EU and world agricultural markets: are they more integrated after the Fischler reform?

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Summary

This work assesses the extent to which the Fischler reform of the CAP increased the elasticity of price transmission (EPT) between the world and the European agricultural commodity markets. Commodities considered are soft and durum wheat, corn, feed barley, and butter. Results show that the reform increased ETP for all commodities even though with different magnitude. Before reform implementation (January 2007), the ETP was almost zero (meaning market isolation) for soft wheat, feed barley, and butter, while it was relatively low (0.4) for corn and durum. After January 2007, the EPT increased to almost unity (perfect transmission) for soft wheat and barley, to 0.9 and 0.8 for durum and corn, and to 0.5 for butter, which had historically been amongst the most protected markets by the CAP. The Fischler reform also helped decreasing "transaction cost," especially for soft wheat and feed barley, and, to a lesser extent for butter. However the results are sensitive to the methodology used, the time span considered, and data frequency. Starting from 2007, international commodity markets have been affected by strong perturbations - increased global demand, biofuel production, and agricultural commodity financialization - that translated into price spikes and increased volatility. The implementation of the Fischler reform is likely to have magnified the effects of these factors on price relationships. However, the reform did increase market integration. The case of butter – a commodity that is only marginally affected by speculation and biofuel production – is emblematic. Nevertheless, a better understanding of factors affecting world-European price relationship could be attained through better and more sophisticated econometric techniques or – more likely – a wider and more complete dataset.

Keywords: price transmission elasticity, Fischler reform, structural breaks, agricultural commodity prices
JEL Classification codes: Q11, Q18, O13, C22

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1. INTRODUCTION

The Fischler reform of the Common Agricultural Policy (CAP) was agreed between Member States in 2003 and started to be implemented in 2005-07. The main characteristic of the reform was the progressive introduction of fully decoupled payments to farmers, in order to mitigate trade and market distorting effects of EU policies and re-align European prices to world ones. However, a greater integration of EU markets to the world ones means also a greater exposure of European farmers to price volatility, which can in turn substantially change agriculture's profitability and trigger deep changes in the structure of European agriculture.

Since the late 50s, when the European Union was established and policies in favour of European farmers started, the support evolved in different ways for different products. In the late 60s Common Market Organizations (CMOs) were put in place, each governed by its own basic regulation and governing a particular commodity. The CMOs existed until 2007, when they were formally and substantially unified. Even though different CMOs implied different measures, they all tended to apply the same principles: support the domestic market, protect domestic farmers from imports and favour exports (through subsidies). This system became out-to-date and politically very difficult to defend at the end of the 80s. Europe was overproducing, crops were not being harvested because of overproduction, and European exports were flooding international markets consequently depressing prices. Both the European public opinion and extra-European countries started to heavily criticize European policies. Finally the Union decided to reduce market support measures replacing them with direct payments to farmers, linked to production (MacSharry reform). Between 1993 and 2005 the main channels of support to EU farmers were production-related (coupled or partly coupled) payments. Direct aids replaced market measures because more transparent and less trade and market distorting. Direct payments were still market-distorting since they spurred farmers to maximize production even when market condition would suggest reduce or even cease it. Mainly for this reason the Commission decided, in 2003, to fully decouple payments to farmers from production and the Single Farm Payment (SFP) was put in place. Under the new regime farmers would receive subsidies on the basis of what they have – on average – received during the 2000-2002 period. The aid was guaranteed to farmers irrespective if they produced or not. However they had to fulfil some basic environment and agricultural conditions.

In this context, the aim of this work is to assess whether the price transmission elasticity (PTE, *i.e.* the extent to which world prices are transmitted into domestic markets) from the world market to the European one changed after the implementation of the Fischler reform. This work focuses on corn, soft wheat, durum wheat, feed barley and butter markets. Corn, soft wheat, and feed barley are among the most widely used

agricultural commodities for human consumption and animal feed, while butter and durum wheat have historically been amongst most protected markets.

Data are monthly figures, as in most of the literature on price transmission, from January 1999 to March 2012. Monthly figures have been preferred over weekly since less affected by short-term market turbulences that might affect the long-run relationship between the variables.

The SFP was officially introduced in January 2005 but member states had time until the end of 2006 to implement it. For this reason January 2007 seems to be the ideal date from to discriminate between the before and after reform period and with respect to which investigate changes in price transmission between the world and the domestic market.

