-works price was detected neither before nor after the reform.

6.3.1.3 Spain

From a preliminary qualitative assessment⁵⁹, no evident relations between ex-works price and retail price can be detected.

Econometric tests for Spain were performed on datasets of suboptimal length for the pre-reform period; the results of the assessment for this time span must hence be considered with due care.

VPT from ex-works to retail price (table 6.7) was found before the reform only in the two situations considered (increasing vs. decreasing ex-works price), but it was remarkably unstable in both situations (PT was detected in only one of the three hypotheses for the timing of the policy-related break considered in the assessment). It is important to underline that such result might have been determined by the suboptimal length of the time series tested. The intensity of PT was higher in the situations where ex-works price was increasing (even if it was quite low in both situations): this implies the presence of an asymmetry towards price increases before the reform.

⁵⁹ Due to confidentiality reasons, the present reports features no graphs or tables describing the dynamics of sugar ex-works price series in Member States with less than three sugar producers in activity in at least one MY within the time span considered for the analysis.

Table 6.7 - VPT from ex-works price to retail price: results of econometric tests for Spain

Period*		Spain short term; Ex-works price => Retail price				
		Ex-works price increasing		Ex-works price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		NO		NO		
Pre-reform (2)		YES	0,144545	YES	0,084774	Asymmetry + 3
Pre-reform (3)		NO		NO		
Post-reform (1,2,3)		NO		NO		
Summary of results	Pre-reform	Presence of price transmission (albeit unstable)		Presence of price transmission (albeit unstable)		Asymmetry towards price increases
	Post-reform	Absence of price transmission		Absence of price transmission		

The results of the assessment of **VPT from retail to ex-works price** in Spain (table 6.8) show some peculiarities. In the situations where retail price is increasing, the intensity of PT more than doubled after the reform, also achieving remarkable stability; on the contrary, in the situations where retail price is decreasing, PT ceased to be present after the reform. The resulting asymmetry towards price increases became particularly strong after the reform (this means that ex-works price has reacted more than proportionally to upward variations of retail price, while the same has not occurred in presence of downward variations). Beside the caveats deriving from a suboptimal pre-reform dataset, a possible explanation of such peculiarity (already seen in France, even if in the pre-reform period only, and with much lower intensity) might lie in the presence of superior market power of sugar producers vis-à-vis retailers. It is worth underlining that the sugar industry structure in Spain has been characterised by the presence of a dominant producer for the entire period considered in the assessment, and that only two domestic producers have been active in Spain after the reform (see on the matter also § 7.2).

Table 6.8 - VPT from retail price to ex-works price: results of econometric tests for Spain

Period*		Spain short term; Retail price => Ex-works price				
		Retail price increasing		Retail price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	0,730862	YES	0,673705	Asymmetry + 2
Pre-reform (2)		NO		NO		
Pre-reform (3)		Undetermined		Undetermined		Undetermined 5
Post-reform (1)		YES	2,806713	NO		Asymmetry + 1-3
Post-reform (2)		YES	1,801122	NO		Asymmetry + 1-3
Post-reform (3)		YES	1,865049	NO		Asymmetry + 1-3
Summary of results	Pre-reform	Presence of price transmission (albeit unstable)		Presence of price transmission (albeit unstable)		Asymmetry towards price increases
	Post-reform	Presence of price transmission (stable); intensity higher than in pre-reform period		Absence of price transmission		Asymmetry towards price increases; speed higher than in pre-reform period

6.3.1.4 United Kingdom

The preliminary qualitative assessment⁶⁰ did not highlight any evident relations between ex-works price and retail price.

Econometric tests for the United Kingdom were performed on datasets of optimal length; however, the representativeness of data prior to late 2009 can be questioned, as DEFRA opted for the switch to “a more robust source” for primary data exactly at that time. The main limitation for the validity of results stems from the fact that such switch occurred in the middle of the post-reform period⁶¹: results for that time span must hence be considered with due care.

VPT from ex-works to retail price (table 6.9) was detected before the reform only in both situations considered (increasing vs. decreasing ex-works price): it was slightly unstable (time pattern of PT was different in each of the three hypotheses for the timing of the policy-related break considered in the assessment). The intensity of PT was very limited in both situations, and especially in the ones where ex-works price is decreasing. A slight asymmetry towards price increases was detected in the pre-reform period. It is however very important to underline that the absence of PT in the post-reform period might well derive from the peculiar features of the time series tested (see above).

⁶⁰ Due to confidentiality reasons, the present reports features no graphs or tables describing the dynamics of sugar ex-works price series in Member States with less than three sugar producers in activity in at least one MY within the time span considered for the analysis.

⁶¹ It is also worth reminding that – differently from the other Member States - the time series for the United Kingdom concerns ex-works delivered prices.

Table 6.9 - VPT from ex-works price to retail price: results of econometric tests for the United Kingdom

Period*		United Kingdom short term; Ex-works price => Retail price				
		Ex-works price increasing		Ex-works price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	0,070182	YES	0,045696	Slight asymmetry + 3-8
Pre-reform (2)		YES	0,152994	YES	0,019776	Asymmetry + 3-7-8
Pre-reform (3)		Undetermined		Undetermined		Undetermined 3
Post-reform (1,2,3)		NO		NO		
Summary of results	Pre-reform	Presence of price transmission (slightly unstable)		Presence of price transmission (slightly unstable)		Asymmetry towards price increases
	Post-reform	Absence of price transmission		Absence of price transmission		

VPT from retail to ex-works price was detected neither before nor after the reform.

6.3.1.5 Other EU-15 Member States

Available datasets allowed a comparative assessment of the pre- and post-reform situation of VPT also for Greece and the Netherlands (the latter with a dataset of suboptimal length for both pre- and post-reform periods).

VPT from ex-works to retail price was detected both before and after the reform in the two Member States; however, in Greece PT was present only in the situations where ex-works price is increasing, while in the Netherlands PT was detected in both situations. In any case, PT was however rather unstable and characterised by limited intensity for both Member States (and especially for the Netherlands). Asymmetry towards price increases was detected in the two Member States both before and after the reform. It is anyway important to underline that the validity of the results of the assessment is limited:

- in the case of Greece, by non-stationarity of some time series for the post-reform period, which did not allow econometric testing of two out of three hypotheses of timing of the policy-related break;
- by suboptimal datasets for both pre- and post-reform periods in the case of the Netherlands.

VPT from retail to ex-works price was detected both before and after the reform in Greece only. In the situations where retail price is increasing, ex-works price increases more than proportionally both before and after the reform; in the situations where retail price is decreasing, there is no transmission to ex-works price before the reform, while after the reform there is response by ex-works price, but its intensity is less strong than in the opposite situations. As a consequence, asymmetry towards price increases is present both before and after the reform, but its overall strength decreases in the latter period. Given the peculiar structure of the Greek sugar industry (presence of a single state-owned producer for the entire period considered in the assessment; see also § 7.2), and also its substantial downsizing after the reform, with an associated increase of imports, an economic explanation of the above results (i.e. the presence of superior market power of sugar producers vis-à-vis retailers, with a partial weakening of such power after the reform) could be plausible. However, it is also worth underlining that non-stationarity of some time series for the post-reform period did not allow econometric testing of two out of three hypotheses of timing of the policy-related break: this implies that the above results must be considered with all due caveats.

6.3.2 Results of the assessment for the NMS-12

The results of the econometric tests performed are summarised at tables 6.10 (transmission from ex-works price to retail price) and 6.11 (transmission from retail price to ex-works price).

Econometric tests also checked for the presence of **long-term relations** between ex-works prices and retail prices; however, these **were never detected**⁶².

As for the **short-term effects**, similarly to the EU-15 **VPT from ex-works price to retail price was detected more often than VPT in the opposite direction**, both before and after the reform. The picture concerning changes in intensity (in the two situations where prices are increasing and decreasing) and speed of VPT is again mixed; **asymmetry towards price increases prevails both before and after the reform**, with just one exception.

The paragraphs which follow provide a more detailed description of the most significant results for specific Member States, complemented by possible explanations of some peculiarities.

⁶² The sole exception is represented by VPT from ex-works to retail price in Romania in the pre-reform period, when however the country was not an EU Member State.

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Table 6.10 - VPT from ex-works price to retail price: summary of results of econometric tests for the NMS-12

Member State	Situations where ex-works price is increasing				Situation where ex-works price is decreasing				Speed of VPT		Asymmetry			
	VPT present		Intensity		VPT present		Intensity		Increased after the reform	Decreased after the reform	towards price increases		towards price decreases	
	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform			Pre-reform	Post-reform	Pre-reform	Post-reform
Czech Republic	x	x			x	x				x				
Poland	x	x	x		x	x	x		x		x	x		
Romania		x				x						x		
TOTAL	2	3	1		2	3	1		1	1	1	2		

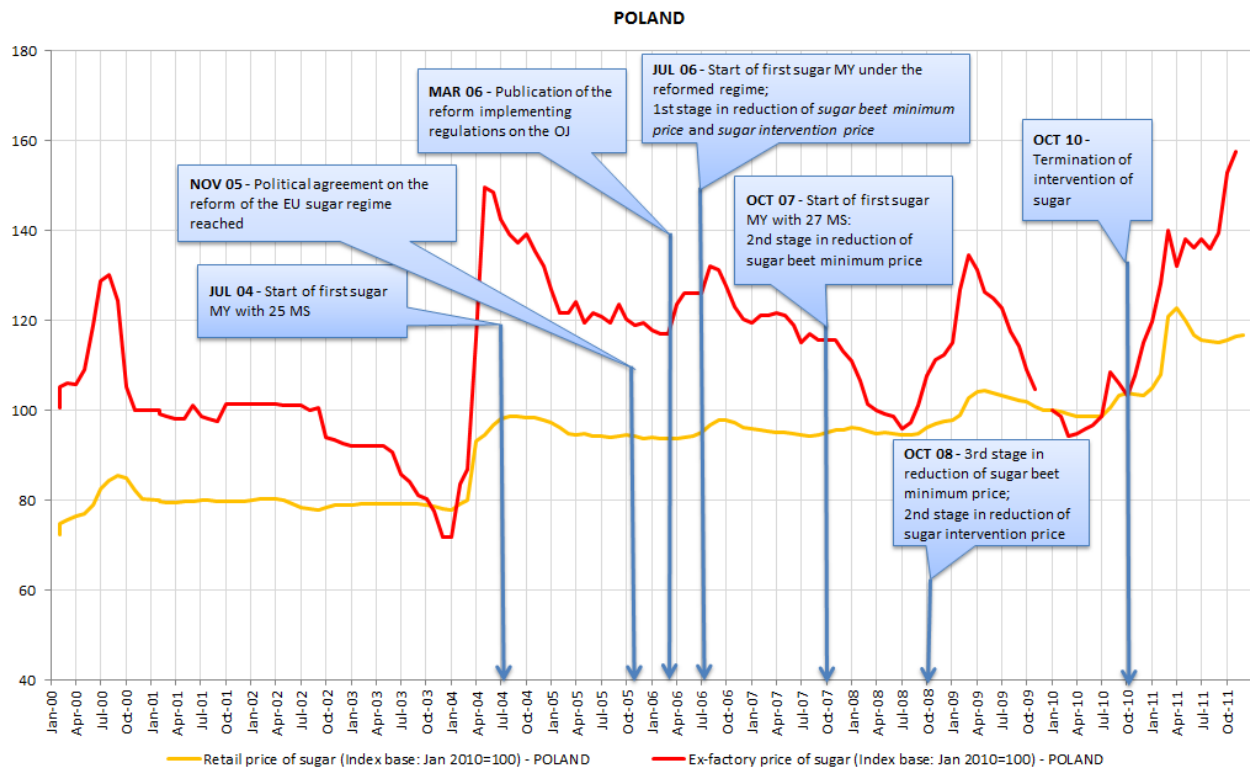
Table 6.11 - VPT from retail price to ex-works price: summary of results of econometric tests for the NMS-12

Member State	Situations where retail price is increasing				Situation where retail price is decreasing				Speed of VPT		Asymmetry			
	VPT present		Intensity		VPT present		Intensity		Increased after the reform	Decreased after the reform	towards price increases		towards price decreases	
	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform	Pre-reform	Post-reform	Increased after the reform	Decreased after the reform			Pre-reform	Post-reform	Pre-reform	Post-reform
Czech Republic		x				x								x
Poland	x										x			
Romania		x										x		
TOTAL	1	2				1					1	1		1

6.3.2.1 Poland

The results of the preliminary qualitative assessment (figure 6.10) highlight the presence of a relation between ex-works price and retail price both before and after the reform.

Figure 6.10 - Poland: evolution of sugar ex-works price index and sugar retail price index vs. main policy changes (2000-2011)



Econometric tests for Poland were performed on datasets of optimal length. It is anyway important to remember that for the most part of the pre-reform period considered in the assessment (i.e. until March 2004) Poland was not an EU Member State, and hence its sugar sector did not operate under the EU regime. As a consequence, results for the pre-reform period must be considered with due care.

VPT from ex-works to retail price (see table 6.12) was detected both before and after the reform in the two situations considered (increasing vs. decreasing ex-works price). While PT in the pre-reform period was unstable in both situations (PT was detected in two out of three timing hypotheses for the policy-related break), it became remarkably stable after the reform, and its speed also increased (responses of retail price to variations of ex-work price took place already in the following month). The intensity of PT in the situations where ex-works price is increasing was much greater than the intensity of PT in the opposite situations: in other terms, a clear asymmetry towards price increases was detected both before and after the reform. The strength of such asymmetry increased remarkably after the reform.

Table 6.12 - VPT from ex-works price to retail price: results of econometric tests for Poland

Period*		Poland short term; Ex-works price => Retail price				
		Ex-works price increasing		Ex-works price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	0,157762	YES	0,021782	Asymmetry + 2
Pre-reform (2)		NO		NO		
Pre-reform (3)		YES	0,147154	YES	0,019776	Asymmetry + 2
Post-reform (1)		YES	0,525183	YES	0,088192	Asymmetry + 1-7
Post-reform (2)		YES	0,543369	YES	0,102542	Asymmetry + 1-7
Post-reform (3)		YES	0,580278	YES	0,160943	Asymmetry + 1-7
Summary of results	Pre-reform	Presence of price transmission (albeit unstable)		Presence of price transmission (albeit unstable)		Asymmetry towards price increases
	Post-reform	Presence of price transmission (stable); intensity higher than in pre-reform period		Presence of price transmission (stable); intensity higher than in pre-reform period		Asymmetry towards price increases; speed higher than in pre-reform period

VPT from retail to ex-works price was detected before the reform only, and only in the situations where retail price is increasing (table 6.13). In such situations, the intensity of PT was substantial (upward variations in retail price were followed by more than proportional increases in ex-works price) and speed was also high (increases of retail price were followed by increases of ex-works price already in the following month). Absence of PT in the situations where retail price is decreasing implies the presence of a clear asymmetry towards price increases in the pre-reform period. A possible explanation of such peculiarity could lie in the presence of greater market power of sugar producers vis-à-vis retailers in the pre-reform period (see on the matter also § 7.2). In this respect, it is worth underlining that the process of privatisation of a substantial part of the Polish sugar industry was finalised only between 2002 and 2003, and that an important state-owned sugar producer has continued to operate afterwards: this might have had an influence on the balance of market power between the sugar sector and the retail sector in the pre-reform period.

Table 6.13 - VPT from retail price to ex-works price: results of econometric tests for Poland

Period*		Poland short term; Retail price => Ex-works price				
		Retail price increasing		Retail price decreasing		Synthesis
		Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Price transmission (YES / NO)	Intensity (sum of statistically significant coefficients)	Symmetry / asymmetry (towards price increases or decreases) Speed (lags at which price transmission is present)
Pre-reform (1)		YES	2,286803	NO		Asymmetry + 1
Pre-reform (2)		YES	3,534725	NO		Asymmetry + 1-5
Pre-reform (3)		YES	2,280017	NO		Asymmetry + 1
Post-reform (1,2,3)		NO		NO		
Summary of results	Pre-reform	Presence of price transmission (albeit slightly unstable)		Absence of price transmission		Asymmetry towards price increases
	Post-reform	Absence of price transmission		Absence of price transmission		

6.3.2.2 Other NMS-12

Available datasets allowed a comparative assessment of the pre- and post-reform situation of VPT also for Czech Republic and Romania (the latter with a dataset of suboptimal length for both pre- and post-reform periods). Leaving aside the case of Romania (whose accession to the EU took place after the reform, a fact which greatly limits the usefulness of a comparative assessment), it is also important to remember that the sugar sector of the Czech Republic operated under the EU regime only for a rather limited fraction of the pre-reform period (MY 2004/05 and 2005/06 only). As a consequence, results for the pre-reform period in the case of the Czech Republic must be considered with due care.

VPT from ex-works to retail price was detected both before and after the reform in the Czech Republic⁶³, but no distinction between situations where ex-works price is increasing and situations where it is decreasing could be made. After the reform, PT became rather unstable; its intensity and speed decreased.

The assessment of **VPT from retail to ex-works price** for the Czech Republic highlighted some peculiarities. PT in this direction was detected after the reform only in both situations considered (increasing vs. decreasing retail price); it shows great stability and its intensity is significant especially in the situations where retail price is decreasing (even if changes in ex-works price induced by variations of retail price are less than proportional, and delayed of six months). This means that - differently from other Member States - a rather evident asymmetry towards price decreases emerged after the reform: in other terms, Czech sugar producers follow reductions of retail price with greater intensity than that applying in the opposite situation (ex-works price increases following upward variations of retail price). A possible economic explanation of such result could be found in the presence of weaker market power of Czech sugar producers vis-à-vis the retail sector after the reform.

6.3.3 Findings of the empirical assessment

In general, the dynamics of retail prices at Member State level appear not to be influenced by policy events and tend to be quite smooth (albeit with some notable exceptions in the post-reform period, e.g. Germany and Poland): in some cases, the presence of a relation between ex-works prices and retail prices can be appreciated already “at a glance” through a qualitative assessment based on graphs. The overall results of the empirical assessment suggest the presence of market power of retailers vis-à-vis sugar producers: this implies that the retailers’ pricing behaviour tends to be independent (within certain limits) from the dynamics of ex-works sugar price.

Coming to the findings of the empirical assessment of VPT proper, these are highlighted at § 6.3.3.1 (VPT from ex-works price to retail price) and at § 6.3.3.2 (VPT from retail price to ex-works price).

The results of the qualitative assessment of VPT at intermediate stages of the sugar marketing channel are illustrated at § 6.3.3.3.

6.3.3.1 VPT from ex-works price to retail price

The overall picture given by the results of the empirical assessment (§ 6.3.1 and 6.3.2) is rather varied; however, a number of significant findings and some emerging trends can be identified and highlighted.

The most evident fact is that the reform was followed by changes in at least one of the aspects of PT considered in the assessment: in other terms, **the reform surely contributed** (possibly in combination with other factors) **to modify the situation of VPT from ex-works price to retail price in the EU**. In this respect, it is also worth noting that only in 2 out of 9 Member States (Spain and United Kingdom) PT was present before

⁶³ VPT from ex-work price to retail price was detected after the reform only in Romania, but this result is rather unstable, and PT intensity is extremely limited.

the reform, but not anymore after the same⁶⁴. This implies that an **“adverse influence” of the reform on VPT from ex-works price to retail price in the EU represents an exception.**

Focusing on individual aspects of PT considered in the assessment, the most notable findings are the following:

1. While no clear trend emerged about the influence of the reform on the intensity of PT in the two situations considered (increasing vs. decreasing ex-works price), in **3 important sugar producing Member States (France, Germany, Poland) the speed of PT always increased after the reform**⁶⁵.
2. The most evident finding of the assessment is that **asymmetry towards price increases clearly prevails** in VPT from ex-works price to retail price in the EU (it was detected both before and after the reform in 5 Member States out of 6). This is consistent with the findings of most scientific literature on VPT along the food supply chains (“prices rise faster than they fall”). An important implication of such finding is the following: as retail prices have tended to follow (more or less than proportionally, and with delays of different extent) upward variations in ex-works prices, but have mostly failed to do so in case of decreases, the **distance in absolute terms between ex-works and retail prices of sugar in the EU has tended to increase over time.**

6.3.3.2 VPT from retail price to ex-works price

First of all, it is important to underline that the presence of **VPT from retail price to ex-works price was detected in fewer cases than VPT in the opposite direction.**

Focusing on the four specific aspects of PT which were considered in the assessment, the overall picture given by the results of the empirical assessment (§ 6.3.1 and 6.3.2) is quite varied, and does not allow to identify clear trends, with one notable exception: again, **asymmetry towards price increases prevails** (it was detected in 3 Member States out of 4 after the reform), in line with other scientific evidence on the issue. This implies that **sugar producers have often been able to follow** (more or less than proportionally, and with delays of different extent) **price increases coming from the retail sector**, while downward variations have not resulted in an analogous response. The most plausible economic explanation of such an outcome lies in the presence of greater market power of sugar producers vis-à-vis retailers.