In order to measure PTE between world and domestic prices OLS regression methods allowing for structural breaks are applied. World prices are US fob (*free on board*) prices for soft wheat, corn, and barley, Canadian fob prices in the case of durum wheat, and fob Oceania (Australia and New Zealand) export prices in the case of butter. The *a priori* hypothesis is that the full implementation of the Fischler reform represented a structural break in the long-term relationship between world and European prices. In particular the reform is expected to have increased the extent to which world agricultural prices are transmitted to domestic ones. Since already the MacSharry and the Agenda 2000 reforms of the CAP addressed the problem of EU market isolation, I expect to find a certain extent of price transmission – between European and world prices - both before and after the implementation of the Fischler reform. However, I expect a higher value of the PTE after reform. Other than by the Fischler reform, price relationships may have been affected also by other factors such as biofuel production, increased demand, and the progressive financialization of agricultural markets, which have in turn increased prices and price volatility: Headey and Shenggen (2010) provide a good review. Even though it was not possible to take into account all these factors in the analysis, they must be considered when interpreting the results.

This work is structured as follows. Section 2 is about the methodology used, section 3 describes the dataset, section 4 illustrates the main results, and section 5 concludes and gives some hints for potential further research.

2. METHODOLOGY

The *law of one price* (LOP) states that the same good cannot be sold for different prices in different countries at the same time, taking into account exchange rates (Mankiw, 2001), and net of transport costs. The LOP holds in the long run even if it might not hold in the short run. If a particular good – say corn – had different prices in different locations, in would be profitable for arbitrageurs to buy corn where it is less expensive and then sell it in the country where it is more expensive. However, by doing so, the price in the "cheap" market would rise due to increased demand, while price in the "expensive" market would decrease as a consequence of increased supply. Therefore, in the long run, prices in the two markets will converge to the same value. Nevertheless, a *conditio sine qua non* for the LOP to hold is that no prohibitive trade restrictions are in place between the two countries.

A direct consequence of the LOP is that – in the long run – world price signals are fully transmitted to domestic prices. However, this is always true only in theory since in the real world many factors impede a full transmission of price fluctuations across markets. The most important among these factors is trade policies implemented by governments, which are aimed at favouring domestic producers over foreign. Nonetheless, even if no trade policies are in place, the LOP might still not hold since there may be quality differences between the goods sold in the two countries. When it comes to (agricultural) commodities quality differences are very often quite small and therefore goods are treated as homogeneous in this work.

Historically the validity of the LOP has been assessed using the following type of regression (Baffes & Gardner, 2003):

$$p_t^d = \alpha + \beta p_t^w + \varepsilon_t$$

Eq. 1

Where p_t^d and p_t^w are domestic and world prices for a given commodity at time t, α and β are parameters to be estimated and ε_t is the error term. If the LOP holds, then $\alpha + 1 = \beta = 1$ and Eq. 1 becomes: $p_t^d = p_t^w$, which also means that any price differential at time t is white noise.

When variables are expressed in logs, the slope coefficient β can be interpreted as the *elasticity of price transmission* (EPT) that is the extent to which price signals are passed through from world to domestic markets. The EPT can range between 0 (no transmission/market isolation) and 1 (perfect transmission/validity of the LOP). The EPT is defined as the percentage change in the domestic price in response to a one-percent change in the world price (Thompson & Bohl, 1999). The EPT can also be thought as a measure of trade barriers in place between two markets. The intercept can be interpreted as a measure of transaction costs that – since the equation is written in logarithmic form – are thought to be a constant proportion of prices (Listorti, 2009). However, during the time span considered (1999-2012) transaction cost is likely not to have remained constant. Therefore it has been tried to model transaction cost variability by augmenting the model with freight rates data from the US to Rotterdam harbour. However, the inclusion of such a variable did not significantly improved the explanatory power of the model and eventually it was decided to drop it. Freight rates are a positive function of oil prices, and, during the 1999-2012 period, they have been characterized by an upward trend, which only in the very last years matched the path followed by agricultural prices: before the reform the correlation coefficient between freight rates and European prices was indeed negative and not significant, while, only after positive and strongly significant.

Eq. 2 can be estimated through OLS as long as the variables are stationary[1]. If they are not, OLS is still valid as long as they are cointegrated, that is there is a linear combination of the variables that is, indeed, stationary (Engle & Granger, 1987). West (1988) shows that the OLS estimates are asymptotically normal also when only the right-hand side variable is non-stationary.

The main issue here is that – when it comes to agricultural prices – we might be in presence of structural breaks that is exogenous shocks that might permanently change price relationships. Classic examples are policy changes or structural reforms. Such shocks may alter the behaviour of price series and their relationships in different ways. The shock can cause a shift in the mean of the series, the time trend, or the long run relationship.

Choosing break dates *a priori* induces a certain degree of arbitrariness but when one wants to investigate the effect of policy changes and/or structural reforms it is a widely accepted practice. Examples in the literature are many. Baffes and Gardner (2003) examine the degree to which world price signals have been transmitted into domestic prices for some developing countries and ten commodities before and after policy reforms. The countries under study undertook substantial policy reforms during the late 80s and early 90s and the break dates were identified in the reform year. Krivonos (2004) evaluates the impact of coffee sector reforms during late 80s and 90s in the main coffee producing countries. The paper assesses whether the transmission of world price signals into the domestic markets has increased after the implementation of

1. [1] (Weak) stationarity means that the series is characterized by constant mean, variance, and co-variances. That is, after a shock, it tends to return to its long-run equilibrium and do not drift apart.

the reforms. Also in this case cointegration allowing for structural breaks was applied, break dates being chosen on the basis of when the policy change did actually take place. Listorti (2009) introduces policy regime changes while testing for price transmission in international soft wheat markets, with special focus to the European Union and its Common Agriculture Policy. Also in this case breaks are indentified *a priori* on the basis of policy changes but the decision has also been "validated" testing for unit-root in the individual series allowing for structural breaks.

In this work the long-run equation (Eq. 1) is modified in order to take into account a potential structural break corresponding to the month of 2007. Even if in some countries the reform was implemented earlier, it has been decided to choose the beginning of 2007 as breaking date to be sure to capture the effects it might have generated.

Allowing for structural breaks Eq. 1 becomes:

$$p_t^d = \alpha_1 + \beta_1 p_t^w + \alpha_2 D^{fisch} + \beta_2 p_t^w D^{fisch} + \varepsilon_t$$

Eq. 3

Where all variables are expressed in logs. p_t^d and p_t^w are domestic and world prices at time t, and D^{fisch} is a binary variable, which assumes the value 1 if $t > Jan\ 1st, 2007$ and 0 otherwise. The αs are constants representing transaction cost before (α_1) and after $(\alpha_1 + \alpha_2)$ the reform, while the slope coefficients βs are an estimate of the PTE from the world into the domestic price before (β_1) and after $(\beta_1 + \beta_2)$ the reform, and ε_t is the iid error term. The conventional Chow test for structural change is then used to verify that α_2 and β_2 and jointly different from zero.

Previous works (Mela and Canali 2011, and Mela and Canali 2012) used higher frequency data (weekly figures) and cointegration techniques to measure ETP between the world and some selected European agricultural prices. However, after some experimentation, OLS controlling for autocorrelation (the methodology eventually used in this work) proved to be the best way to model price relationships. Moreover monthly figures must be preferred over weekly data since the latter have worse time series properties and are more prone to short-term perturbations, which can, in turn, alter price relationships.

3. DATA

Data used in this work are monthly prices for five major agricultural commodities: soft wheat, corn, durum wheat, barley, and butter. The time span considered is from January 1999 up to March 2012 for a total of 159 observations. Even though older data were available, it has been decided to start from 1999 for two reasons. The first one is the need to express prices in the same currency and euro exchange rates are available only from January 1999, when the euro started to be effectively traded on international monetary markets. The second one is that considering a longer time span would have implied to take into account also the effect of other major reforms of the CAP.

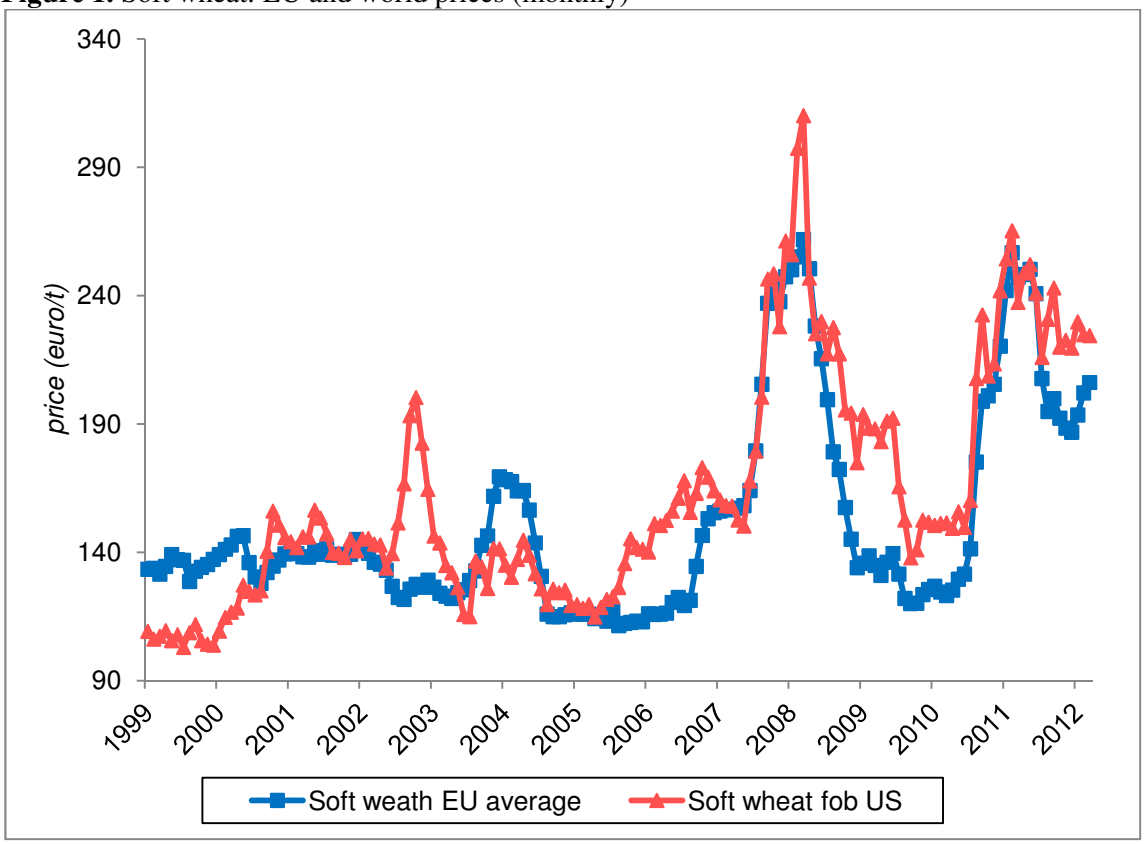
For corn and soft wheat (Hard Red Winter) the US *fob* price at the Gulf of Mexico are considered to be representative of world prices, while for butter the reference price is the fob Oceania export price. Figures are from the FAO international prices database[2]. For feed barley and durum wheat world prices are considered to be the US fob price at Portland harbour and the Canada fob export price respectively. These two series have been kindly provided by the Canadian Market Analysis Division of Agriculture and Agri-