6.3.3.3 VPT at intermediate stages of the sugar marketing channel

As no adequate time series of **sugar price at intermediate stages of the marketing channel** were available for econometric testing, the assessment concerning this stage of VPT was carried out by means of a qualitative approach. The assessment is based on evidence sourced through interviews with independent experts and study of the relevant bibliography⁶⁶. The results of the assessment are illustrated in Box 1.

Box 1 – Assessment of vertical price transmission at intermediate stages of the sugar marketing channel

Market intermediaries between sugar producers and industrial users of sugar or retailers play a significant role in some Member States. This qualitative assessment is mostly based on evidence concerning the Italian market (which can however be extended to the situation of other Member States where imports cover a significant share of

⁶⁴ It is also worth underlining that absence of PT after the reform in the United Kingdom might be due to quality issues of the dataset used for the assessment.

⁶⁵ Decreases in the speed of PT after the reform occurred in 2 out of 6 Member States (Netherlands and the Czech Republic), but in both cases PT after the reform was anyway quite unstable.

⁶⁶ Two independent experts with long-time experience in the sugar supply chain were interviewed for the purposes of the assessment. United Kingdom’s Office of Fair Trading review of the acquisition by Napier Brown Foods plc of James Budgett Sugars Ltd (12 October 2004) constituted an extremely useful reference.

consumption) and the British market (which shows some peculiarities concerning the role of market intermediaries). It is important to underline that such figures play a less important role in sugar-exporting Member States like France, Germany and Belgium.

In Italy intermediaries operating in the sugar marketing channel (“sugar merchants” for sake of conciseness from now on) mostly act as service providers: they neither own nor operate storage facilities and/or transport equipment. In the United Kingdom, sugar merchants provide intermediation services (“nominal merchanting”) but also purchase, store, re-sell and distribute sugar on their own account (“true merchanting”). Over the years, the importance of “nominal” merchanting in the United Kingdom has declined substantially.

The main functions performed by sugar merchants are the following:

1. Supplying sugar to small/medium-sized purchasers which domestic sugar producers do not wish to serve directly. Additional customized services can be also offered to such purchasers (e.g. packing / re-packing).
2. Offering an alternative sourcing option to large-sized purchasers, in competition with domestic sugar producers (also in this case additional customized services can be offered).

In the case at point 1 above, merchants buy sugar mostly from domestic producers (at a discounted price), and apply a mark-up including coverage of their costs and a profit. In the case at point 2 above, merchants usually buy sugar abroad⁶⁷, often from multiple suppliers (mainly operating in the EU, but also in third countries, especially in the Balkans area): they can obtain a discounted price under the condition that they would not re-sell sugar in the same countries where their suppliers operate.

In the pre-reform years, when volatility of domestic sugar prices was fairly limited, merchants usually applied a “flat” mark-up, which could remain unchanged for rather long periods (6 months and more). In the post-reform period merchants had to change their pricing behaviour in order to adapt to increased price volatility: the extent of the mark-up is now changed every 1-2 months, or even more frequently; usually sugar merchants “hedge” their price risks by buying large volumes of sugar at the beginning of the marketing year⁶⁸.

In the pre-reform period, sugar merchanting was generally a low-margin business. Merchants fully passed on to their customers any (usually small) increase in prices they had paid to sugar producers: in doing so, they were basically **neutral with respect to PT within the sugar marketing channel**.

In the post-reform period, margins of sugar merchants can vary substantially over time depending on market conditions and type of customer, because of greatly increased price volatility. For large customers – usually supplied by merchants in the framework of long-term contracts - the mark-up applied generally tends to remain fairly stable. On the contrary, the mark-up applied for small-medium sized purchasers can become substantial in case of spot sales in periods where supply is tight (in such market conditions, sugar merchants can sell at a high price sugar they had previously bought at a much lower price). Sugar merchants can therefore **exert a non-negligible influence on PT along the supply chain in particular market conditions**.

In general, sugar merchants tend to react rather quickly and proportionally to increases of the prices they pay to sugar producers, while their response to decreases of the same prices is usually slower and less than proportional: this implies that also the **pricing behaviour of sugar merchants shows a certain asymmetry towards price increases**.

⁶⁷ The interviewed experts shared the view that sugar merchants played an important role for granting cross-border competition, as sugar producers are often unwilling to sell directly to foreign customers (mostly because they would have to bear additional fixed costs to do so, like buying adequate facilities in the countries they want to serve, hiring skilled local salesmen, etc.).

⁶⁸ The interviewed experts suggested that – also due to increased concentration of the EU sugar industry - it could be more difficult for “independent” sugar merchants to purchase sugar at favourable conditions in the post-reform period.

6.4 Answer to the question

First of all, it is important to underline that the time series which underwent econometric testing are updated to the end of 2011; as a consequence, **the empirical assessment carried out does not cover possible effects of ex-works price increases occurred in the first months of 2012.**

The investigations carried out for the purposes of the assessment showed that the three-step **reduction of sugar intervention price** between 2006/07 and 2009/10 (with subsequent termination of intervention purchases from the 2010/11 campaign onwards) implemented with the 2006 reform of the sugar regime **did not fully translate in a decrease of ex-works sugar prices in the EU.** Indeed ex-works prices stayed well above the intervention price until the end of the 2009/10 marketing year, and kept an ample margin over the reference price from October 2009 onwards (see § 6.2).

Even with all the caveats due to the impossibility of performing a full-fledged empirical assessment, the available evidence suggests that **also the reduction of sugar beet minimum prices** introduced by the 2006 reform **did not fully translate in an equal decrease of sugar beet prices paid to farmers** (see § 6.2).

Ex-works price decreases (which mostly occurred in the first three marketing years after the reform) were transmitted proportionally to the retail price only in 1 case out of 9 examined; in the remaining cases, such decreases were **transmitted less than proportionally, or even not transmitted at all.** This implies that transmission from ex-works price towards retail price shows an **evident asymmetry towards price increases** (see § 6.3.3.1). Besides being consistent with the findings of most scientific literature on VPT along the food supply chains (“prices rise faster than they fall”), such finding has an important implication. As retail prices have tended to follow (more or less than proportionally, and with delays of different extent) upward variations in ex-works prices, but have mostly failed to do so in case of decreases, the **distance in absolute terms between ex-works and retail prices of sugar in the EU has tended to increase over time.**

Vertical transmission from retail price to ex-works price was detected in fewer cases than VPT in the opposite direction (see § 6.3.3.2). **Asymmetry towards price increases prevails** also in this case, in line with other scientific evidence on the issue. This implies that **sugar producers have often been able to follow** (more or less than proportionally, and with delays of different extent) **price increases coming from the retail sector**, while downward variations of retail prices have not resulted in an analogous response by sugar producers.

The influence of market intermediaries on vertical price transmission could not be tested empirically for absence of adequate data. With all due caveats, the findings of a qualitative assessment (see § 6.3.3.3, Box 1) suggested that **pricing behaviour of market intermediaries in the pre-reform period was basically neutral with respect to vertical price transmission**, whereas **after the reform** increased price volatility induced market intermediaries to vary more frequently their margins according to market conditions and type of customer, thus exerting a **more significant influence on price transmission along the supply chain in particular market conditions.** Also the **pricing behaviour of sugar merchants shows a certain asymmetry towards price increases.**

In conclusion, assuming as definition of “efficient sugar market” the one adopted in the 2003 *Study on price transmission in the Agro-Food Sector*⁶⁹ (“in an ‘efficient’ market any change in the institutional price of sugar would be reflected in a corresponding change in the retail price of sugar”), the **empirical evidence stemming from the assessment suggests that – despite some significant steps made in this direction – the EU sugar market after the reform is still quite far from having achieved complete efficiency.** It is however also worth underlining that the reform removed existing constraints to price variation within the EU, thus promoting more favourable conditions for improving the efficiency of the sugar market.

⁶⁹ Report for European Commission – Agriculture DG, Agra CEAS Consulting Ltd 2064/EHO/July 2003.

7 Reply to Question 2

“To what extent has the Common Agricultural Policy (CAP) influenced the degree of competition and concentration in the sugar industry after the 2006 reform? And has this had an effect on consumer prices?”

Key terms:

Degree of competition: for the purposes of the study, the degree of competition is defined by a combination of qualitative elements and quantitative indicators (see Issue 4, step a) and measured through the Lerner Index (see Box 7)

Degree of concentration: for the purposes of the study, the degree of concentration is defined by a combination of qualitative elements and quantitative indicators (see Issue 5, step a) and measured through the Herfindahl-Hirschman Index (see Box 8)

Consumer prices: price of sugar and sugar-containing products sold to final consumers (households) in retail outlets

Reference theories and related approaches:

- Neoclassical theory (market forms: oligopoly, monopolistic competition, etc.) and institutional economics
- Supply chain approach; structure-conduct-performance paradigm; Porter approach to the analysis of competition

The reply to this question is based on analyses (and econometric tests in particular) carried out for all Member States for which data were available. For sake of conciseness, evidence provided in the following paragraphs, as well as the related reasoning, are mostly focused on a selection of five Member States⁷⁰ (France, Germany, Spain, United Kingdom and Poland). Additional elements on other Member States are provided whenever they can improve the completeness of the reply.

7.1 Relevant policy measures and overall rationale

Question 2 focuses on the possible influence of the 2006 reform of the EU sugar regime on the degree of competition and concentration in the sugar industry, and on the possible effects that such influence (if actually present) could have had on consumer prices of sugar and sugar-containing products.

According to the preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to price transmission (PT)⁷¹, a number of reformed measures can have an evident influence on both concentration and competition in the EU sugar industry.

Reduction of price support, promotion of reduction of production quotas and of national quota reallocation, and improved access to the EU market for sugar produced in LDCs and in non-LDC ACP countries can all determine an **increase in the concentration of the EU sugar industry**. According to the classic SCP paradigm, higher concentration in the sugar sector should result in superior market power of sugar producers vis-à-vis their customers; however, scholars have often questioned the validity of the classic SCP paradigm, demonstrating that ***increased concentration does not necessarily determine a decrease in competition***, as there are many other aspects of the latter which cannot be adequately assessed by reasoning in terms of concentration dynamics only.

As for potential effects of the reform on the degree of competition in the sugar sector, the preliminary theoretical assessment concluded that **reduced price support** combined with **reduced production quotas** should – in theory at least - **promote cost-based competition among producers**, while **improved access to**

⁷⁰ France and Germany kept their importance as sugar-producing Member States both before and after the 2006 reform. Italy and Spain experienced a substantial reduction of their sugar production capacity after the reform. United Kingdom is peculiar inasmuch it produces sugar from both domestic beets and imported raw cane sugar (the split has roughly been a 55-45 one for most of the 2000-2011 period). Finally, Poland is by far the most important sugar-producing NMS.

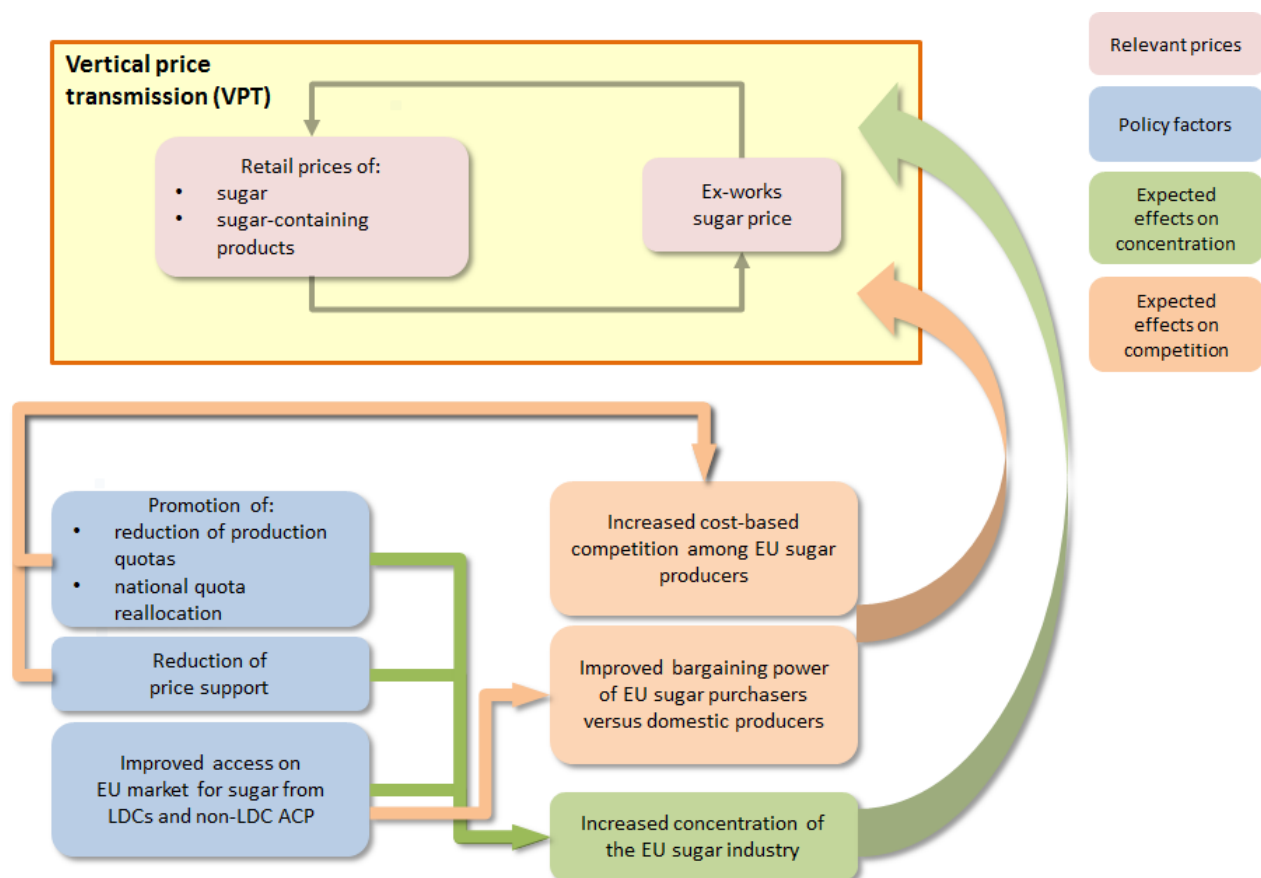
⁷¹ For a complete description of the results of the preliminary theoretical assessment, please refer to §4.

the EU market for ACP and LDC-based producers should – again, in theory at least - **improve bargaining power of EU sugar purchasers** versus domestic producers. It is however important to underline that the **actual effects of the reform on the degree of competition in the EU sugar sector are greatly determined by the strategies of sugar producers**, which can reshape the organisation of the sugar supply chain (also in its geographic aspects) in a way to offset (totally or in part) potential increases in the degree of competition within the sector.

Summarising, the **reform of the sugar regime should have effects on both concentration and competition in the EU sugar sector**: this could in turn **influence vertical price transmission (VPT)** between ex-works sugar price and consumer prices of sugar and sugar-containing products.

Figure 7.1 below outlines the overall rationale of the question.

Figure 7.1 – Overall rationale of question 2



Important notice: for a complete description of the results of the preliminary theoretical assessment, please refer to § 4

Assessment of the effects of the reform on concentration in the sugar sector (§ 7.2.1) was carried out by studying the evolution of the Herfindahl-Hirschman Index⁷² in relation to a number of significant events in the evolution of the relevant policy framework and of the sugar industry structure (mergers & acquisitions, formation and termination of inter-firm marketing alliances, etc.). For the purposes of the assessment of the

⁷² The Herfindahl-Hirschman Index is given by the sum of the squares of individual market shares of firms.

effects of the reform on competition in the sugar sector (§ 7.2.2), the evolution of the Adjusted Lerner Index⁷³ was again studied against the aforementioned succession of policy-related and industry-related significant events, which was also considered in the study of the evolution of other variables concerning competition (number of producers, number of beet sugar factories in operation, average production capacity of such factories). It is important to underline that the ***Lerner Index is a synthetic indicator of the degree of competition, and cannot hence adequately represent also its many qualitative aspects, which may however play an important role in determining actual competition within a sector.*** Another limitation stems from the use of an ***adjusted version of the Lerner Index (ALI)*** which ***does not allow measurement of the actual degree of competition, but just an appreciation of its dynamics over time.*** In particular, the ALI ***does not allow to understand whether the evolution of competition is mainly driven by variations in sugar price or in sugar production cost.***

The relation between the evolution of the Herfindahl-Hirschman Index (HHI) and the evolution of the Adjusted Lerner Index (ALI) in the 2000-2011 period was investigated through statistical methods (§ 7.2.3), in order to detect the possible presence of correlation, and hence to assess consistency, with or deviation from, the classic SCP paradigm (concentration determines the degree of competition; the higher the former, the lower the latter).

The evolution of all the relevant prices was then studied against the evolution of the ALI through econometric methods (§ 7.3), in order to assess empirically the impacts of the evolution of concentration and competition on PT in the sugar sector. The 2006 reform of the EU sugar regime was considered as the **policy-related break** for the assessment; three hypotheses were considered for the timing of such break:

- a. achievement of a political compromise on the content of the reform (November 2005);
- b. publication of the implementing regulation on the Official Journal (March 2006)
- c. entry into force of the regulation (July 2006 – start of the first EU sugar marketing year under the reformed regime).

Definition of the short-term lag structure was made by considering a time span of 1 to 9 months, on the basis of economic considerations linked to duration of supply contracts in the sugar sector.

Reasoned conclusions on the findings of all the aforementioned investigations are drawn at § 7.4, in order to provide an answer to the question.

7.2 Effects of the reform on concentration and competition in the sugar sector

This paragraph illustrates the dynamics of a number of variables describing the evolution of concentration (§ 7.2.1) and competition (§ 7.2.2) in the sugar sector, against the framework formed by the most significant policy-related and industry-related events which occurred over the 2000-2011 period. It also reports the results of statistical analyses carried out in order to detect the possible presence of correlation between the HHI and the ALI, i.e. to assess consistency with, or deviation from, the classic SCP paradigm.

It is worth underlining that the evolution of some variables (number of sugar producers and of sugar factories in operation; EU self-sufficiency ratio for sugar and share of imports on internal use for human consumption)

⁷³ Due to confidentiality issues concerning sugar production cost data, an *ad hoc* procedure was adopted for treatment of the Lerner Index in the assessment. Time series of the Lerner Index were calculated by DG Agriculture on the basis of sugar ex-works prices and of LMC International sugar production cost data (Lerner Index = [(sugar price – sugar production cost)/(sugar price)]). Values of the Lerner Index were then multiplied by an unknown constant, different for each Member State. The resulting time series are referred to in this study as “Adjusted Lerner Index” (ALI). Due to the above procedure, comparison of time series of the ALI between Member States can be made only in terms of dynamics, not of absolute level of the ALI itself.

has relevance for defining both concentration levels and degree of competition: to avoid repetitions, the dynamics of such variables are described at § 7.2.2, dealing with the evolution of competition.

The evolution of concentration and competition illustrated here and the results of the assessment of the impacts of such evolution on PT in the sugar sector illustrated at § 7.3 are updated to the end of 2011. This notwithstanding, ***qualitative elements on some notable developments in the sugar sector occurred in the first months of 2012*** are also provided, together with ***related considerations on their possible effects on the evolution of concentration and competition in the EU sugar sector.*** Such updates are highlighted in boxes within the relevant paragraphs.