2. [2] http://www.fao.org/economic/est/prices?lang=en

Food Canada. Average European prices (production weighted averages among all 27 member states) are provided by the European Commission[3].

Graphical comparisons between world and European prices are provided by Figures 1, 2, 3, 4, and 5.

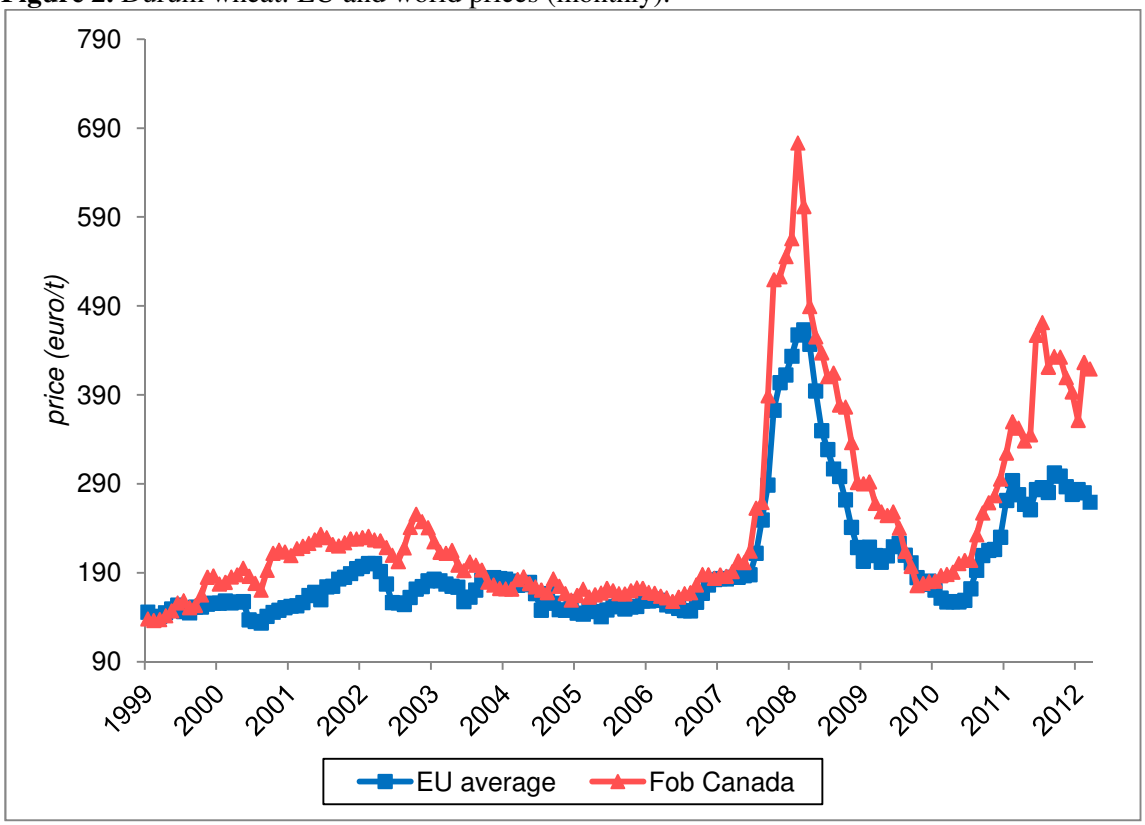
Figure 1. Soft wheat: EU and world prices (monthly)



Source: own elaboration on European Commission and FAO data.