7.2.1 Evolution of concentration in the EU sugar sector and evolution of the relevant policy framework

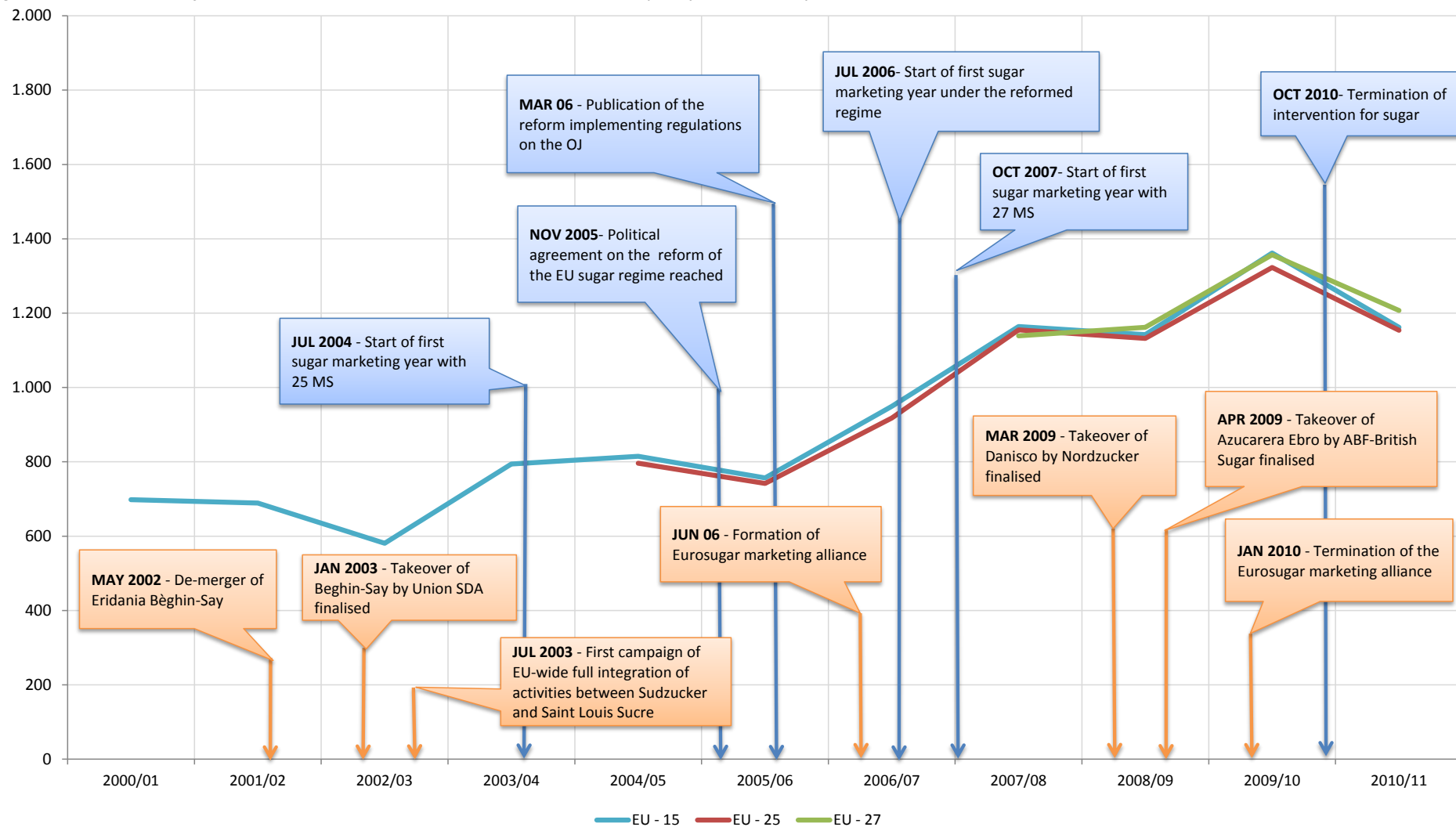
The evolution of concentration in the EU sugar sector was studied at both area (EU-15; EU-25; EU-27) and individual Member State level. Such evolution is represented here by the dynamics of HHI calculated on production capacity data (and hence not on actual market shares⁷⁴) illustrated at figures 7.2, 7.3 and 7.4.

In figure 7.2 HHI dynamics are outlined against a succession of significant events which occurred over the relevant timeline: these events constitute important reference points for the interpretation of the evolution of concentration in the EU sugar sector before and after the 2006 reform.

⁷⁴ Calculation of HHI on production capacity shares instead of actual market shares constitutes a limitation in the analysis; this was however an unavoidable choice, due to the unavailability of time series of data on actual market shares of firms in the various relevant geographical markets. In case calculation of HHI on market shares had been possible for all the campaigns in the 2000-2011 period, the evolution of concentration might have shown different patterns from the ones described; always reasoning in terms of market shares, in all cases where additional sugar imports allowed by the reform are not controlled by operators already present on a specific national market, decreases in concentration might also have occurred.

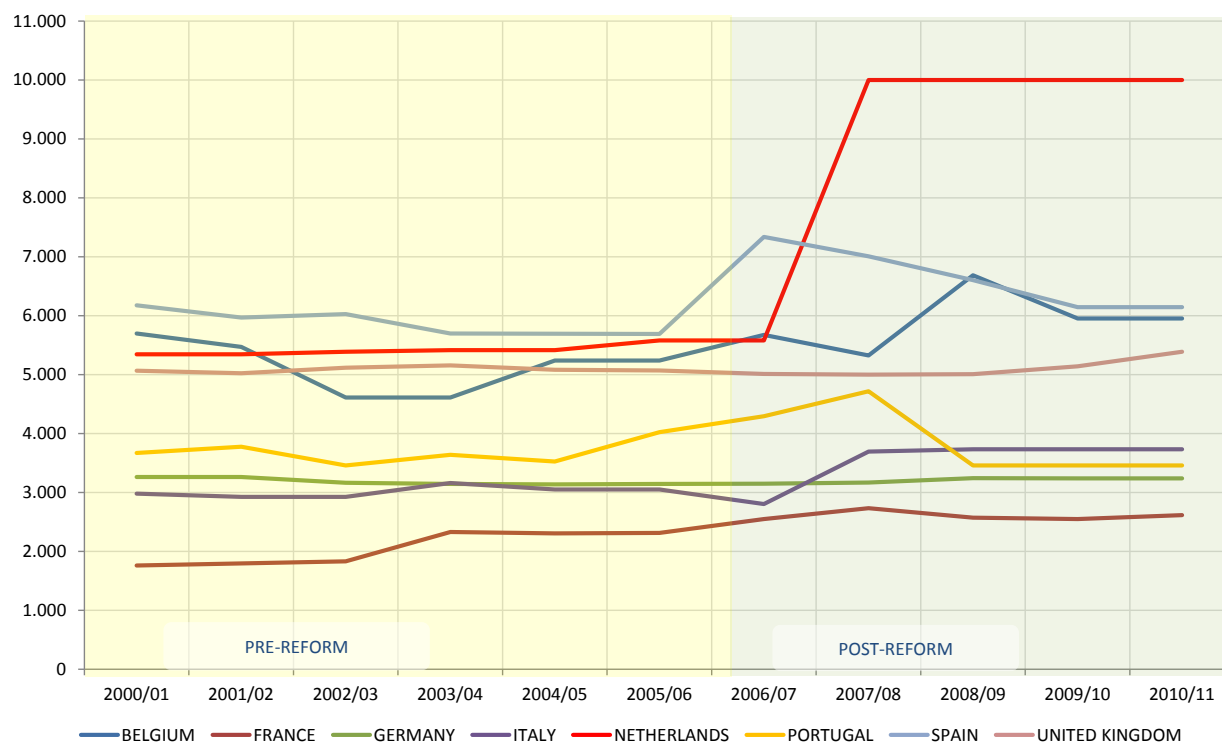
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Figure 7.2 – Evolution of the HHI at EU-15, EU-25 and EU-27 level vs. main policy and industry events (2000-2011)



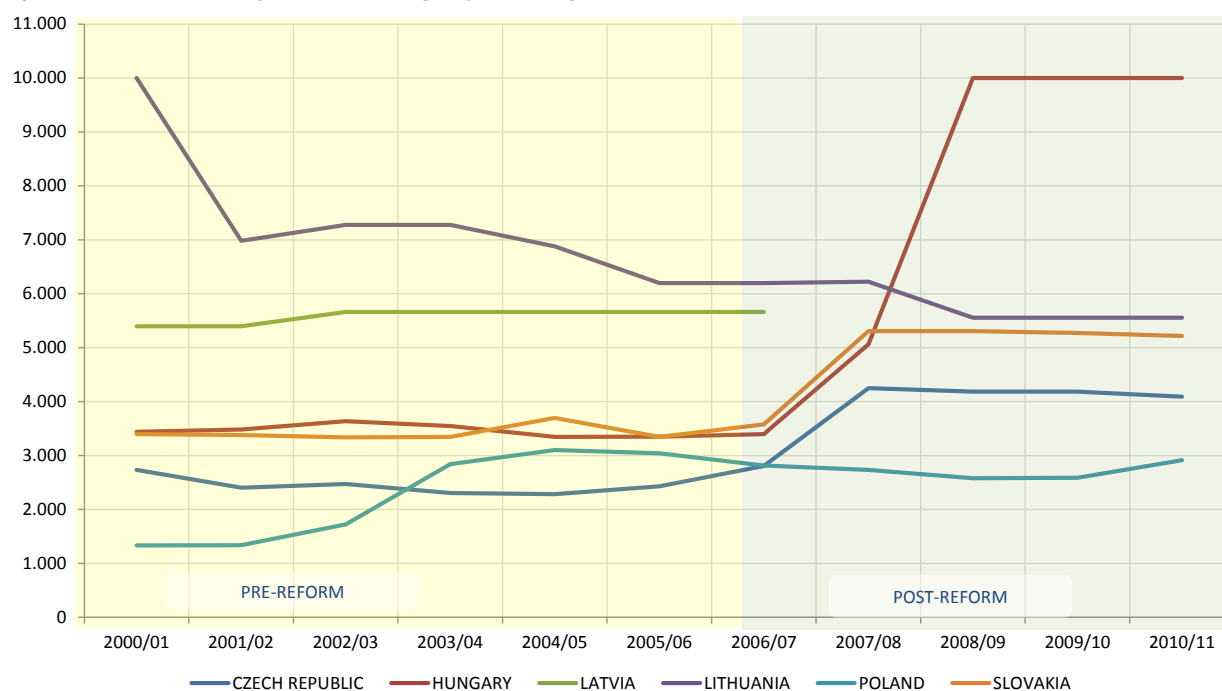
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Figure 7.3 – Evolution of the HHI in sugar-producing EU-15 Member States (2000-2011)



Note: HHI has been equal to 10.000 (maximum value => single producer) over the entire period in the following EU-15 Member States: Austria, Denmark, Finland, Greece, Ireland, Sweden.

Figure 7.4 - Evolution of the HHI in sugar-producing NMS-12 Member States (2000-2011)



Note: HHI has been equal to 10.000 (maximum value => single producer) over the entire period in Slovenia.

Concentration in the EU sugar sector increased remarkably in the post-reform period (figure 7.2).

Three important **developments of transnational importance** greatly contributed to increase concentration at EU level:

1. the formation of the Eurosugar international marketing alliance between French consortium Sucre Union and German-based Nordzucker group (June 2006);
2. the March 2009 acquisition of Danisco group (with operations in Denmark, Germany, Sweden, Finland and Lithuania) by Nordzucker group (which produced sugar in Germany, Poland and Slovakia);
3. the April 2009 takeover of Spanish leading producer Azucarera Ebro by UK-based ABF-British Sugar group (with operations in the United Kingdom and Poland - the latter to be divested after the takeover).

The termination of the Eurosugar alliance in January 2010 brought a decrease in concentration at EU level, which remains however remarkable (HHI at EU-27 level was equal to 1.207 points in the 2010/11 campaign; see also Box 2).

Shifting the focus to **Member State level**, it is first of all worth noting that concentration was extremely high in most sugar-producing Member States already in the early 2000s. In the EU-15 (figure 7.3), the only Member State with an HHI at the 2nd level of aggregation of less than 1.800 points was France, but such mark was crossed already in the 2002/03 campaign: in the last pre-reform campaign (2005/06), 2nd level HHI in France was equal to 2.314 points. Among the NMS-12 (figure 7.4), the only Member State with an HHI at the 2nd level of aggregation of less than 1.800 points was Poland, but in the 2003/04 campaign (the last before accession of Poland to the EU) 2nd level HHI was already equal to 2.842 points: in the last pre-reform campaign (2005/06), 2nd level HHI in Poland was equal to 3.044 points.

In spite of the already concentrated structure in the pre-reform period, the changes introduced by the reform promoted further concentration at both EU and Member State level, i.e. exactly the **outcome which the preliminary theoretical assessment indicated as the most probable impact of the reformed sugar regime** on concentration in the sugar sector. A number of Member States experienced significant and even substantial increases in the HHI since the first campaign under the reformed regime (2006/07). The most remarkable increases occurred in the Netherlands and Hungary, where a single producer was in operation from, respectively, 2007/08 and 2008/09 campaigns onwards. Concentration increased significantly after the reform in a number of Member States (France, Italy, Spain and Belgium in the EU-15, Czech Republic and Slovakia among the NMS-12).

It is however important to take into due account that:

- in case calculation of HHI on market shares had been possible for all the campaigns in the 2000-2011 period, the evolution of concentration might have shown different patterns from the ones described above;
- always reasoning in terms of market shares, in all cases where additional sugar imports allowed by the reform are not controlled by operators already present on a specific national market, decreases in concentration might also have occurred.

Box 2 – Further evolution of concentration in the sugar sector in the first months of 2012

Two important industry events determined an increase in the concentration of the EU sugar sector in the first months of 2012. In February 2012, Cristal Union obtained approval of its takeover of Groupe Vermandoise by French antitrust authority. The resulting entity constitutes France's second-ranked sugar producer, with a combined output of 1,5 million T of sugar. In May 2012, the EU antitrust authority approved Südzucker Group's purchase of a stake in UK-based international sugar trader ED&F Man (to obtain approval, Südzucker agreed to sell off ED&F's share of Italy's biggest sugar refinery). Südzucker Group is the leading sugar producer in the EU: the move is aimed at improving the group's access to extra-EU markets.

7.2.2 Evolution of competition in the EU sugar sector and evolution of the relevant policy framework

The evolution of competition in the EU sugar sector was studied at both area (EU-15; EU-25; EU-27) and individual Member State level. Such evolution is represented here by the dynamics of a set of variables:

1. Number of sugar producers at 2nd level of aggregation (EU level) and at 1st level of aggregation (Member State level).
2. Number of beet sugar factories in operation (EU level).
3. Average production capacity of beet sugar factories (EU level).
4. Self-sufficiency ratio and share of imports on internal use for human consumption (EU level).
5. Adjusted Lerner Index - ALI (Member State level only). ALI constitutes a synthetic indicator of the evolution of the degree of competition in the different national sugar sectors. The dynamics of ALI are outlined for different groups of Member States, defined according to the average level of concentration in the sugar industry over the 2000-2011 period (group 1: avg. HHI = 10.000; group 2: avg. HHI 3.000 – 9.999; group 3: avg. HHI < 3.000). It is important to underline that due to the procedure adopted for construction of the ALI (which is the result of multiplication of the Lerner Index proper by an unknown constant, different for each Member State), comparison between Member States can be made only in terms of dynamics, not of absolute level of the ALI itself.

The graphs showing the evolution of the above variables always highlight the transition from the pre-reform to the post-reform period, to allow better appreciation of trend variations.

Figure 7.5 – Evolution in the number of sugar producers (2nd level of aggregation) – European Union (2000-2011)

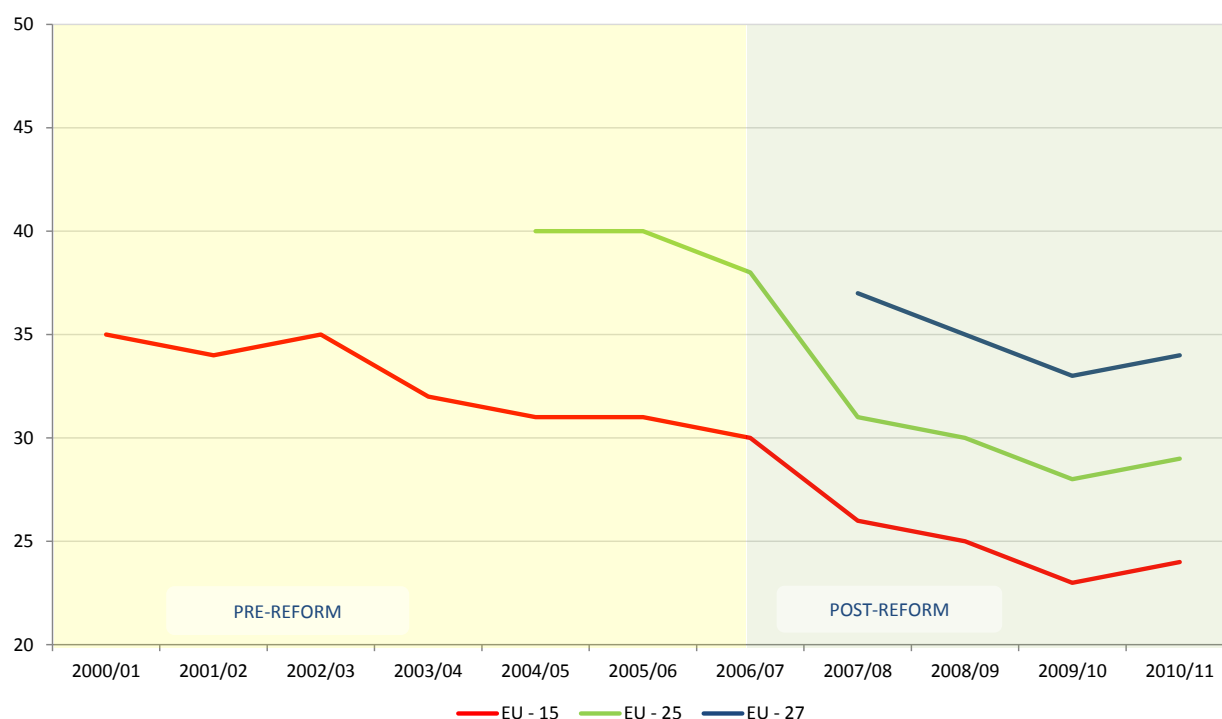
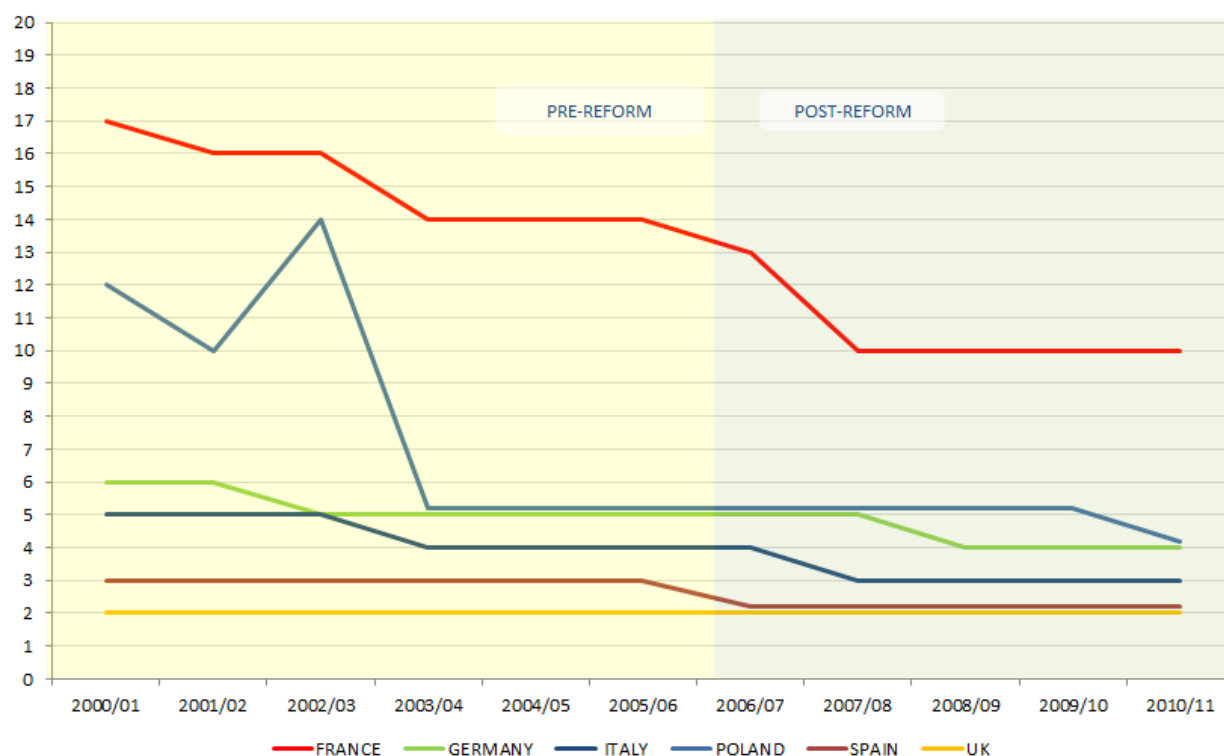


Figure 7.6 - Evolution in the number of sugar producers (1st level of aggregation) in six Member States (2000-2011)



The **number of sugar producers** at the 2nd level of aggregation in the EU (which takes into account the presence of multinational groups and of marketing alliances) **greatly decreased between 2005/06 and 2009/10** (figure 7.5), passing from 40 to 28 (EU-25). A slight increase occurred in 2010/11, after termination of the Eurosugar international marketing alliance.

Passing to the Member State level (see also figure 7.6), the most remarkable decrease in the number of sugar producers occurred in the only Member State which still had more than 7 producers at the 1st level of aggregation (unified management, without considering marketing alliances) before the reform, i.e. in France (from 14 producers in 2005/06 to 10 producers from 2007/08 onwards). **In the 2010/11 campaign, no Member State other than France had more than 5 producers in operation, and 7 out of 20 sugar-producing Member States (35%) had a single producer in activity** (Austria, Denmark, Finland, Greece, Netherlands, Sweden in the EU-15; Hungary among the NMS-12).

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Figure 7.7 – Evolution of the number of beet sugar factories in operation and of their average production capacity (tons of beet sliced / day) – EU-15 (2000-2011)

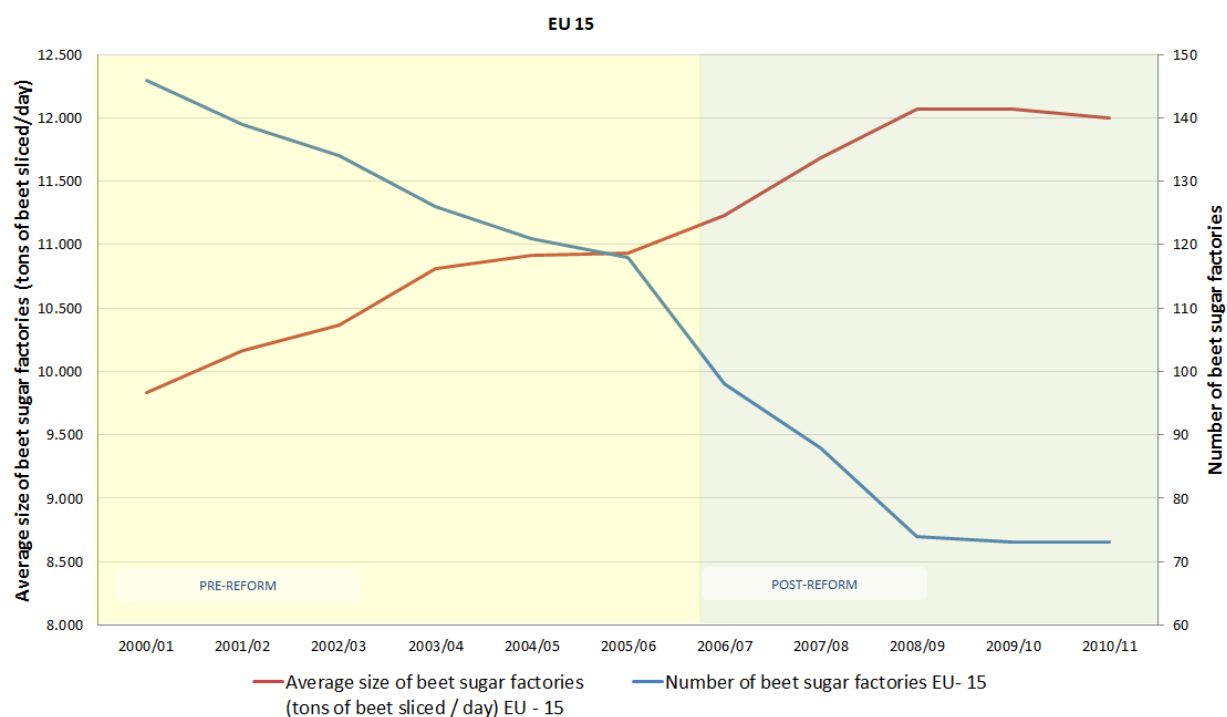
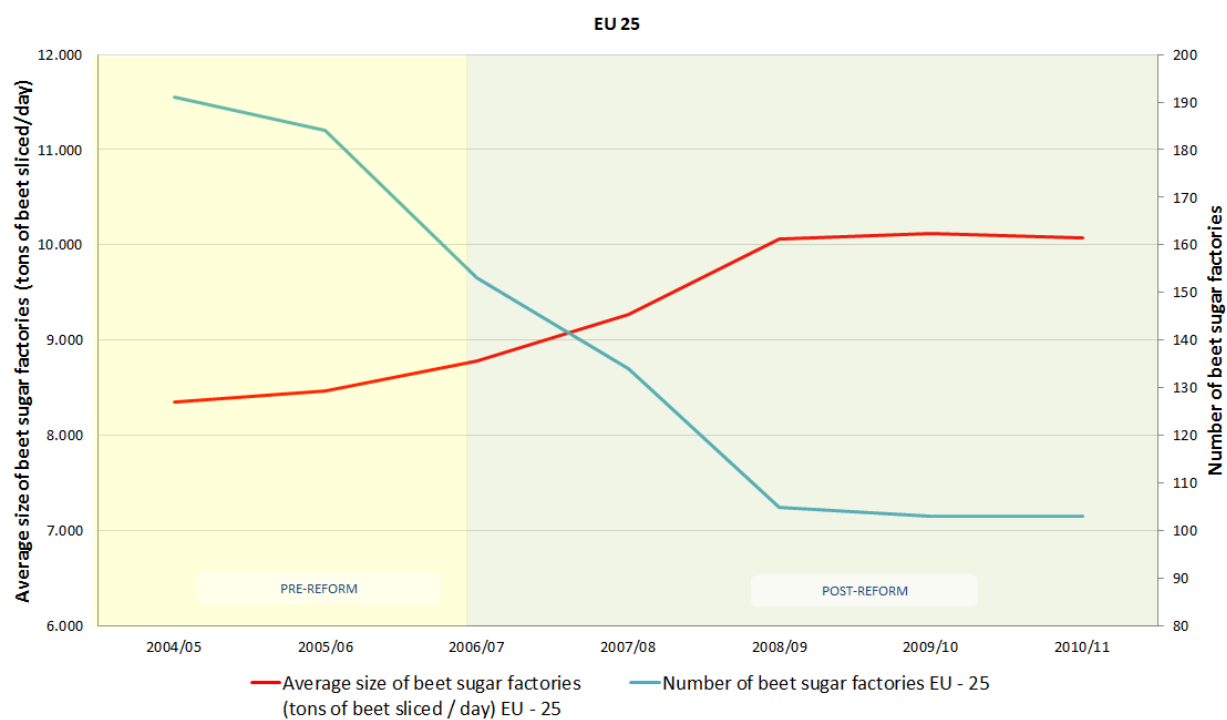


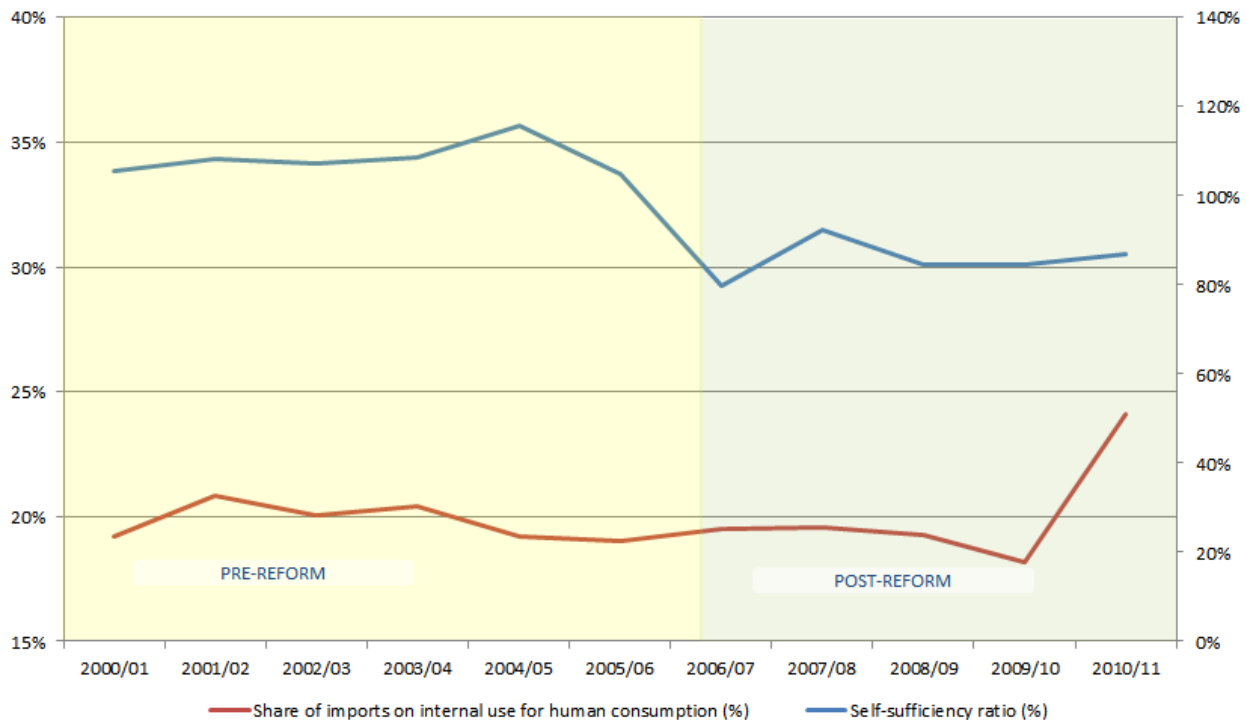
Figure 7.8 - Evolution of the number of beet sugar factories in operation and of their average production capacity (tons of beet sliced / day) – EU-25 (2004-2011)



The preliminary theoretical assessment of the new sugar regime underlined that policy changes introduced with the reform made the achievement of scale economies at both plant and firm level even more important in the sugar sector.

Figures 7.7 and 7.8 clearly show that **scale economies were intensively pursued in the EU sugar sector in the post-reform period, through closure of the less performing plants and expansion of production capacity of the remaining ones**. Out of 184 beet sugar factories operating in the EU-25 in the 2005/06 campaign (the last pre-reform one), 79 had been closed by the start of the 2008/09 campaign (a 43% decrease); only 103 beet sugar factories were in operation in the 2010/11 campaign. The average slicing capacity of EU beet sugar factories in the EU-25 has passed from around 8.500 T/day in 2005/06 to over 10.000 T/day from 2008/09 onwards. Such trend towards reduction of the number of plants in operation and increase in average production capacity is evident in all the main sugar-producing Member States.

Figure 7.9 – Evolution of the self-sufficiency ratio and share of imports on internal use for human consumption – European Union (EU-15: 2000/01 to 2003/04; EU-25: 2004/05 to 2006/07; EU-27: 2007/08 to 2010/11).



Incentives to reduction of sugar production capacity in the framework of the 2006 reform have combined with improved access for sugar imports, especially after full implementation of the EBA sugar regime and transition from the ACP sugar protocol to EPAs from October 2009 onwards. As a consequence, the self-sufficiency ratio of the EU for sugar has fallen from 105% in 2005/06 to 80-90% in the post-reform period, while the share of imports on internal use for human consumption has jumped from 18% in 2009/10 to 24% in 2010/11 (see figure 7.9 above).

Estimating which share of such additional imports is controlled by new operators in each national market or, in other terms, assessing the extent to which improved access for sugar imports has actually translated into decreased concentration and increased competition (thanks to the entry of new suppliers) at Member State level is extremely difficult. From information available to the study group, **the share of such additional**

imports actually controlled by EU sugar producers should be substantial⁷⁵, thus reducing the potential beneficial effects of improved access to the EU market on competition and concentration in the sugar sector.

As previously explained at § 7.1, the Adjusted Lerner Index (ALI) constitutes a synthetic indicator of the dynamics of competition within the sugar sector, and is hence suitable for econometric treatment. By representing the evolution of the ratio between production margin and ex-works sugar price, the dynamics of the ALI constitute an acceptable – even if oversimplified – representation of the evolution of competition in the sugar sector, which also takes into account the effect of increased imports (and hence of the possible entry of new operators on the market) which could not be assessed directly due to lack of adequate information. However two main limitations are associated to the use of the ALI in the assessment, stemming from its inability to:

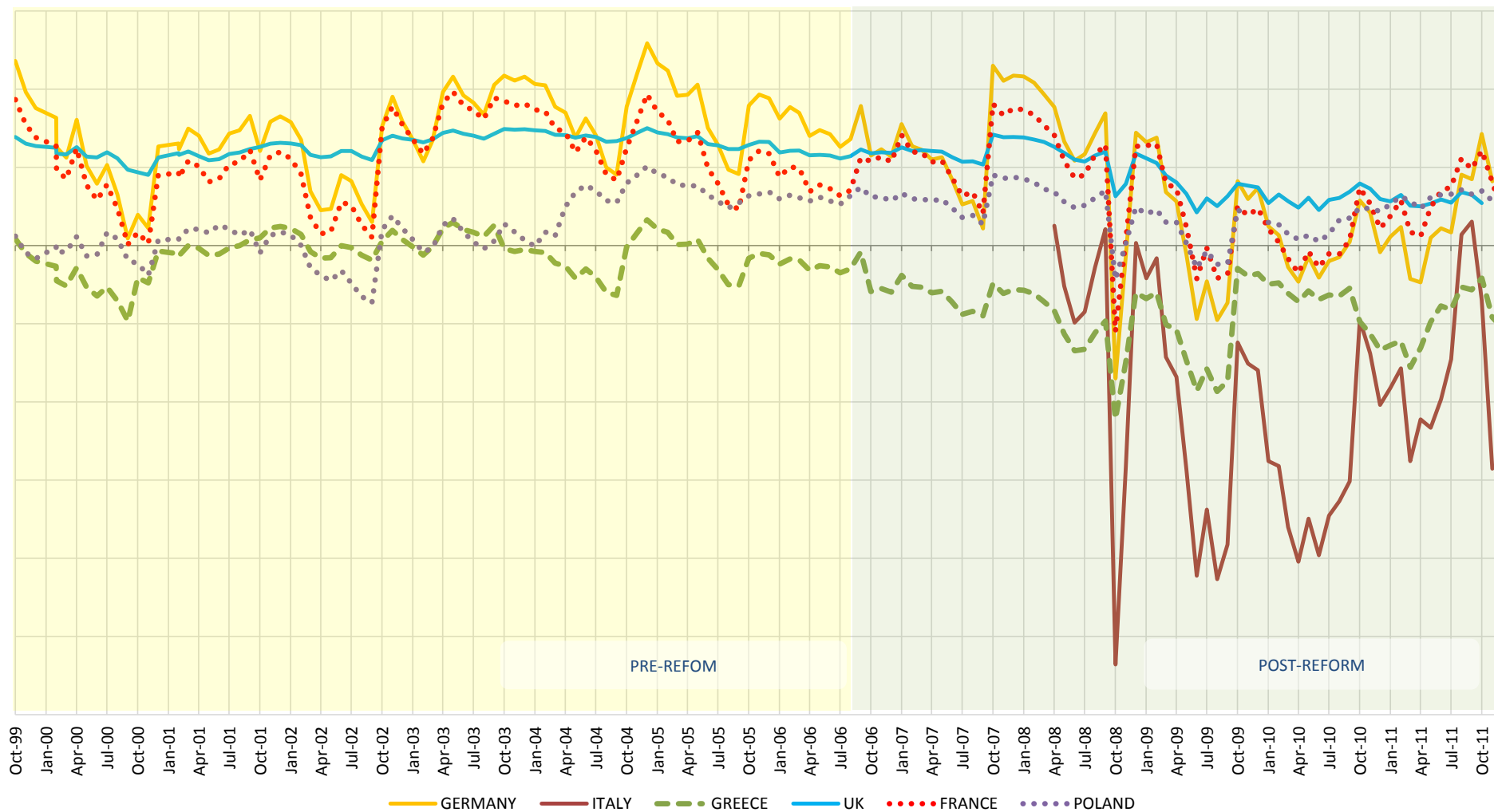
1. describe all the qualitative elements which concur to determine the actual situation of competition in a specific market;
2. allow measurement of the degree of competition in the sugar sector (or in other words, of market power exerted by sugar producers).

Figure 7.10 describes the dynamics of the ALI for a number of Member States featuring different average levels of concentration (HHI score) over the 2000-2011 period. It appears quite clearly from the graph that the dynamics of the ALI in Member States with higher concentration (Greece, with a single producer; UK, Germany and Italy) are not automatically smoother than the dynamics of the ALI in Member States with lower concentration (France, Poland). Even if the graph does not allow for comparison among Member States in terms of absolute levels of Lerner Index (due to the procedure used for calculation of the ALI, which was multiplied by an unknown constant, different for each Member State), the above consideration implies that **the dynamics of the ALI in Member States with a more concentrated sugar sector are not necessarily more stable over time (like the classic SCP paradigm would suggest) than in Member States with a less concentrated sector.**

⁷⁵ For instance, the Südzucker group controls a substantial share of sugar imports from Mauritius through a long-term supply agreement with the local organization of sugar producers; ABF-British Sugar group controls a significant share of imports from Southern African countries (South Africa, Malawi, Zambia, Swaziland, Tanzania, Mozambique) through its subsidiary Illovo Sugar; Tereos has a significant presence in Brazil through its subsidiary Açúcar Guarani (third-ranked sugar producer at national level).

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Figure 7.10 – Evolution of the Adjusted Lerner Index in some Member States with different HHI average score (1999/00 – 2010/11)



Greece: avg. HHI score = 10.000; Germany, Italy, United Kingdom: avg. HHI score 3.000 – 9.999; France, Poland: avg. HHI score < 3.000

Important notice: due to the procedure adopted for construction of the ALI, comparison between Member States can be made only in terms of dynamics, not of absolute level of the ALI itself

In conclusion, the **main trends in the evolution of competition in the EU sugar sector from the pre-reform to the post-reform period** can be summarised as follows:

1. **Post-reform acceleration of the decrease in the number of sugar producers** in operation.
2. **Even greater emphasis on the achievement of scale economies in the post-reform period**, through closure of the less performing plants and expansion of production capacity of the remaining ones.
3. **Potential beneficial influence of additional imports on competition** (i.e. entry of new operators on national markets) **likely to be partly offset by the control exerted on such flows by EU sugar producers**, through their overseas subsidiaries and/or long-term supply agreements.
4. **No elements suggesting an evident relation between concentration levels and evolution of the degree of competition** in the sugar sector.

Box 3 – Further evolution of competition in the sugar sector in the first months of 2012

The two important industry events which determined an increase in the concentration of the EU sugar sector in the first months of 2012 (see § 7.2.1, Box 2) might have influenced the recent evolution of competition in the EU sugar sector, and might continue to influence it in the future. Even if both acquisitions received approval by competent antitrust authorities, they have **further reduced the number of active players in the EU sugar market**. Furthermore, control exerted by European leading sugar producer Südzucker on international sugar trader ED&F Man could **further offset the potential beneficial influence of additional extra-EU imports on competition in the EU domestic markets**.

7.2.3 Relation between concentration and competition in the EU sugar sector

This paragraph illustrates the results of the analysis of the relation between concentration and competition in the EU sugar sector for the period 2000-2011. The analysis was aimed at assessing consistency with, or deviation from, the classic SCP paradigm.

The results of the statistical tests carried out to detect the possible presence of correlation between the evolution of HHI and the evolution of ALI in the 2000-2011 period are reported in table 7.1.

Table 7.1 – Results of the correlation analysis between ALI and HHI (2nd level of aggregation)

Correlation between Adjusted Lerner Index and Herfindahl-Hirschman Index (2nd level)															
Period	Austria	Belgium	Czech Republic	Finland	France	Germany	Greece	Hungary	Italy	Netherlands	Poland	Romania	Slovakia	Spain	UK
2000-2005	–	–	-0,87	–	0,31	-0,96	0,00	-0,04	–	–	0,93	0,75		0,06	0,78
2006-2011	0,00	-0,73	-0,60	0,00	0,72	-0,85	0,00	-0,51	-0,91	0,00	0,77	0,25	-0,10	0,58	-0,69

Light green background: results of correlation analysis are consistent with the expected outcomes of classic SCP paradigm

As any variation in the ALI can indicate a variation of opposite sign in the degree of competition in the sugar sector, empirical confirmation of the classic SCP paradigm (the greater the concentration, the lower the degree of competition, and vice versa) via correlation analysis between the ALI and HHI is indicated by the presence of positive coefficients (increases in HHI coincide with increases in ALI, i.e. with decreases in the degree of competition, and vice versa).

In the light of the results of correlation analysis (see table 2.1 above), the classic SCP paradigm would be verified in France, Poland, Romania and Spain (both before and after the 2006 reform) and in the United Kingdom (in the pre-reform period only).

It is however worth remembering that – besides the previously mentioned limitations of the ALI as a stand-alone proxy of the degree of competition - the validity of the classic SCP paradigm has been questioned by many scholars: the presence of negative coefficients in many Member States suggests that increases in the degree of competition might have occurred also in presence of stable or even increased concentration levels.

7.3 Empirical assessment of the impacts of the evolution of concentration and competition on price transmission in the sugar sector

The results of the econometric tests carried out to assess empirically the relation between the Adjusted Lerner Index (ALI) and all the relevant prices are illustrated at § 7.3.1 (ALI vs. sugar ex-works price), 7.3.2 (ALI vs. sugar retail price) and 7.3.3 (ALI vs. retail prices of sugar-containing products).

Results are reported in tables featuring:

- the detail of the results for each of the subsamples considered in the assessment (pre-reform; post-reform); information on the stability of the results across hypotheses 1, 2, and 3 for the timing of the policy-related break (see § 7.1) are also provided;
- information on the changes in speed⁷⁶ and persistence⁷⁷ of the short-term effects of variations of the ALI on relevant prices.

Table 7.2 illustrates the geographical coverage granted in the empirical assessment.