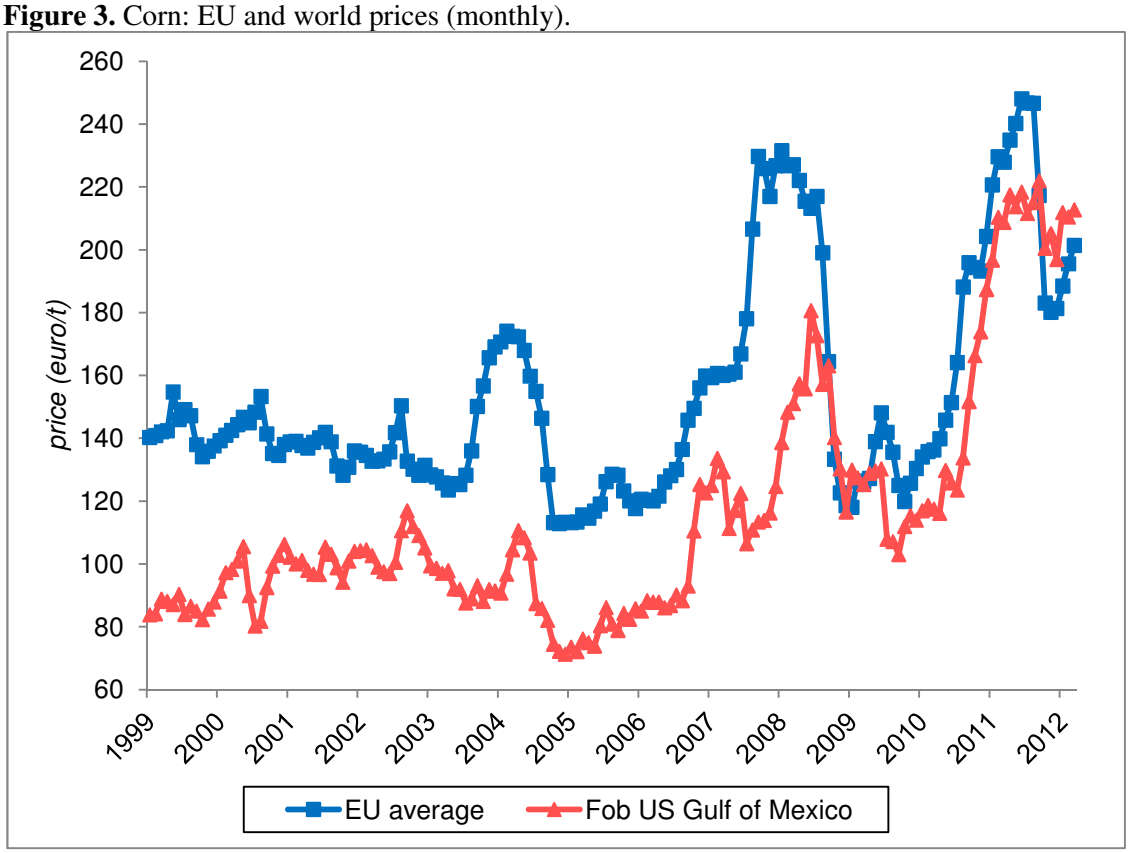
3. [3] http://ec.europa.eu/agriculture/markets/prices/monthly_en.xls

Figure 2. Durum wheat: EU and world prices (monthly).