Table 7.2 - Geographical coverage of econometric tests performed for Question 2

Question 2	EU-15		NMS-12		Total
	Countries	N°	Countries	N°	N°
Econometric tests performed	Austria, Belgium, France, Finland, Germany, Greece, Italy, Netherlands, Spain, United Kingdom	10	Czech Republic, Hungary, Poland, Romania, Slovakia	5	15
<i>of which on suboptimal datasets</i>	<i>Austria, Belgium, Finland, Italy, Netherlands, Spain</i>	<i>6</i>	<i>Hungary, Romania, Slovakia</i>	<i>3</i>	<i>9</i>
Relation between ALI and ex-works sugar price					
Comparison pre- / post-reform possible	France, Germany, Greece, Spain, United Kingdom	5	Czech Republic, Hungary, Poland, Romania	4	9
<i>of which on suboptimal datasets</i>	<i>Spain</i>	<i>1</i>			<i>1</i>
Relation between ALI and retail sugar price					
Comparison pre- / post-reform possible	France, Germany, Greece, Spain, United Kingdom	5	Czech Republic, Poland, Romania	3	8
<i>of which on suboptimal datasets</i>	<i>Spain</i>	<i>1</i>	<i>Romania</i>	<i>1</i>	<i>2</i>
Relation between ALI and retail price of sugar-containing products					
Comparison pre- / post-reform possible	France, Germany, Greece, Spain, United Kingdom	5	Czech Republic, Poland, Romania	3	8
<i>of which on suboptimal datasets</i>	<i>Spain</i>	<i>1</i>	<i>Romania</i>	<i>1</i>	<i>2</i>

⁷⁶ Timing of lags at which there is a statistically significant effect of the variation of the ALI on prices.

⁷⁷ Distance between the first lag and the last lag at which there is a statistically significant effect of the variation of the ALI on prices.

It is important to underline that the time series which underwent econometric testing are updated to the end of 2011; as a consequence, **the assessment does not cover possible effects of ex-works price increases occurred in the first months of 2012.**

The main findings of the empirical assessment are highlighted at § 7.3.4.

7.3.1 Relation between the Adjusted Lerner Index and sugar ex-works price

7.3.1.1 Results of the preliminary assessment

In order to help the interpretation of the results of the empirical assessment, the pre- and post-reform dynamics of ALI and ex-works price of sugar in a number of Member States are first outlined in a series of graphs⁷⁸ (figures from 7.11 to 7.13). Average levels of the ALI for the pre- and post-reform periods are also shown in the graphs, to allow an immediate (even if “rough”) appreciation of the overall effect of the reform on the degree of competition. It is however essential to underline once again two important **limitations**:

1. the sole dynamics of the ALI do not allow a thorough assessment of the evolution of competition in the EU sugar sector in all its aspects (which include a number of qualitative elements whose representation through a synthetic index is clearly impossible);
2. due to the peculiar procedure followed for their construction (see § 7.1), time series of the ALI do not allow to measure in absolute terms the variations of market power exerted by EU sugar producers, and also do not allow to understand if changes in the degree of competition are mainly driven by price dynamics or by production cost dynamics.

In an attempt to address the limitation at the above point 2, two other data series are also featured in the graphs: oil price and ECB commodity price index (Euro-denominated, use-weighted, food). These two series describe the dynamics of two important variable cost items in sugar production - i.e. energy and agricultural raw materials (in order to “buy hectares” under sugar beet, EU sugar manufacturers must beat competition from other crops by offering an adequate price to farmers) – and can hence be of some help in interpreting the dynamics of ALI and ex-works sugar price. In particular, the dynamics of oil price and ECB commodity price index are useful to understand whether the evolution of ALI is mainly driven by prices or by variable production costs. It is anyway worth underlining that – being sugar production a capital-intensive activity – also fixed costs have great importance in determining the dynamics of ALI: in this respect, it is plausible to assume that – due to rationalisation of production capacity at plant and firm level which followed the reform (see § 7.2.2) – fixed costs have continued their long-term descent, thus offsetting – in part at least - increases in the variable component of total sugar production cost.

⁷⁸ Due to confidentiality reasons, the present reports features no graphs or tables describing the dynamics of sugar ex-works price series in Member States with less than three sugar producers in activity in at least one MY within the time span considered for the analysis.

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Figure 7.11 – France: relation between ALI, ex-works sugar price index, oil price index and “ECB Commodity Price index, Euro denominated, use-weighted, Food” (2000-2011)

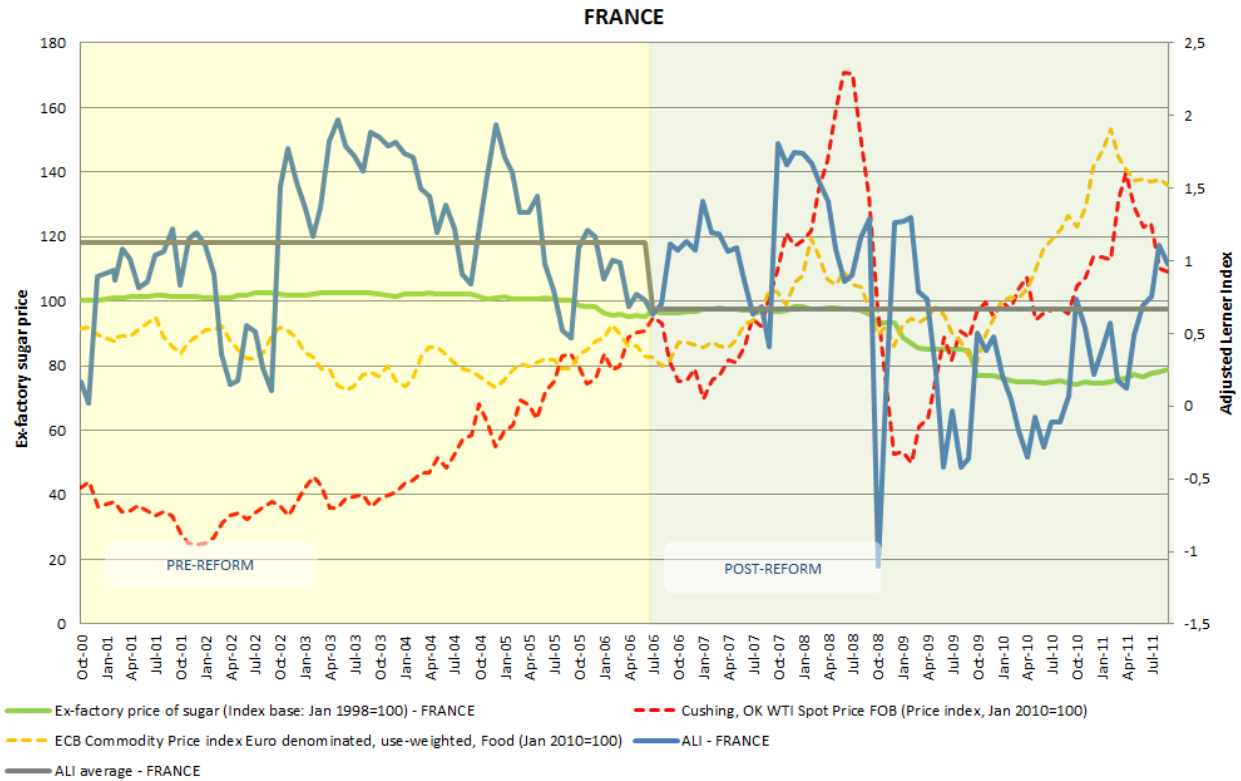
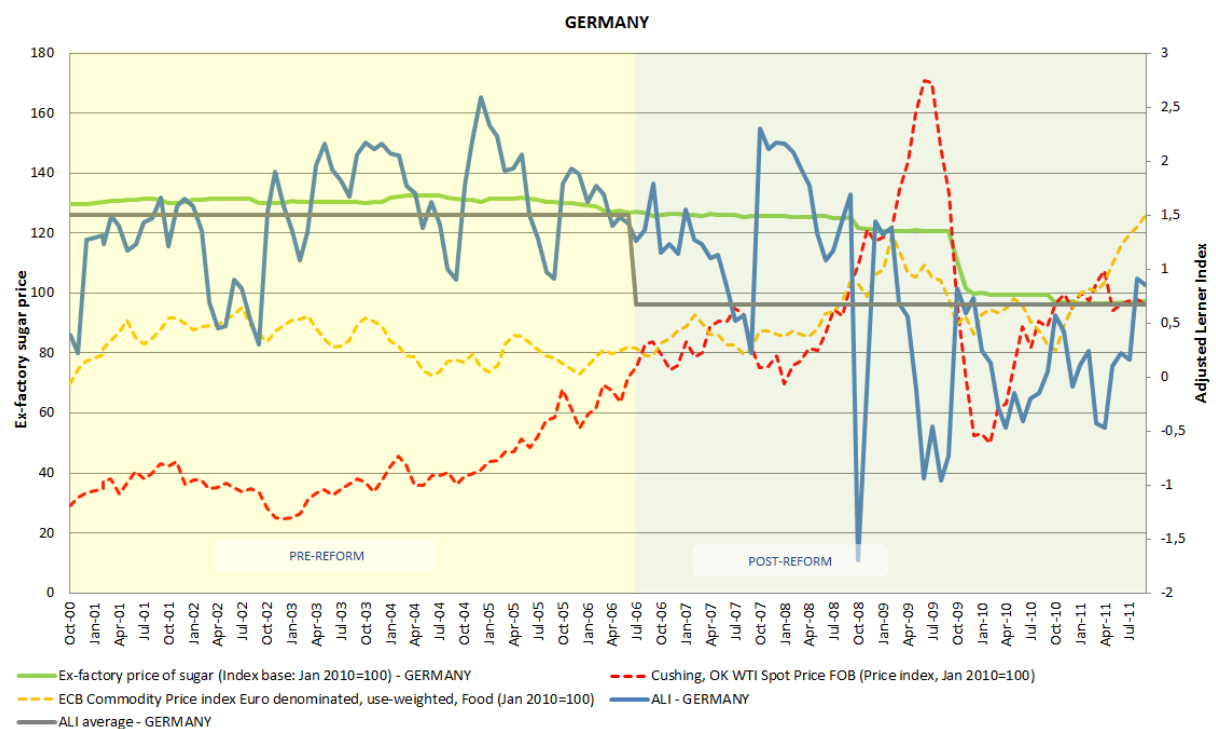
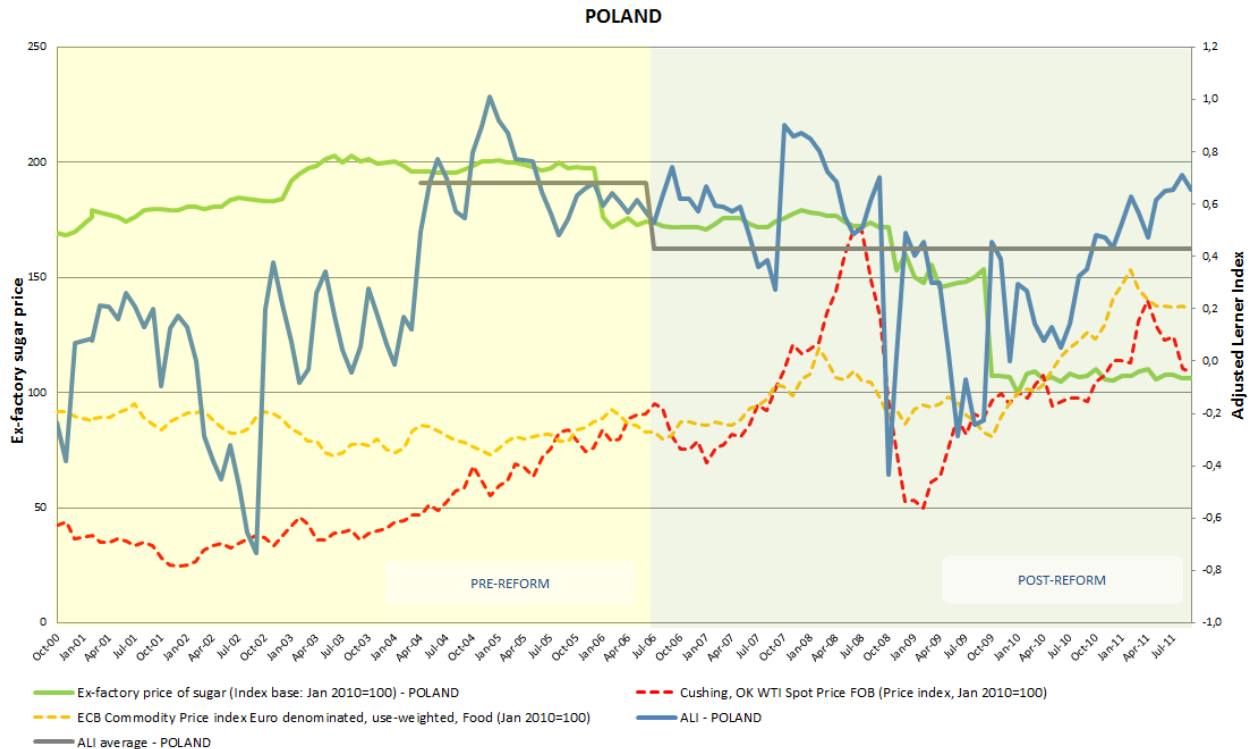


Figure 7.12 – Germany: relation between ALI, ex-works sugar price index, oil price index and “ECB Commodity Price index, Euro denominated, use-weighted, Food” (2000-2011)



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Figure 7.13 - Poland: relation between ALI, ex-works sugar price index, oil price index and “ECB Commodity Price index, Euro denominated, use-weighted, Food” (2000-2011)



Figures from 7.11 to 7.13 show that the ALI has generally shown **greater variability in the post reform period**; part of such increased variability can be explained by higher volatility of ex-works sugar price, but also **cost-related dynamics** had their importance, and **often explain a substantial portion of the steepest variations of the ALI**.

On average, the ALI tends to decrease in the post reform period with respect to the pre-reform one, suggesting the **possible presence of a trend towards a higher degree of competition in the sugar sector following the 2006 reform**. However, **such conclusion must be considered with extreme care**, in the light of the previously underlined **limitations of the ALI**, and also of further developments in the evolution of concentration and competition in the EU sugar sector occurred in the first months of 2012 (see § 7.2.1, Box 2 and § 7.2.2, Box 3). In this respect, it is also extremely important to underline that **the average EU ex-works sugar price has remarkably increased over the first months of 2012 in comparison with late 2011 levels** (711 Euros/T in May 2012 against 654 Euros in December 2011); such price dynamics might have affected the recent evolution of the ALI (especially if sugar production cost has not experienced an analogous evolution over the same period), and hence suggest that **EU sugar producers might again be exerting remarkable market power**.

7.3.1.2 Results of the econometric tests

Coming to the empirical assessment proper, the econometric tests carried out were aimed at detecting the presence of the following types of relation:

1. long-term relations (cointegration), which can be transmitted in the short-term (or not) and can be economically meaningful (or not);
2. short-term relations, which – when present and statistically significant - can be of two types:

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- a. “Conventional” relation between ALI and ex-works sugar price, which includes all relations where variation of ALI and variation of price are of the same sign (i.e. variations in the degree of competition and variations of price are of opposite sign, consistently with economic theory: increase in the degree of competition should reflect in decreasing price, and vice versa);
- b. “Non-conventional” relation between ALI and ex-works sugar price, i.e. all relations where variation of ALI and variation of price are of opposite sign. Such relations can nevertheless be economically meaningful because they include all the cases in which the variation of ALI is determined by cost dynamics prevailing over price dynamics (ALI increases / competition decreases also in presence of falling price because cost falls faster than price; ALI decreases / competition increases also in presence of rising price because cost rises faster than price).

The above relations can be more or less stable across the three timing hypotheses considered.

The results of the assessment are reported in tables 7.3 and 7.4.

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Table 7.3 - Relation between the Adjusted Lerner Index and sugar ex-works price: results of the econometric tests for the EU-15 Member States

Member State	Pre-reform						Post-reform						
	Long-term relation		Short-term effect of <u>opposite</u> sign on ex-works price (conventional relation)		Short-term effect of <u>equal</u> sign on ex-works price (non-conventional relation)		Long-term relation		Short-term effect of <u>opposite</u> sign on ex-works price (conventional relation)		Short-term effect of <u>equal</u> sign on ex-works price (non-conventional relation)		Post-reform changes in speed and persistence of short-term effect
	stable	unstable	stable	unstable	stable	unstable	stable	unstable	stable	unstable	stable	unstable	
France									x				
Germany									x				
Greece					x								
Spain						x			x				Increased speed; increased persistence
United Kingdom				x									
TOTAL				1	1	1			3				

Table 7.4 - Relation between the Adjusted Lerner Index and sugar ex-works price: results of the econometric tests for the NMS-12

Member State	Pre-reform						Post-reform						
	Long-term relation		Short-term effect of <u>opposite</u> sign on ex-works price (conventional relation)		Short-term effect of <u>equal</u> sign on ex-works price (non-conventional relation)		Long-term relation		Short-term effect of <u>opposite</u> sign on ex-works price (conventional relation)		Short-term effect of <u>equal</u> sign on ex-works price (non-conventional relation)		Post-reform changes in speed and persistence of short-term effect
	stable	unstable	stable	unstable	stable	unstable	stable	unstable	stable	unstable	stable	unstable	
Czech Republic					x		x				x		Increased speed
Hungary	x					x			x				Decreased speed; increased persistence
Poland													
Romania						x							
TOTAL	1				1	2	1		1		1		

7.3.2 Relation between the Adjusted Lerner Index and sugar retail price

The econometric tests carried out for the assessment were aimed at detecting the presence of the following types of relation:

1. long-term relations (cointegration), which can be transmitted in the short-term (or not) and can be economically meaningful (or not);
2. short-term relations: if present and statistically significant, all relations where variation of ALI and variation of retail price are of the same sign are meaningful from an economic standpoint (e.g. decrease in ALI implies increase in the degree of competition: this should translate into lower ex-works sugar prices which should in turn, if PT is present, translate into lower sugar retail prices). For a relation to be economically meaningful, positive significant coefficients must prevail over negative significant ones.

The above relations can be more or less stable across the three timing hypotheses considered.

The results of the assessment are reported in tables 7.5 and 7.6.

Table 7.5 - Relation between the Adjusted Lerner Index and sugar retail price: results of the econometric tests for the EU-15 Member States

Member State	Pre-reform				Post-reform				
	Long-term relation		Short-term effect on retail price of sugar		Long-term relation		Short-term effect on retail price of sugar		Post-reform changes in speed and persistence of short-term effect
	stable	unstable	stable	unstable	stable	unstable	stable	unstable	
France									
Germany								x	
Greece			x					x	Decreased speed; decreased persistence
Spain			x						
United Kingdom				x					
TOTAL			2	1				2	

Table 7.6 - Relation between the Adjusted Lerner Index and sugar retail price: results of the econometric tests for the NMS-12

Member State	Pre-reform				Post-reform				
	Long-term relation		Short-term effect on retail price of sugar		Long-term relation		Short-term effect on retail price of sugar		Post-reform changes in speed and persistence of short-term effect
	stable	unstable	stable	unstable	stable	unstable	stable	unstable	
Czech Republic								x	
Poland								x	
Romania		x				x			
TOTAL		1				1		2	

7.3.3 Relation between the Adjusted Lerner Index and retail prices of sugar-containing products

The sugar-containing product types considered for the assessment are the following: sugar confectionery, chocolate confectionery, jams, biscuits, soft drinks.

The econometric tests carried out for the assessment were aimed at detecting the presence of the following types of relation:

1. long-term relations (cointegration), which can be transmitted in the short-term (or not) and can be economically meaningful (or not);
2. short-term relations: if present and statistically significant, all relations where variation of ALI and variation of retail prices are of the same sign are meaningful from an economic standpoint (decrease in ALI implies increase in the degree of competition: this should translate into lower ex-works sugar prices which should in turn, if PT is present, translate into lower retail prices of sugar-containing products). For a relation to be economically meaningful, positive significant coefficients must prevail over negative significant ones.

The above relations can be more or less stable across the three timing hypotheses considered.

The results of the assessment are reported in tables 7.7 and 7.8.

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Table 7.7 - Relation between the Adjusted Lerner Index and retail prices of sugar-containing products: results of the econometric tests for the EU-15 Member States

Member State	Pre-reform					Post-reform					
	Long-term relation		Short-term effect on retail price of sugar-containing products			Long-term relation		Short-term effect on retail price of sugar-containing products			Post-reform changes in speed and persistence of short-term effect
	stable	unstable	type of product	stable	unstable	stable	unstable	type of product	stable	unstable	
France			Sugar,jam,honey		x			Sugar,jam,honey			
			Non alcoholic beverages		x			Non alcoholic beverages		x	Decreased speed; decreased persistence
Germany			Chocolate bars					Chocolate bars			
			Jam	x				Jam			
			Instant cocoa drink					Instant cocoa drink			
			Sweets					Sweets		x	
			Fruit juice					Fruit juice			
Greece			Jam		x			Jam			
			Chocolate					Chocolate		x	
			Biscuits					Biscuits			
Spain			Soft drinks					Soft drinks			
United Kingdom			Biscuits		x			Biscuits		x	
			Sweets and chocolate	x				Sweets and chocolate			
			Soft drinks					Soft drinks		x	
TOTAL				2	4					5	

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Table 7.8 - Relation between the Adjusted Lerner Index and retail prices of sugar-containing products: results of the econometric tests for the NMS-12

Member State	Pre-reform					Post-reform					
	Long-term relation		Short-term effect on retail price of sugar-containing products			Long-term relation		Short-term effect on retail price of sugar-containing products			Post-reform changes in speed and persistence of short-term effect
	stable	unstable	type of product	stable	unstable	stable	unstable	type of product	stable	unstable	
Czech Republic			Jam					Jam		x	
			Confectionery					Confectionery		x	
			Chocolate					Chocolate		x	
Poland			Non alcoholic beverages		x			Non alcoholic beverages		x	Decreased speed; decreased persistence
Romania			Non alcoholic beverages		x						
			Sugar, sweets, honey								
TOTAL					2					4	

7.3.4 Findings of the empirical assessment

7.3.4.1 Relation between the Adjusted Lerner Index and sugar ex-works price

Datasets allowed comparison between pre-reform and post-reform situation for 9 Member States out of 15. Comparison was possible for:

- five EU-15 Member States: France, Germany, Greece, Spain (suboptimal dataset), United Kingdom;
- four NMS-12 countries: Czech Republic, Hungary, Poland and Romania.

Stable long-term relations between ALI and ex-works price were detected in the pre-reform period only in Hungary and in the post-reform period only in the Czech Republic.

Short-term effects of the variation of the ALI on ex-works price were detected both before and after the reform in 3 Member States only; in 2 more Member States, variations in the ALI translated into effects on ex-works price only after the reform.

Post-reform short-term effects of variations of ALI on sugar ex-works price occurred through a “conventional relation” in most Member States (5 out of 6); post-reform effects via a “non-conventional relation” (cost dynamics prevailing over price dynamics) occurred in the Czech Republic only. This is the only clear trend which emerged from the assessment.

Of the 3 Member States where short-term effects were present in both pre- and post-reform periods, their persistence increased in 2 cases, while the evolution of speed was equally split between increase, decrease and stability (one Member State each).

7.3.4.2 Relation between the Adjusted Lerner Index and sugar retail price

Datasets allowed comparison between pre-reform and post-reform situation for 8 Member States out of 15. Comparison was possible for:

- five EU-15 Member States: France, Germany, Greece, Spain (suboptimal dataset), United Kingdom;
- three NMS-12 countries: Czech Republic, Poland and Romania (suboptimal dataset).

An unstable long-term relation between ALI and sugar retail price was detected both before and after the reform in Romania only (it is however worth reminding that Romania was not an EU Member State in the pre-reform period).

Short-term effects of variations of the ALI on sugar retail price were detected both before and after the reform in Greece only; their speed and persistence decreased after the reform. Variations of the ALI started to have effects on sugar retail prices only after the reform in Germany, Poland and Czech Republic.

In the light of the above results, we can conclude that **no evident trends in the relation between ALI and sugar retail price emerged from the assessment.**

7.3.4.3 Relation between the Adjusted Lerner Index and retail price of sugar-containing products

Datasets allowed comparison between pre-reform and post-reform situation for 8 Member States out of 15, for a total of 20 relations between variations of the ALI and variations of retail prices of sugar-containing products (or aggregates of such products).

No long-term relations between variations of the ALI and variations of retail prices of sugar-containing products were detected before or after the reform.

Short-term effects of variations of the ALI on retail price of sugar-containing products were detected both before and after the reform in:

- EU-15 Member States: France (for “non-alcoholic beverages”) and United Kingdom (for biscuits);

- NMS-12 countries: Poland (for “non-alcoholic beverages”).

In two out of three cases, **both speed and persistence of the effects decreased after the reform**: this is the **only trend which emerged from the assessment**.

Variations of competition translated into effects on retail prices of sugar-containing products only after the reform in:

- EU-15 Member States: Germany (for sweets) and United Kingdom (for soft drinks);
- NMS-12 countries: Czech Republic (for jams, sugar confectionery, chocolate).

A certain **prevalence of non-alcoholic beverages (including soft drinks) among the products concerned by short-term effects of variations of the ALI on retail prices** constitutes another notable finding of the assessment.

7.4 Answer to the question

The investigations carried out for the purposes of the assessment showed that the **2006 reform had quite evident effects on both the level of concentration and the degree of competition in the EU sugar sector**: such finding should however be considered with due care - especially as far as the effects on the degree of competition are concerned – because of limitations in the available dataset.

Policy changes introduced by the reform put additional emphasis on the achievement of scale economies at both plant and firm level. The reform contributed to promote an **acceleration of the on-going process of concentration of the sugar industry, at both national and EU level** (see § 7.2.1, and in particular figures 7.2, 7.3 and 7.4). The increase in concentration was the result of a number of mergers and acquisitions (including some transnational ones) and of the formation of marketing alliances. As a consequence, the number of sugar producers in activity decreased (see § 7.2.2, and in particular figures 7.5 and 7.6), and with it also the number of sugar factories in operation (average production capacity of the remaining plants increased significantly after the reform: see § 7.2.2, and in particular figures 7.7 and 7.8).

As for the **effect of the reform on the degree of competition in the EU sugar sector**, the dynamics of the Adjusted Lerner Index (ALI) (see § 7.3.1.1, and in particular figures from 7.11 to 7.13) would suggest the possible presence of a trend towards a higher degree of competition in the sugar sector following the 2006 reform. However, such conclusion must be considered with extreme care, in the light of some **limitations stemming from the use of the ALI in the assessment**, and also considering **further developments in the evolution of concentration and competition in the EU sugar sector occurred in the first months of 2012** (see § 7.2.1, Box 2 and § 7.2.2, Box 3). If it is true that the ALI constitutes a synthetic index of the degree of competition which **takes into account also the effect of increased sugar imports** (and hence of the possible entry of new operators on the EU market), it is however also true that it **cannot adequately represent the many qualitative aspects which may determine actual competition within the EU sugar sector**⁷⁹. In this respect, it is also extremely important to underline that **the average EU ex-works sugar price has remarkably increased over the first months of 2012 in comparison with late 2011 levels**; such price dynamics might have affected the recent evolution of the ALI (especially if sugar production cost has not experienced an analogous evolution over the same period), and hence suggest that **EU sugar producers might again be exerting remarkable market power**.

⁷⁹ An additional limitation of the ALI lies in the fact that it does not allow measurement of the actual degree of competition, but just an appreciation of its dynamics over time. In particular, the ALI does not allow to understand whether the evolution of competition is mainly driven by variations in sugar price or in sugar production cost.

Empirical evidence from the econometric tests performed (see § 7.3) shows that **variations of the ALI for the sugar sector which followed the reform had short-term effects on consumer prices of sugar and sugar-containing products in a number of cases**. Such effects occurred in a number of EU-15 Member States as well as in some NMS-12 countries. **“Non-alcoholic beverages” (including soft drinks)** are the **type of sugar-containing products** which were found to be **most frequently concerned by such effects**. The only trend which emerged from the assessment is that **both speed and persistence of short-term effects of variations of ALI on retail prices of sugar-containing products decreased after the reform**.

However, the **overall picture of the effects** of variations of competition on consumer prices which emerged from the assessment **is extremely varied and heterogeneous**, and **no other notable trends or similarities could be identified**.

8 Reply to Question 3

“In the cereal sector, where the CAP reforms have reduced the distance between domestic and international prices, liberalization reforms (WTO – Uruguay Round) seem to have positively influenced price transmission. Did the same effect occur in the sugar sector?

The answer to this question will have to clearly distinguish the effects resulting from the CAP reform and the trade liberalisation following the WTO-Uruguay Round”

Key terms:

CAP reforms: all changes in the overall structure of the CAP and of the relevant Common Market Organisations (cereals; sugar; single CMO) which have taken place in the relevant period for the study, i.e. 1985-2011

Liberalization reforms: all changes in the overall structure of agricultural trade agreements concerning the EU (GATT/WTO; ACP sugar protocol/EPAs; EBA initiative; other preferential trade agreements concerning trade in cereals and/or sugar, as defined below) which have taken place in the relevant period for the study, i.e. 1985-2011

Cereal sector: centred on production and marketing of maize, common and durum wheat, spelt, rye, barley, oats, sorghum, buckwheat

Sugar sector: centred on production of raw and white sugar from sugar beets and sugar cane

Reference theories and related approaches:

- Neoclassical theory (market forms: oligopoly, monopolistic competition, etc.; “Law of one price”) and institutional economics
- Porter approach to the analysis of competition

The reply to this question is based on analyses (and econometric tests in particular) carried out for all Member States for which data were available. For sake of conciseness, evidence provided in the following paragraphs, as well as the related reasoning, are mostly focused on a selection of five Member States⁸⁰ (France, Germany, Spain, United Kingdom and Poland). Additional elements on other Member States are provided whenever they can improve the completeness of the reply.

8.1 Relevant policy measures and overall rationale

Question 3 focuses on the evolution of horizontal price transmission (HPT) between the international sugar market and EU domestic markets, and between different domestic markets within the EU, to be assessed in comparison with the developments which occurred in this respect in the cereal sector.

According to the preliminary theoretical assessment of the new market rules in the EU sugar sector in relation to price transmission (PT)⁸¹, the reformed measures which were found to have the most direct and straightforward linkage with HPT are those concerning **improved access to the EU market** for sugar produced in LDCs and in non-LDC ACP countries. As for the effects of the other elements of the 2006 reform on HPT:

- **reduction of price support** (and in particular termination of intervention) *removed existing constraints to price variation within the EU, thus promoting more favourable conditions for the functioning of HPT* (indirect influence);

⁸⁰ France and Germany kept their importance as sugar-producing Member States both before and after the 2006 reform. Italy and Spain experienced a substantial reduction of their sugar production capacity after the reform. United Kingdom is peculiar inasmuch it produces sugar from both domestic beets and imported raw cane sugar (the split has roughly been a 55-45 one for most of the 2000-2011 period). Finally, Poland is by far the most important sugar-producing NMS.

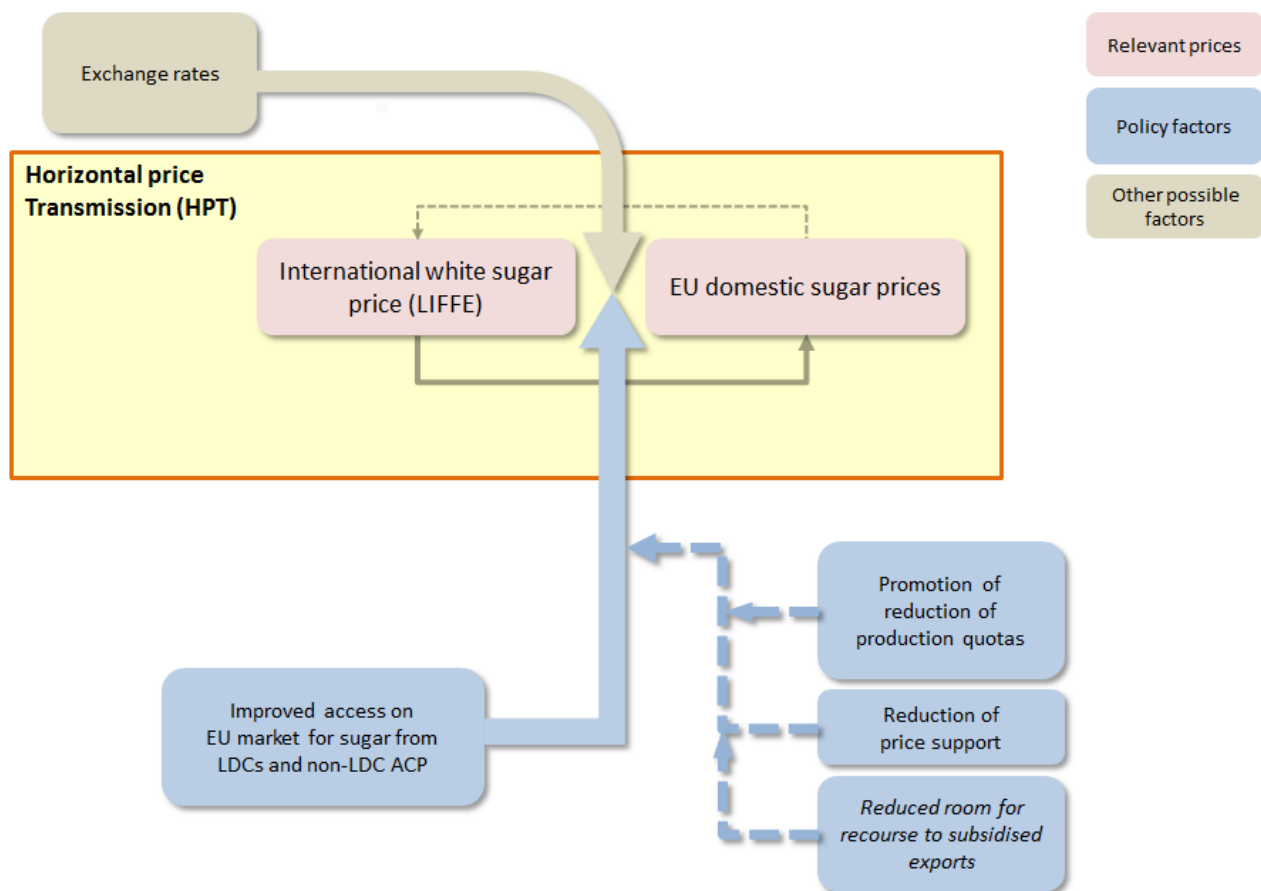
⁸¹ For a complete description of the results of the preliminary theoretical assessment, please refer to § 4.

- ***promotion of quota reduction*** made room for greater import flows, promoting stronger integration between the EU market and the international market and hence improving the conditions for better functioning of HPT (indirect influence).

Other **non-policy factors** can also influence the functioning of HPT: among them, exchange rates (LIFFE white sugar price is in US dollars) are the most straightforward ones.

Figure 8.1 below outlines the overall rationale of the question.

Figure 8.1 – Overall rationale of question 3



Important notice: for a complete description of the preliminary theoretical assessment, please refer to § 4.

The assessment of the development of HPT in the cereal sector was carried out on the basis of the findings of the relevant literature (see § 8.2 and 8.3), while an empirical assessment through econometric models was carried out for the sugar sector (see § 8.4, 8.5 and 8.6).

For the purposes of the empirical assessment of HPT in the sugar sector, two potential **policy-related breaks** were considered:

1. WTO creation (January 1995).
2. Reform of the EU sugar regime. Three hypotheses were considered for the timing of such break:
 - a. achievement of a political compromise on the content of the reform (November 2005);
 - b. publication of the implementing regulation on the Official Journal (March 2006)
 - c. entry into force of the regulation (July 2006 – start of the first EU sugar marketing year under the reformed regime).

Definition of the short-term lag structure was made by considering a time span of 1 to 9 months, on the basis of economic considerations linked to duration of supply contracts in the sugar sector.

The findings of the assessments in the two sectors were compared in order to detect the main similarities and differences in the development of HPT in the two sectors themselves; comparative analysis was performed in a way to distinguish clearly CAP-related developments (§ 8.7) from those deriving from trade liberalization reforms (§ 8.8).

Conclusions are drawn at § 8.9 in order to provide an answer to the question.

8.2 Impacts of CAP reforms on price transmission in the cereal sector

The findings of the most significant studies on this specific issue are outlined in table 8.1 below.

Table 8.1 – CAP reforms and price transmission in the cereal sector: main findings of relevant literature

Paper	Relevant findings
LISTORTI G. (2009)	<p>Mac Sharry reform (1993) + Agenda 2000 and Fischler reform (2000-2003): substantial cuts in intervention prices for wheat => promotion of convergence of EU domestic (French) wheat prices towards international (US) prices (re-alignment)</p> <p>Cuts in intervention prices alone (Mac Sharry reform pre-WTO): no effect on HPT</p>
BARASSI, M. R. and GHOSHAY, A. (2007)	<p>Before the Mac Sharry reform (1993): no long-term relationship between EU domestic (French) wheat prices and international (US) prices</p> <p>After the Mac Sharry reform (1993): robust long-term relationship between EU domestic (French) wheat prices and international (US) soft wheat price</p> <p>However, the paper makes no clear distinction between the effects attributable to CAP reform and the effects attributable to trade liberalization reform (see § 3.3)</p>
THOMPSON, S. R., SUL, D. and BOHL, M. T. (2002)	<p>After the Mac Sharry reform:</p> <ul style="list-style-type: none"> • HPT elasticity between EU domestic wheat markets (France, Germany, United Kingdom) and international market is nearly double than in the pre-reform period • Within the EU, domestic wheat markets (France, Germany, United Kingdom) are in spatial equilibrium
THOMPSON, S. R., and BOHL, M. T. (1999)	<p>After the Mac Sharry reform, domestic (German) wheat price volatility increases, while world wheat price volatility decreases</p>

According to the relevant bibliography, the main impacts of CAP reforms on PT in the cereal sector can be summarised as follows:

1. According to one study, **reduction of EU wheat intervention price promoted a convergence** (re-alignment) **of domestic prices towards the international price**. It is worth noting that prior to the Mac Sharry reform (1993) EU domestic prices and intervention price were usually much higher than international wheat price.
2. **Mixed, non-conclusive evidence** emerges from the reviewed literature for what concerns the **effects on HPT proper of CAP reforms alone** (i.e. not considering policy changes linked to trade liberalization reforms: see § 3.3). One study detects significant increases in HPT elasticity coefficients, whose levels remain however quite low, and hence very far from full HPT.

3. One study dealing with **HPT within the EU** finds that some important **domestic wheat markets** (France, Germany, United Kingdom) **were in spatial equilibrium after the Mac Sharry reform**.

8.3 Impacts of trade liberalization reforms on price transmission in the cereal sector

The findings of the most significant studies on this specific issue are outlined in table 8.2 below.

Table 8.2 – Trade liberalization reforms and price transmission in the cereal sector: main findings of relevant literature

Paper	Relevant findings
LISTORTI G. (2009)	WTO formation: tariffication of variable import levy + “capping” of import entry price (max 155% of intervention price) + reduction of export subsidies => increase in HPT elasticity , but full HPT still not in place
BARASSI, M. R. and GHOSHRAI, A. (2007)	The paper makes no clear distinction between the effects attributable to trade liberalization reform and the effects attributable to CAP reform (see § 3.2)
THOMPSON, S. R., SUL, D. and BOHL, M. T. (2002)	After WTO formation, HPT elasticity between EU domestic wheat markets (France, Germany, United Kingdom) and international market increases remarkably with respect to pre-WTO period
THOMPSON, S. R., and BOHL, M. T. (1999)	After WTO formation, long-term HPT elasticity increases remarkably with respect to pre-WTO period

According to the relevant bibliography, the main impacts of trade liberalization reforms on PT in the cereal sector can be summarised as follows:

1. Most studies detect **remarkable improvement of HPT between EU domestic markets and the international market after the formation of WTO**.
2. However, according to the most recent literature, **full HPT between EU domestic markets and the international market is not yet in place**.

8.4 Horizontal price transmission in the sugar sector: evolution of the relevant variables and results of the econometric tests

8.4.1 Evolution of the relevant variables

It is important to underline that the time series which underwent econometric testing are updated to the end of 2011; as a consequence, **the assessment does not cover possible effects of ex-works price increases occurred in the first months of 2012**. Indeed, the average EU ex-works sugar price has remarkably increased over the first months of 2012 in comparison with late 2011 levels (711 Euros/T in May 2012 against 654 Euros in December 2011), while LIFFE white sugar price has returned below December 2011 levels after rising between January and March 2012 (see figure 8.2).