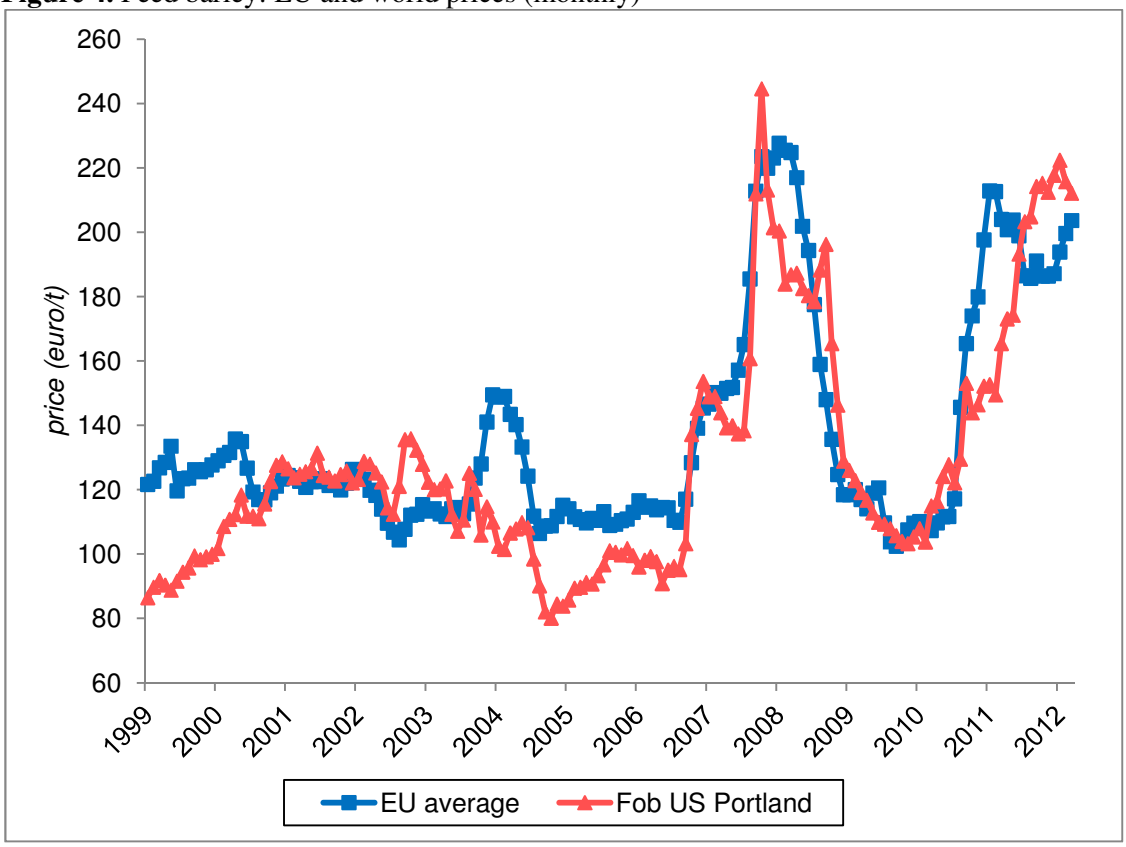
Source: own elaboration on European Commission and Agriculture Canada data.

Figure 3. Corn: EU and world prices (monthly).



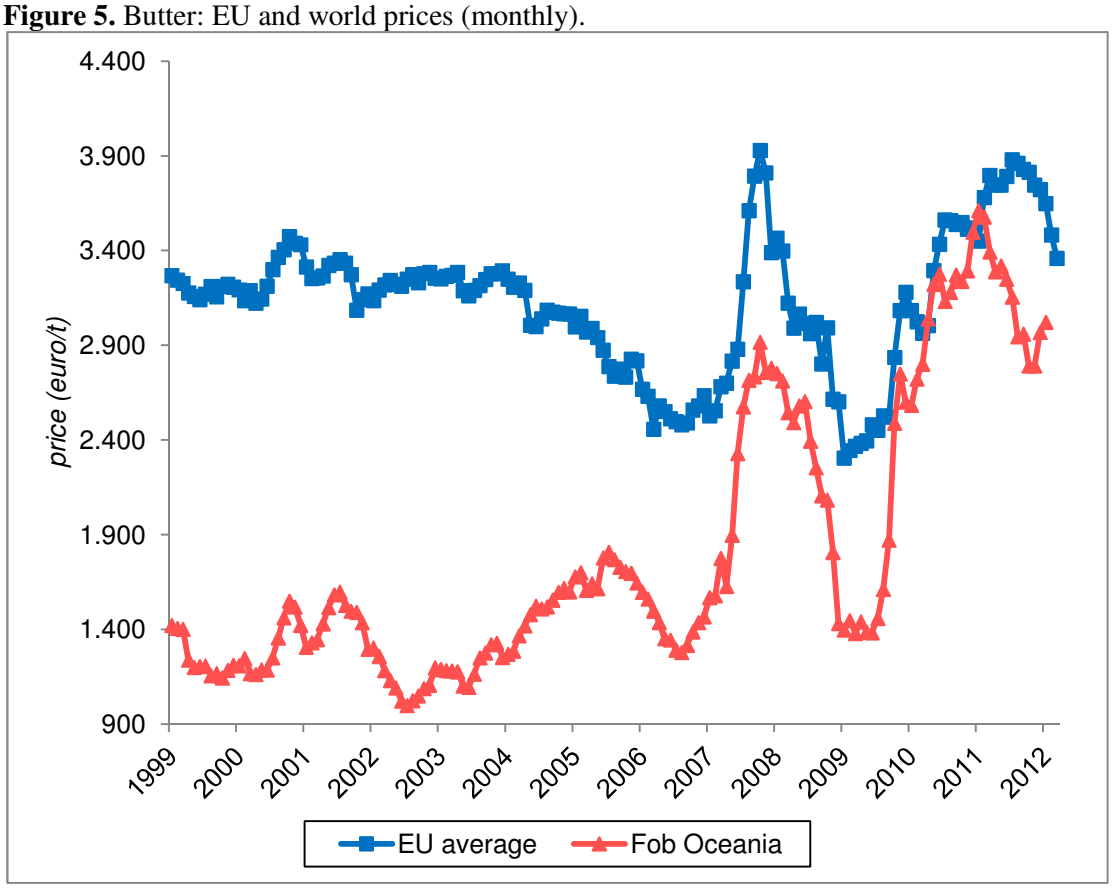
Source: own elaboration on European Commission and FAO data.