Figure 8.2 - Evolution of sugar ex-works price (EU average) vs. evolution of LIFFE white sugar price, 2006-2012

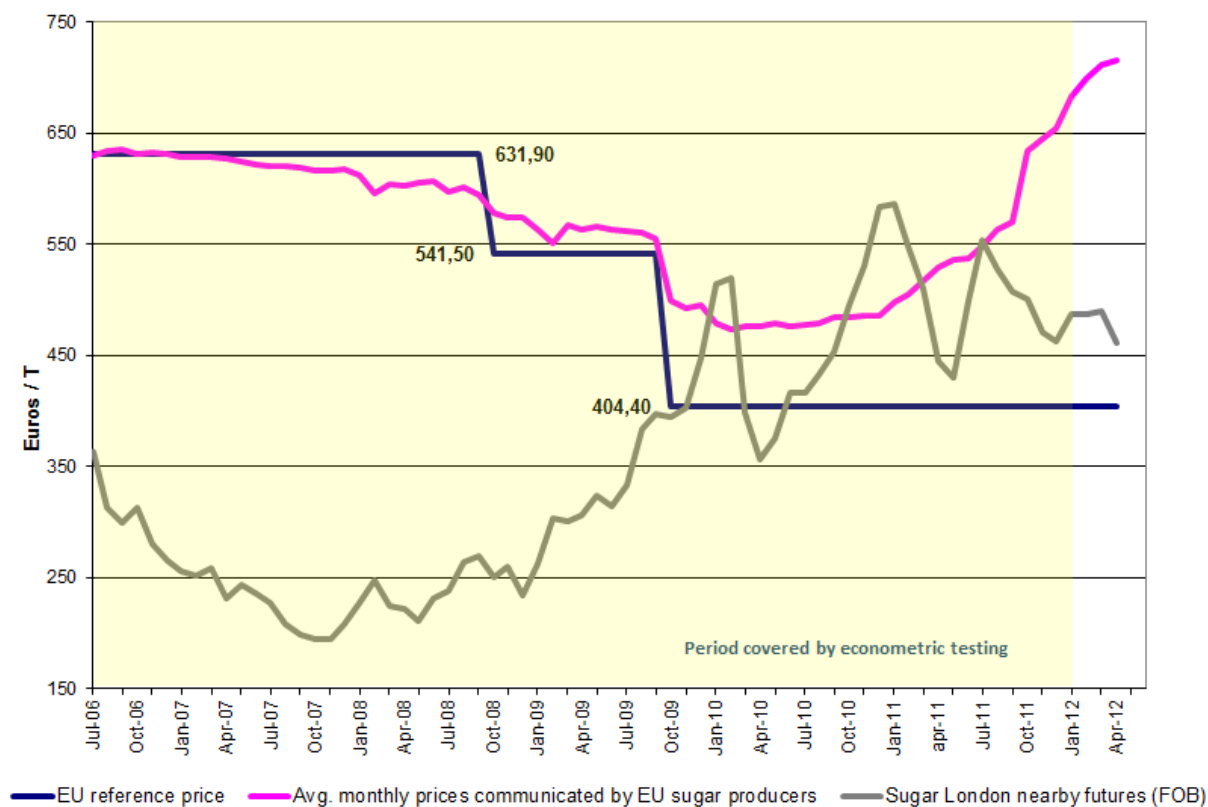
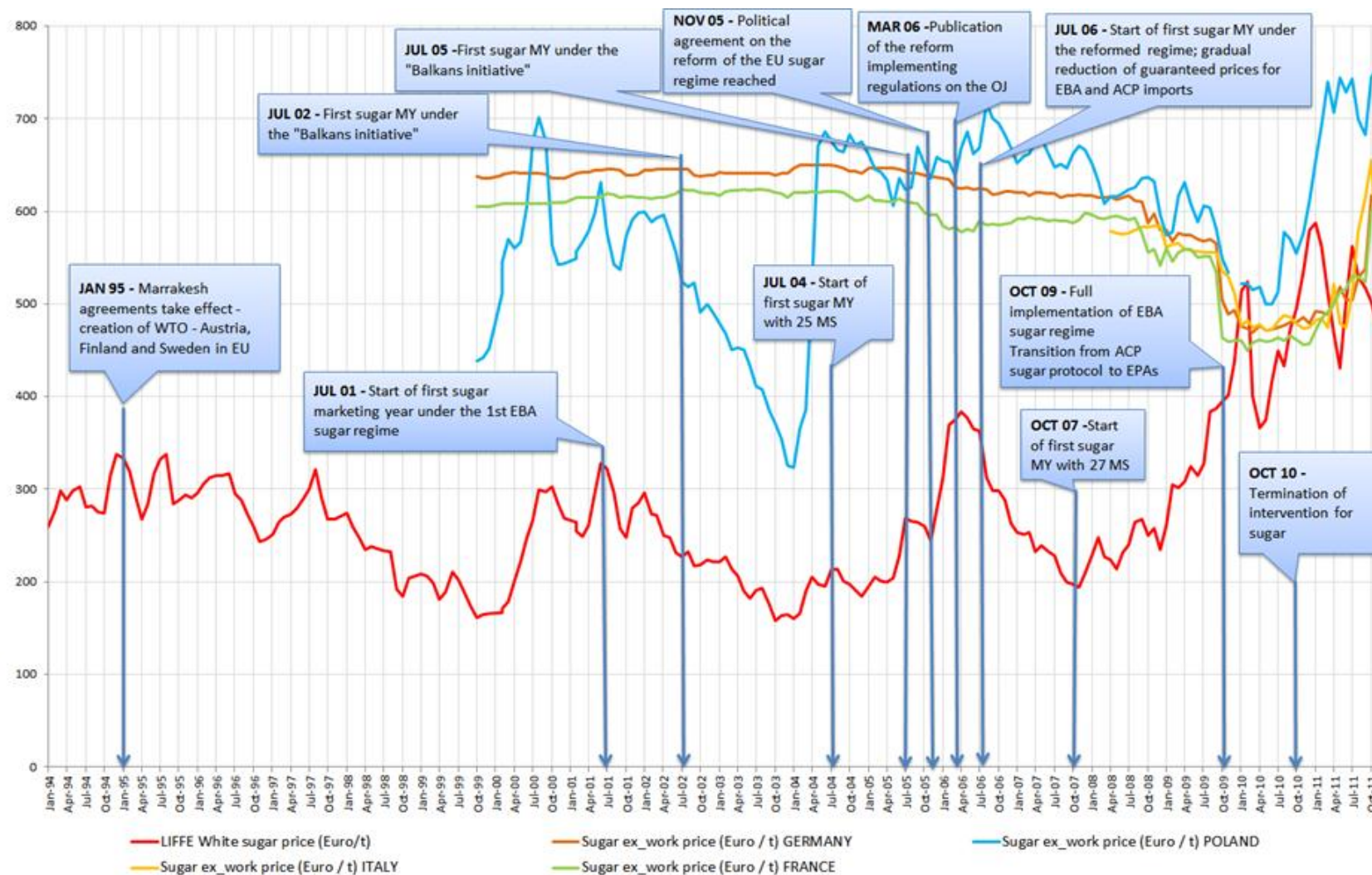


Figure 8.3 illustrates the evolution of the relevant variables (**LIFFE white sugar price; sugar ex-factory price at Member State level⁸²**) over the period considered for the assessment, also highlighting a number of important events which can have determined changes in the emerging trends.

⁸² Due to confidentiality reasons, the present reports features no graphs or tables describing the dynamics of sugar ex-works price series in Member States with less than three sugar producers in activity in at least one MY within the time span considered for the analysis.

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Figure 8.3 – Evolution of D/F/ IT/PL ex-works sugar price and LIFFE white sugar price (absolute value, Euro/t)

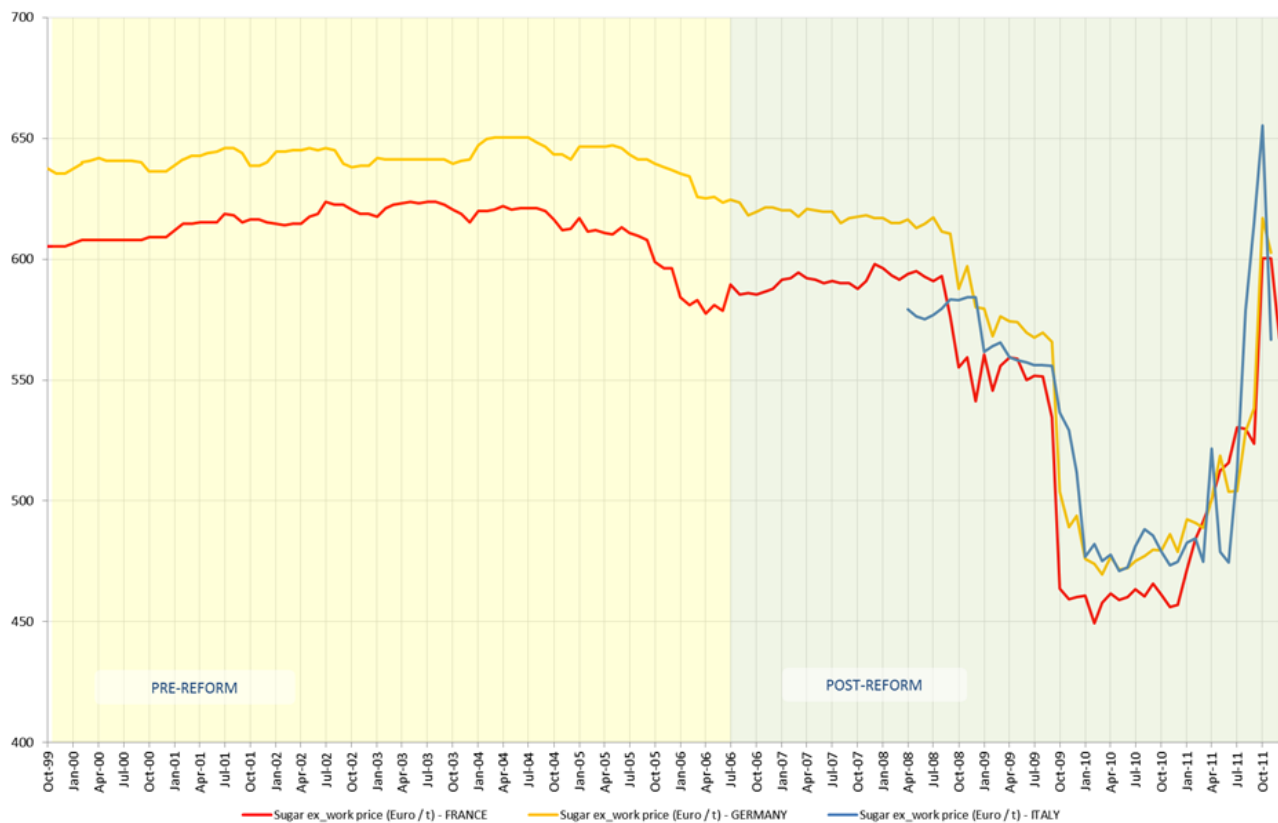


From the graph at figure 8.3 above it can clearly be seen that:

1. EU domestic prices stayed well above LIFFE white sugar price for all the pre-reform period and for the first two marketing years (MY) after the 2006 reform.
2. A process of convergence between EU domestic prices and LIFFE white sugar price become evident after the 2006 reform, and sharply accelerated after the full implementation of EBA initiative for sugar and the transition from ACP Sugar Protocol to EPAs (October 2009).
3. During the price rallies on international markets of 2010 and 2011, EU domestic prices stayed for some months below the level of LIFFE white sugar price.

Figure 8.4 instead describes the evolution of **sugar ex-works prices in a selection of Member States**⁸³ considered for assessing HPT between different domestic markets within the EU.

Figure 8.4 – Evolution of sugar ex-works prices in France, Germany and Italy, 2000-2011



⁸³ Due to confidentiality reasons, the present reports features no graphs or tables describing the dynamics of sugar ex-works price series in Member States with less than three sugar producers in activity in at least one MY within the time span considered for the analysis.

At a first glance, the dynamics of ex-works prices in the Member States at figure 8.4 seem to be somehow related.

An analysis of the post-reform **changes in the structure of sugar import flows** in Germany, France and Spain (table 8.3) can provide useful empirical evidence for interpreting the evolution of HPT between their domestic markets. Such analysis showed that:

- France has kept to be the reference foreign supplier of Germany also after the reform;
- the mix of foreign suppliers of France changed radically after the reform, with Germany losing its pre-reform role of leading supplier;
- drastic changes in the mix of foreign suppliers of Spain occurred after the reform, and especially after full implementation of EBA initiative and transition from ACP sugar protocol to EPAs (October 2009); in particular, the weight of France as leading foreign supplier greatly decreased.

Table 8.3 – Evolution of the structure of sugar import flows (two-year averages) of Germany, France and Spain before and after the reform*

Member state	Average 2003/2004				Average 2007/2008				Average 2010/2011			
	Rank	Origin	Imports (T)	% share on total	Rank	Origin	Imports (T)	% share on total	Rank	Origin	Imports (T)	% share on total
Germany	1	France	215.613	53,2%	1	France	273.588	49,9%	1	France	256.552	54,0%
	2	Belgium	52.581	13,0%	2	Netherlands	59.913	10,9%	2	Poland	56.428	11,9%
	3	Poland	32.729	8,1%	3	Poland	57.518	10,5%	3	Netherlands	46.508	9,8%
	4	Netherlands	22.941	5,7%	4	Belgium	29.454	5,4%	4	Belgium	30.579	6,4%
		TOP-4	323.864	79,8%		TOP-4	420.472	76,7%		TOP-4	390.067	82,2%
		ALL	405.602	100,0%		ALL	548.223	100,0%		ALL	474.801	100,0%
France	1	Germany	75.351	41,6%	1	Spain	77.538	31,2%	1	Spain	80.052	26,6%
	2	Belgium	48.352	26,7%	2	Germany	57.038	23,0%	2	Germany	76.081	25,3%
	3	Netherlands	39.544	21,9%	3	United Kingdom	39.772	16,0%	3	Mauritius	46.481	15,5%
	4	Ivory Coast	5.022	2,8%	4	Belgium	28.886	11,6%	4	Belgium	29.775	9,9%
		TOP-4	168.269	93,0%		TOP-4	203.235	81,8%		TOP-4	232.388	77,3%
		ALL	180.915	100,0%		ALL	248.386	100,0%		ALL	300.560	100,0%
Spain	1	France	233.677	57,1%	1	France	356.567	63,6%	1	France	232.335	46,1%
	2	Germany	72.476	17,7%	2	Portugal	99.375	17,7%	2	Portugal	127.555	25,3%
	3	Portugal	29.021	7,1%	3	Germany	33.354	5,9%	3	Mauritius	41.846	8,3%
	4	United Kingdom	23.107	5,7%	4	United Kingdom	20.125	3,6%	4	Germany	39.492	7,8%
		TOP-4	358.280	87,6%		TOP-4	509.420	90,9%		TOP-4	441.227	87,5%
		ALL	408.918	100,0%		ALL	560.635	100,0%		ALL	504.350	100,0%

Source: Areté elaboration of EUROSTAT-COMEXT data

* = 6-digits HS code 17 01 99 “Cane or beet sugar and chemically pure sucrose, in solid form (excluding cane and beet sugar containing added flavouring or colouring and raw sugar)”

8.4.2 Results of the econometric tests

The results of the econometric tests carried out for a selection of Member States are illustrated in table 8.4 (HPT between international sugar market and EU domestic markets), and table 8.5 (HPT between different domestic markets within the EU).

Tables report:

- the detail of the results for each of the subsamples considered in the assessment: pre-WTO; post-WTO / pre-reform (timing hypotheses 1, 2, and 3 - see § 8.1); post-reform (timing hypotheses 1, 2, and 3 - see § 8.1);
- the overall result for each subsample.
- a summary of results, divided into “Pre-WTO”, “Post-WTO / Pre-reform” and “Post-reform” periods.

The econometric tests carried out were aimed at detecting the presence of the following types of relation between the concerned prices:

1. long-term relations (cointegration), which can be transmitted in the short-term (or not) and can be economically meaningful (or not);
2. short-term transmission relations and convergence relations.

In the short term, both transmission and convergence relations can be present, with the ones prevailing more or less clearly on the others. These relations can be more or less stable across the three timing hypotheses considered.

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Table 8.4 - HPT between international sugar market and EU domestic markets: results of the econometric tests

Period*	Type of relation**	Member States					
		France	Germany	United Kingdom	Italy	Spain	Poland
Pre-WTO	Long term rel.	n/a	NO	NO	NO	n/a	n/a
	Short term rel.	n/a	T(1) > C(8)	C(4-9)	C(7)	n/a	n/a
	Overall result	n/a	Transmission	Convergence	Convergence	n/a	n/a
Post-WTO / Pre-reform (1)	Long term rel.	NO	YES	NO	n/a	NO	NO
	Short term rel.	NO	C(4)	NO	n/a	NO	NO
	Overall result	No clear relation	Convergence	No clear relation	n/a	No clear relation	No clear relation
Post-WTO / Pre-reform (2)	Long term rel.	NO	YES	NO	n/a	NO	NO
	Short term rel.	C(1)	C(4)	C(6)	n/a	NO	NO
	Overall result	Convergence	Convergence	Convergence	n/a	No clear relation	No clear relation
Post-WTO / Pre-reform (3)	Long term rel.	NO	NO	NO	n/a	NO	NO
	Short term rel.	C(4)	C(4)	C(6)	n/a	NO	NO
	Overall result	Convergence	Convergence	Convergence	n/a	No clear relation	No clear relation
Post-reform (1)	Long term rel.	NO	NO	NO	n/a	NO	NO
	Short term rel.	C(2-5-8) > T(3)	C(2)	C(2)	n/a	NO	T(3)
	Overall result	Convergence	Convergence	Convergence	n/a	No clear relation	Transmission
Post-reform (2)	Long term rel.	NO	NO	NO	n/a	NO	NO
	Short term rel.	C(2-5) > T(3)	C(2)	C(2)	n/a	NO	T(3)
	Overall result	Convergence	Convergence	Convergence	n/a	No clear relation	Transmission
Post-reform (3)	Long term rel.	NO	NO	NO	NO	NO	NO
	Short term rel.	C(2-5-8) > T(3)	C(2)	NO	C(2-5-8)	NO	NO
	Overall result	Convergence	Convergence	No clear relation	Convergence	No clear relation	No clear relation
Summary of results	<i>Pre-WTO</i>	n/a	Short-term transmission	Short-term convergence (stable)	Short-term convergence (stable)	n/a	n/a
	<i>Post-WTO / Pre-reform</i>	Short-term convergence (slightly unstable)	Long-term relation (slightly unstable) + short-term convergence (stable)	Short-term convergence (slightly unstable)	n/a	No clear relation	No clear relation
	<i>Post-reform</i>	Short-term convergence (slightly unstable)	Short-term convergence (stable)	Short-term convergence (slightly unstable)	Short-term convergence (stable)	No clear relation	Short-term transmission (slightly unstable)

* Period: Post-WTO / Pre-reform (1), (2), (3) and Post-reform (1), (2), (3) = timing hypotheses 1 (Nov 2005), 2 (Mar 2006), 3 (Jul 2006)

** Short term rel.: T(1) or C(1) = transmission relation at lag 1 or convergence relation at lag 1; C(2-5-8) > T(3) = convergence relations at lags 2, 5 and 8 prevail over transmission relation at lag 3

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Table 8.5 - HPT between different domestic markets within the EU: results of the econometric tests

Period*	Type of relation*	Relation between (Member States involved)						
		Germany => France	France => Germany	Netherlands => Belgium	Belgium => Netherlands	France => Italy	Germany => Italy	France => Spain
Pre-WTO	Long term rel.	n/a	n/a	n/a	n/a	n/a	NO	n/a
	Short term rel.	n/a	n/a	n/a	n/a	n/a		n/a
	Overall result	n/a	n/a	n/a	n/a	n/a	No transmission	n/a
Post-WTO / Pre-reform (1)	Long term rel.	NO	NO	n/a	n/a	NO	NO	NO
	Short term rel.	T(2-4)	NO	n/a	n/a			T(3)
	Overall result	Transmission	No transmission	n/a	n/a	No transmission	No transmission	Transmission
Post-WTO / Pre-reform (2)	Long term rel.	NO	NO	n/a	n/a	n/a	n/a	NO
	Short term rel.	T(2-4)	T(1)	n/a	n/a	n/a	n/a	T(1-3-4-7)
	Overall result	Transmission	Transmission	n/a	n/a	n/a	n/a	Transmission
Post-WTO / Pre-reform (3)	Long term rel.	NO	NO	n/a	n/a	n/a	n/a	NO
	Short term rel.	T(4)	T(5)	n/a	n/a	n/a	n/a	T(1)
	Overall result	Transmission	Transmission	n/a	n/a	n/a	n/a	Transmission
Post-reform (1)	Long term rel.	NO	NO	n/a	n/a	n/a	n/a	NO
	Short term rel.		T(9)	n/a	n/a	n/a	n/a	
	Overall result	No transmission	Transmission	n/a	n/a	n/a	n/a	No transmission
Post-reform (2)	Long term rel.	NO	NO	n/a	n/a	n/a	n/a	NO
	Short term rel.		T(9)	n/a	n/a	n/a	n/a	
	Overall result	No transmission	Transmission	n/a	n/a	n/a	n/a	No transmission
Post-reform (3)	Long term rel.	NO	NO	NO	NO	No elaboration because of non-stationary time series	No elaboration because of non-stationary time series	NO
	Short term rel.		T(9)		T(2-5-6-7-8)			
	Overall result	No transmission	Transmission	No transmission	Transmission			No transmission
Summary of results	Pre-WTO	n/a	n/a	n/a	n/a	n/a	No transmission	n/a
	Post-WTO / Pre-reform	Short-term transmission (slightly unstable)	Short-term transmission (slightly unstable)	n/a	n/a	No transmission	No transmission	Short-term transmission (slightly unstable)
	Post-reform	No transmission	Transmission	No transmission	Transmission	No elaboration because of non-stationary time series	No elaboration because of non-stationary time series	No transmission

* Period: Post-WTO / Pre-reform (1), (2), (3) and Post-reform (1), (2), (3) = timing hypotheses 1 (Nov 2005), 2 (Mar 2006), 3 (Jul 2006)

** Short term rel.: T(2-4) = transmission relations at lags 2 and

8.5 Empirical assessment of impacts of CAP reforms on price transmission in the sugar sector

8.5.1 Horizontal price transmission between the international sugar market and EU domestic markets

According to the findings of the preliminary theoretical assessment of the reformed sugar regime, changes relating with the “domestic dimension” of CAP reforms in the sugar sector (i.e. changes not concerning import regulation) should contribute to influence HPT between the EU market and the international market only in combination with improved access to the EU for sugar produced in third countries, which is expected to play a major role.

In the timeline of relevant policy events, 2006 reform of the sugar regime is preceded and followed by some important events clearly concerning trade liberalization reforms:

- Pre-reform events: WTO formation (January 1995); entry in force of the EBA initiative in the sugar sector (July 2001); entry in force of the “Balkans initiative” in the sugar sector (July 2002) and of its subsequent reform (July 2005).
- Post-reform events: full implementation of the EBA sugar regime and transition from the ACP sugar protocol to EPAs (October 2009).

From the evidence presented at § 8.4.1 (see in particular figure 8.3) it is quite clear that the process of convergence of ex-works sugar prices at Member State level towards LIFFE white sugar price became evident in the wake of the 2006 reform (early 2006), gained momentum between 2008 and 2009, and took a brisk pace after October 2009. During the LIFFE price rallies of 2010 and 2011, ex-works sugar prices in the EU even stayed under the LIFFE price for some months.

The econometric tests performed (see § 8.4.2, table 8.4) show that the process of convergence was already under way before the reform in a number of Member States (France, Germany and United Kingdom among them), and confirm its acceleration after the reform, when it also became more widespread (sometimes convergence and transmission are both present, but the former prevails on the latter). On the contrary, prevalence of PT between EU domestic markets and sugar international market represents an exception both before the reform (it was detected in Germany, Belgium and the Netherlands only) and after the same (it was detected in Portugal and in some NMS: Poland, Hungary and especially Romania⁸⁴).

The monthly frequency of data series available for econometric tests (limited number of observations) does not allow optimal assessment of HPT in the period after the 2006 reform but before October 2009 (full implementation of EBA and ACP/EPA transition), i.e. in the period where the “CAP reform” alone could have had an influence on HPT, with limited “interference” from the influence of trade liberalization reforms. However, whenever the “statistical” (policy-unrelated) breaks considered for some Member States fall before October 2009, transmission is rarely present in the period before the breaks themselves, and prevails over convergence in Romania only⁸⁵; convergence is instead often detected, and prevails over transmission (with the sole exception of Romania).

Summarising, the results of the empirical assessment of the impacts of “CAP reforms” on HPT between the international sugar market and EU domestic markets suggest that changes concerning reduction of price support and promotion of reduction of production quota in the framework of the 2006 reform of the sugar regime mainly played a role in **promoting the process of convergence of EU ex-works sugar prices towards LIFFE white sugar price, by removing important constraints to variation of EU domestic prices**. Such result is in line with the findings of the preliminary theoretical assessment.

⁸⁴ It is worth noting that in Portugal and Romania the sugar refining sector – which is strongly linked with the international market - plays an important role in supplying sugar to the domestic market.

⁸⁵ It must anyway be underlined that Romania was a third country (and hence not subject to the EU sugar regime) for all the pre-reform period.

8.5.2 *Horizontal price transmission between domestic markets within the EU*

HPT within the EU was investigated by testing the presence of relations between a number of pairs of neighbouring Member States (see § 8.4.1, and in particular figure 8.4, and § 8.4.2, table 8.5). The presence of a bidirectional HPT relation (slightly unstable) was detected in one case in the pre-reform period, between Germany and France. In the pre-reform period also a unidirectional HPT relation was detected, from France (leader) to Spain (follower).

When testing the relations between the above pairs by considering “statistical” (policy-unrelated) breaks falling before October 2009 (i.e. in the period where the “CAP reform” alone could have had an influence on HPT, with limited “interference” from the influence of trade liberalization reforms), the aforementioned unidirectional HPT relations hold.

A plausible implication of the above evidence is that **policy changes pertaining to the “domestic dimension” of the 2006 reform did not alter significantly the existing HPT relations**, where this were present.

In the post-reform period, two cases of unidirectional HPT are detected:

1. between France (leader) and Germany (follower);
2. between Belgium (leader) and the Netherlands (follower).

Unidirectional HPT from France to Spain ceases instead to exist.

The above outcomes should derive from a combination of at least two phenomena:

- a. **Increased weight of imports in the domestic supply** (due to reduction of national production, promoted by the 2006 reform, and improved access to the EU market; see § 7.2.2 and 8.6); this was often combined with increased geographical diversification of sources, or anyway with changes in the mix of foreign suppliers (both EU and extra-EU ones) and in their relative importance (see § 8.4.1, table 8.3). Consideration of this phenomenon can be especially useful in explaining the post-reform evolution of HPT between France and Spain.
- b. **Structural evolution of the EU sugar sector in the post-reform period** (see § 7.2): indeed trans-national merger & acquisition operations (takeover of Spanish Azucarera Ebro by UK-based multinational group ABF-British Sugar in April 2009 is especially important in our case) and formation (June 2006) and termination (January 2010) of the Eurosugar international marketing alliance between France’s Sucre Union and Germany’s Nordzucker Group very likely played an important role in altering existing HPT linkages between specific pairs of Member States.

8.6 *Empirical assessment of impacts of trade liberalization reforms on price transmission in the sugar sector*

8.6.1 *Horizontal price transmission between the international sugar market and EU domestic markets*

The preliminary theoretical assessment of the reformed sugar regime concluded that all policy changes concerning regulation of imports are expected to play a major role in influencing HPT.

Evidence from § 8.4.1 indeed suggests that the decisive steps in the process of convergence between domestic ex-works sugar prices and LIFFE white sugar price occurred after full implementation of the EBA sugar regime and transition from the ACP sugar protocol to EPAs (October 2009), while possible impacts of prior trade liberalization reforms concerning the EU sugar sector (WTO formation; launch of EBA and “Balkans” EU initiatives) appear to be – if actually present – certainly not very evident.

As we already underlined at § 8.5, the results of the econometric tests performed basically confirm the above interpretation; it is hence plausible to conclude that **trade liberalization reforms played an important role in promoting the acceleration of the convergence process after October 2009**. It is anyway worth underlining that the “domestic dimension” of the 2006 reform of the sugar regime played a significant role in getting the

convergence process started (see § 8.5.1), and helped to create the conditions for the granting of improved access to imported sugar.

It is however important to consider adequately that constraints deriving from the monthly frequency of the available data did not allow econometric testing of HPT relations in the November 2009 / December 2011 period (the number of observations was not sufficient to grant reliable results): the importance of full implementation of EBA initiative and of transition to EPAs for ACP sugar in accelerating convergence of EU domestic prices towards international sugar prices can actually only be derived from the conclusions concerning the role of the “domestic side” of the 2006 reform (see § 8.5.1).

8.6.2 Horizontal price transmission between domestic markets within the EU

Impossibility of performing econometric testing of HPT between Member States within the EU in the November 2009 / December 2011 period had implications also on the assessment of the role played by trade liberalization reforms in influencing such relations. In absence of conclusive empirical evidence in this respect, it is nevertheless plausible to derive from the other available elements (see § 8.5.2) that **improved access to the EU market for sugar imports from LDCs and non-LDC ACP countries** combined with the “domestic” side of the 2006 reform (and with the restructuring of the EU sugar sector which the reform contributed to cause) in **altering the pre-reform linkages existing between adjacent geographical markets**. Indeed, empirical evidence from the analysis of the evolution of sugar import flows in the pre- and post-reform periods (see § 8.4.1, table 8.3) showed that changes in the mix of foreign suppliers (both EU and extra-EU ones) and in their relative importance actually occurred after the reform, and especially after full implementation of EBA initiative and transition from ACP sugar protocol to EPAs (October 2009) in the case of Spain.

It is worth reminding that the EU self-sufficiency ratio for sugar fell from 105-115% pre-reform levels to 80-90% in the post-reform period, and that the share of imports on EU internal use for human consumption increased from 19-21% in the pre-reform period to 24% in the 2010/11 MY (see § 7.2.2, figure 8.9). While in certain cases such additional import flows are probably controlled by EU operators which were already active in specific national markets, in other cases additional imports are likely to be linked to the entry of new operators (based in the EU or in third countries) into those markets: in these latter cases, the existing HPT linkages with neighbouring Member States may have been altered.

8.7 Impact of CAP reforms on price transmission: similarities and differences between the cereal sector and the sugar sector

Reasoned comparison between the results of the assessment in the cereal sector (based on the findings of relevant literature; see § 8.2) and the results of the empirical assessment carried out for the sugar sector (see § 8.5) allow to identify a number of similarities and differences between the two sectors concerning the impacts of CAP reforms on PT.

The main similarities and differences in relation to the type of HPT investigated are outlined in table 8.6 below, also taking into account differences in the regulatory framework for each sector (in *italics* in the table).

Table 8.6 - Impact of CAP reforms on price transmission: cereal sector and sugar sector

Type of horizontal price transmission	Similarities	Differences
EU domestic markets ⇔ international markets	CAP reforms (especially reduction of price support) play a role in promoting convergence between EU domestic prices and international prices (“realignment”).	Convergence process is not concluded yet in the sugar sector (<i>reduction of price support was implemented much later than in the cereal sector; tariff protection from imports is still much stronger than in the cereal sector</i>)

Type of horizontal price transmission	Similarities	Differences
Between different Member States within the EU	CAP reforms alone caused no adverse effects on spatial integration between markets	While CAP reforms in the cereal sector appear to have promoted increased HPT between Member States within the EU, the same effect did not occur in the sugar sector, where existing pre-reform HPT relations ceased 2-3 years after the reform, due to the combined effect of sugar industry restructuring and improved access for sugar imports (<i>constraints still posed by the presence of national production quotas in the sugar sector should also be considered</i>)

8.8 Impacts of trade liberalization reforms on price transmission: similarities and differences between the cereal sector and the sugar sector

Reasoned comparison between the results of the assessment in the cereal sector (based on the findings of relevant bibliography; see § 8.3) and the results of the empirical assessment carried out for the sugar sector (see § 8.6) allow to identify some similarities and differences between the two sectors concerning the impacts of trade liberalization reforms on PT.

The main similarities and differences in relation to the relevant aspects of PT investigated are outlined in table 8.7 below, also taking into account differences in the regulatory framework for each sector (in *italics* in the table).

Table 8.7 - Impact of trade liberalization reforms on price transmission: cereal sector and sugar sector

Type of horizontal price transmission	Similarities	Differences
EU domestic markets ↔ international markets	Trade liberalisation reforms promoted the acceleration of convergence between EU domestic prices and international prices	While in the cereal sector the transition from convergence to an increase in HPT already took place, in the sugar sector convergence still prevails over HPT (<i>mostly because the first effective improvements in access of imports into the EU sugar market were introduced only in October 2009; tariff protection from imports is still substantial in the sugar sector</i>)
Between different Member States within the EU		Increased sugar imports due to improved market access appear to have contributed to the alteration of existing pre-reform HPT linkages between Member States; no evidence in this respect has emerged for the cereal sector

8.9 Answer to the question

First of all, it is essential to underline that the time series which underwent econometric testing are updated to the end of 2011; as a consequence, **the assessment does not cover possible effects of ex-works price increases occurred in the first months of 2012**. Indeed, the average EU ex-works sugar price has remarkably increased over the first months of 2012 in comparison with late 2011 levels (711 Euros/T in May 2012 against

654 Euros in December 2011), while LIFFE white sugar price has returned below December 2011 levels after rising between January and March 2012 (see § 8.4.1). Early 2012 price dynamics would suggest a (possibly temporary) setback in the process of convergence between EU domestic prices and international sugar price promoted by the reform of the sugar regime (see § 8.9.1 and 8.9.2).

8.9.1 Conclusions on the effects resulting from CAP reforms

Similarly to what happened in the cereal sector, empirical evidence suggests that CAP reforms in the sugar sector (i.e. the “domestic side” of the 2006 reform of the EU sugar regime):

- **have played an important role in promoting convergence between EU domestic prices and international prices;**
- **have not altered significantly existing pre-reform HPT relations between neighbouring Member States within the EU.**

However, it must be underlined that CAP reforms concerning the cereal sector have had a much wider period to exert their influence than the policy changes introduced in the sugar regime from the 2006/07 marketing year onwards: as a consequence, the aforementioned **convergence process is still not fully consolidated in the sugar sector**, and the **transition from convergence to HPT proper between EU domestic sugar markets and the international sugar market has not occurred yet**. It is also worth noting that – excluding the case of duty-free access for sugar imported from developing countries – tariff protection for sugar imported from other origins is still substantial, especially if compared with tariff protection applying to food grade wheat imports. (see § 8.9.2).

CAP reforms in the sugar sector do not seem to have promoted – for the moment at least – a widespread and intense HPT between neighbouring Member States within the EU; in the sole case of the relation between France and Germany, stronger unidirectional HPT from the former to the latter has developed after the reform. It has however to be underlined that the evolution of EU sugar industry restructuring (especially for what concerns transnational mergers and acquisitions, and formation / termination of international marketing alliances), increased imports of extra-EU sugar (when controlled by new operators) and changes in the mix of foreign suppliers (both EU and extra-EU ones) also play an important role in this respect (see also § 8.9.2), and can sometimes pose constraints to the achievement of stronger integration between geographical markets within the EU. It goes without saying that significant constraints in this respect are also posed by the operation of a system of national production quotas in the sugar sector.

8.9.2 Conclusions on the effects resulting from trade liberalization reforms

Trade liberalization reforms have accelerated the pace of convergence processes in both the cereal and the sugar sector; however, similarities between the two sectors end here.

The first effective improvements in EU market access for sugar imports were introduced in October 2009 with:

- full implementation of EU EBA initiative (unlimited, duty-free access for sugar imports from LDCs);
- transition from the ACP Sugar Protocol to Economic Partnership Agreements (sugar from non-LDC ACP countries is granted unlimited duty free access to the EU; however, until 2014/15 duty-free access for such imports may be suspended when particular conditions apply).

It is hence evident that trade liberalization reforms in the cereal sector have had a longer time span to exert their influence; as a consequence, while in the cereal sector the transition from convergence to an increase in horizontal price transmission between EU domestic markets and international markets already took place, in the sugar sector **convergence between EU domestic sugar price and international sugar price still prevails over price transmission proper**. As already mentioned at § 8.9.1, it is however important to consider that

tariff protection in the sugar sector is still set at levels which can effectively discourage non-preferential imports of sugar to the EU, at least in ordinary market conditions.

Coming to horizontal price transmission between Member States within the EU, **increased sugar imports due to improved market access appear to have contributed to the alteration of existing pre-reform linkages**, together with restructuring of the EU sugar sector (see in this respect § 7.9.1), while no similar outcome appears to have occurred in the cereal sector.

In any case, it is important to underline that **constraints deriving from the monthly frequency of the available data** did not allow econometric testing of horizontal price relations in the November 2009 / December 2011 period (the number of observations was not sufficient to grant reliable results). This constitutes a **limitation in the validity of the empirical assessment of the role played by the most recent trade liberalization reforms in the sugar sector in influencing horizontal price transmission**: in absence of solid empirical evidence, conclusions in this respect can actually only be derived from the conclusions concerning the role of the “domestic side” of the 2006 reform (see § 7.9.1).

SECTION D - CONCLUSIONS

9 Conclusions

Even if the reformed EU sugar regime was not explicitly designed to have specific effects on price transmission in the sugar sector, improvements in this respect were among the expectations of policymakers, as a consequence of the elimination/reduction of constraints to more free-floating domestic sugar prices.

The preliminary theoretical assessment of the new market rules in the sugar sector (§ 4) highlighted the possible influence of specific policy changes on price transmission; in particular:

- **Reduction of price support and termination of intervention** removed existing constraints to price variation within the EU, thus promoting **more favourable conditions for the functioning of price transmission**.
- **Improvement of market access for sugar imports** (mainly linked to full implementation of EBA initiative and to transition from the ACP sugar protocol to the EPAs) promoted **stronger integration between the EU domestic markets and the international market, fostering the process of convergence** between the respective prices.

Furthermore, policy changes introduced with the reform put additional emphasis on pursuing scale economies via external growth and rationalisation of production capacity; **effects on concentration and competition in the sugar sector** could hence be expected, and such effects could in turn **influence price transmission along the sugar supply chain**.

The assessment carried out to answer the three study questions provided empirical evidence which partly confirmed actual occurrence of the expected effects of the reform on price transmission in the sugar sector.

Evidence from **question 1** (§ 6.4) showed that the three-step reduction of sugar intervention price and the subsequent termination of intervention purchases did not fully translate in a decrease of ex-works sugar prices in the EU. Furthermore, as retail prices have often tended to follow upward variations in ex-works prices, but have mostly failed to do so in case of decreases (asymmetric price transmission), the **distance in absolute terms between ex-works and retail prices of sugar in the EU has tended to increase over time**. Assuming that “in an ‘efficient’ market any change in the institutional price of sugar would be reflected in a corresponding change in the retail price of sugar”⁸⁶, the empirical evidence stemming from the assessment suggests that – **despite some significant steps made in this direction – the EU sugar market after the reform is still quite far from having achieved complete efficiency**.

Evidence from **question 2** (§ 7.4) confirmed that the reform contributed to promote an **acceleration of the on-going process of concentration of the sugar industry**, at both national and EU level. As for effects of the reform on competition within the sugar sector, the results of an assessment based on a synthetic index of competition (Adjusted Lerner Index) would suggest the possible presence of a trend towards a higher degree of competition in the sugar sector following the reform; however, limitations stemming from the use of such index⁸⁷, and further developments in the evolution of concentration and competition in the EU sugar sector

⁸⁶ Definition of “efficient sugar market” adopted in the *Study on price transmission in the Agro-Food Sector* for European Commission – Agriculture DG, Agra CEAS Consulting Ltd, 2003.

⁸⁷ If it is true that the Adjusted Lerner Index (ALI) constitutes a synthetic index of the degree of competition which takes into account also the effect of increased sugar imports (and hence of the possible entry of new operators on the EU market), it is however also true that it cannot adequately represent the many qualitative aspects which may determine actual competition within the EU sugar sector. An additional limitation of the ALI lies in the fact that it does not allow measurement of the actual degree of competition, but just an appreciation of its dynamics over time. In particular, the ALI does not allow to understand whether the evolution of competition is mainly driven by variations in sugar price or in sugar production cost.

occurred in the first months of 2012, would lead to conclude that **EU sugar producers are again exerting remarkable market power**. Econometric tests showed that variations of the Adjusted Lerner Index had **short-term effects on consumer prices of sugar and sugar-containing products** in a number of cases, both before and after the reform; however, the overall picture of such effects is **extremely varied and heterogeneous, and does not allow to identify notable trends or similarities**.

Finally, evidence from **question 3** allowed to identify some similarities - but also some significant differences - between the sugar sector and the cereal sector concerning the influence of CAP reforms and of trade liberalization reforms on horizontal price transmission between the EU domestic markets and the international market. **Similarly to what happened in the cereal sector, CAP reforms in the sugar sector** (i.e. the “domestic side” of the 2006 reform) **have played an important role in promoting convergence between EU domestic prices and international prices**. However, CAP reforms concerning the cereal sector have had a much wider period to exert their influence: as a consequence, the convergence process is still not fully consolidated in the sugar sector, and the **transition from convergence to price transmission proper between EU domestic sugar markets and the international sugar market has not occurred yet**. **Trade liberalization reforms have accelerated the pace of convergence processes in both the cereal and the sugar sector**; however, due to the different length of the post-reform period for the two sectors, in the cereal sector the transition from convergence to improved horizontal price transmission between EU domestic markets and international markets has already taken place, whereas **in the sugar sector convergence between EU domestic sugar price and international sugar price still prevails over price transmission proper**. In this respect it is however important to note that – excluding the case of duty-free access for sugar imported from developing countries - tariff protection for sugar imported from other origins is still substantial, especially if compared with tariff protection applying to food grade wheat imports.

The above findings allow to draw some **general conclusions on the effects of the reform of the EU sugar regime on price transmission in the sugar sector**:

1. The **reform has contributed to improve the conditions for the functioning of price transmission** (and especially of horizontal price transmission between EU domestic markets and the international market), **by removing some remarkable constraints to free variation of domestic sugar prices**. In other terms, it promoted the start of a process which might lead (in combination with other non-policy developments) to improved price transmission in the EU sugar sector⁸⁸.
2. Despite significant progress made in the six years which have passed since the implementation of the reform, the **expected effects of policy changes on vertical and horizontal price transmission in the sugar sector have occurred only in part**. The comparison with the cereal sector actually highlighted that the relevant processes (and especially the transition from convergence between EU domestic prices and international price to horizontal price transmission proper between the concerned markets) need time to produce their effects.
3. **Changes in the EU sugar regime are probably not sufficient to promote full price transmission along the entire sugar supply chain** (i.e. down to the final consumption stage) **without the contribution of changes in other policies and of favourable non-policy developments**. Actually the functioning of vertical price transmission in the sugar sector is remarkably affected also by the state of competition in the downstream levels of the supply chain (food industry, distribution), over which the EU sugar regime has no direct influence. The evident asymmetry towards price increases highlighted by the assessment, with retail prices reacting to increases in ex-works prices more often than to decreases, implies that operators in the downstream sectors are in a position to adopt such pricing behaviour: it is unlikely that they will change it in absence of any pressure in this respect.

⁸⁸ It is however worth underlining that while short-term price transmission was detected in a significant number of cases, long-term price transmission was rarely found.

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