Figure 4. Feed barley: EU and world prices (monthly)



Source: own elaboration on European Commission and Agriculture Canada data.

Figure 5. Butter: EU and world prices (monthly).



Source: own elaboration on European Commission and FAO data.

In all cases it is possible to see how world and European prices tend to follow the same path, especially from 2007 onwards, after the Fischler reform was fully implemented. The difference in price patterns before and after 2007 is particularly evident for butter (which had historically been one of the most protected markets), feed barley, and soft wheat. For corn and durum wheat the difference seems to be less relevant. In the case of butter it is clear that, before reform, the European market was isolated from the world one, while for the other commodities it seems that, even if to a lesser extent than after, also before reform a certain degree of co-movement between world and domestic prices was present. For barley and soft wheat, before 2007, the European market seemed to respond to changes in the world price with some lags of delay.

4. RESULTS

The standard Augmented Dickey-Fuller unit root test has been performed on the variables in levels, in order to assess whether they are stationary or not (Table 1). Results show that most of the variables, contrary to what one may expect a priory, are indeed (trend) stationary, even if sometimes at a relatively low significance level (10 percent). The null of unit root has been rejected in all cases, except than for corn and soft what soft wheat prices, in favour of the trend-stationary alternative hypothesis.

Table 1. Augmented Dickey-Fuller test on the variables in logs.

Variable	Costant	Trend	Lags	ADF	Verdict
Wheat EU	Yes***	Yes**	12	-3.23*	Reject
Durum EU	Yes***	Yes**	12	-3.54**	Reject
Corn EU	Yes***	Yes**	11	-3.67**	Reject
Barley EU	Yes***	Yes**	4	-3.39*	Reject
Butter EU	Yes***	No	2	-2.85*	Reject
Wheat US	Yes***	Yes**	10	-2.67	Do not reject
Durum CAN	Yes***	Yes**	10	-3.18*	Reject
Corn US	Yes	Yes*	10	-1.5	Do not reject
Butter AUS	Yes***	Yes***	7	-4.09***	Reject
Barley US	Yes***	Yes***	11	-3.74**	Reject

Source: own elaborations.

*,**,*** denote 10, 5, 1% significance level respectively.

Null hypothesis: unit root.

In the case of durum wheat, barley, and butter, since both the world and the European prices are (trend) stationary, the long-run relationship between world and domestic prices can be safely estimated through OLS, without incurring in the "spurious regression" problem. Conventional statistical measures are inapplicable when all regressors are non-stationary and, on the other hand, cointegration techniques are not appropriate if the variables are integrated of different orders (Baffes J. , 1997). Even though it was not possible to reject the null of unit root for neither soft wheat nor corn world prices, the long-run relationship between variables (and therefore ETP) has been estimated anyway. In this case the dependent variables – EU corn and soft wheat – are stationary variables, while the independent ones – US soft wheat and corn – are not. West (1988) shows that, under fairly general conditions, the OLS estimator is asymptotically normal when it can be transformed to have a single non-stationary right-hand side variable. This is true also in presence of heteroskedasticity and autocorrelation of unknown form. This applies not only to tests on the non-stationary variable but to hypotheses on the model as a whole. Therefore, in estimating such a model, there is no need to take special steps to handle the assumed non-stationarity.

The long-run relationship between price pairs has been estimated with and without taking into account structural breaks. All regressions were affected by positive autocorrelation (the Durbin-Watson test always rejected the null of no-autocorrelation) and heteroskedasticity (Breusch-Pagan test) problems. In presence of autocorrelation and heteroskedasticity, even if OLS estimates can still be asymptotically consistent, OLS standard errors underestimate the true uncertainty in parameters estimates. Therefore all equations have been estimated Heteroskedasticity-Autocorrelation standard errors (HAC), which are robust with respect to deviations from the iid assumptions.

As a robustness check, the long-run relationships between price pairs had been estimated also using the Prais-Winsten estimator, an alternative method to HAC robust standard errors to deal with heteroskedasticity and – especially – autocorrelation. The Prais-Winsten estimator is a Feasible Geneneralized Least Squares (FGLS) estimation method assuming that the autocorrelation of the error terms is due to a time-series dependence. The HAC method is usually preferred since using a FGLS methodology implies making additional statistical assumptions, which may not be justified and that may threat estimator efficiency. Therefore OLS (with HAC standard errors) results must be regarded as reference ones.

For all commodities considered, the Fischler reform seems to have significantly modified the long-run relationship between price series. In all cases there is evidence in favour of the *a priori* hypothesis that the Fischler reform increased price transmission elasticity between world and European markets and decreased transaction cost. The Chow test for structural change rejects the null that coefficients from the unrestricted model (allowing for a structural break corresponding to the Fischler reform) are equal to zero in all regressions, meaning that the change in EU policy changed the relationship between the variables However, the magnitude of such increase is different when estimated with OLS with HAC standard errors and the Prais-Winsten technique. In the case of corn and feed barley while the OLS estimator finds the structural break to be significant, the Prais-Winsten does not.

Table 2 shows the estimation results regarding the long-run price relationship between European and US (world price) soft wheat prices.

Table 2. Soft wheat: long-run relationship between world and European prices.

Parameter	OLS		OLS (HAC std. errors)		Prais-Winsten	
	No break	Break	No break	Break	No break	Break
Constant	0.318***	1.772***	0.318	1.772***	1.309***	1.809***
Time trend	-0.0005***	-0.001***	-0.0005*	-0.001***	No	No
World price	0.862***	0.180**	0.862***	0.18	0.399***	0.161**
Fischler dummy		-2.09***		-2.09***		-0.843***
Fischler*world price		0.967***		0.967***		0.385***
Fischler*time		0.0002		0.0002		No
Observations	159	159	159	159	159	159
Adj R-squared	0.62	0.81	0.65	0.81	0.97	0.97
Chow test		45.69***		45.69***		
DW	0.14***	0.26***	0.14***	0.26***	0.99	1.12
Breusch-Pagan	11.68***	20.59***	11.68***	20.59***		

Source: own elaborations.

*,**,*** denote 10, 5, 1% significance level respectively.

Before the full implementation of the Fischler reform EPT from the world market to the European one was almost zero (no transmission). The world price coefficient, before the break, was equal to 0.180 and not significant. After reform, price transmission grew to almost one (perfect transmission). After January 2007 (break date) also the intercept – a measure of transaction cost – decreased from 1.772 to almost zero. Results from the Prais-Winsten estimation are similar, even though they suggest that the impact of the Fischler

reform on the soft wheat market was lower. In particular, EPT increased from 0.161 (before) to 0.546 meaning that, in the long-run, almost 55% of a change in the world price is transmitted to the domestic one. Also in this case transaction cost decreased, but not as much as estimated by the OLS regression. The intercept declines from 1.809 to 0.966 meaning that a certain degree of transaction cost is still present.

Table 3: Durum wheat: long-run relationship between world and European prices.

Parameter	OLS		OLS (HAC std. errors)		Prais-Winsten	
	No break	Break	No break	Break	No break	Break
Constant	0.579***	1.281***	0.579***	1.281***	1.160***	3.299***
Time trend	0.0003***	0.0003**	0.0003*	0.0003*	No	No
World price	0.712***	0.401***	0.712***	0.401***	0.476***	0.058
Fischler dummy		-0.653***		-0.653***		-0.800***
Fischler*world price		0.364***		0.364***		0.243***
Fischler*time		-0.001***		-0.001***		No
Observations	159	159	159	159	159	157
Adj R-squared	0.89	0.93	0.89	0.93	0.97	0.94
Chow test		24.15***		24.15***		
DW	0.31***	0.45***	0.31***	0.45***	1.76	2.01
Breusch-Pagan	14.80***	2.41	14.80***	2.41		

Source: own elaborations.

*,**,*** denote 10, 5, 1% significance level respectively.

Table 3 shows the results regarding durum wheat, the essential ingredient for making pasta. The world reference price is the Canadian export price. It must be stressed that the average European price mainly reflects the Italian price, being Italy the only country endowed with an active durum market and leading producer of pasta. Also in this case the Fischer reform increased price transmission and decreased transaction cost, even if the magnitude of the changes is different when estimated with OLS or Prais-Winsten. According to the OLS coefficients, price transmission elasticity increased from 0.401 to 0.765 after January 2007. This is probably the result of Italy's decision to fully decouple payments from production, therefore exposing domestic producers to wider market fluctuations. Transaction cost almost halved, decreasing from 1.281 to 0.628. EPT estimated with the Prais-Winsten is significantly lower being 0.058 before reform and 0.301 after. Also transaction cost decreased less (from 3.299 to 2.499). Nevertheless, Prais-Winston estimates are consistent with OLS in measuring an increase in market integration after January 2007.

Table 4: Corn: long-run relationship between world and European prices.

Parameter	OLS		OLS (HAC std. errors)		Prais-Winsten	
	No break	Break	No break	Break	No break	Break
Constant	0.885***	1.349***	0.885***	1.349***	1.641***	1.829***
Time trend	-0.0003***	-0.0003*	-0.0003	-0.0003	No	No
World price	0.645***	0.408***	0.645***	0.408***	0.265***	0.169*
Fischler dummy		-0.776***		-0.776**		-0.384
Fischler*world price		0.529***		0.529***		0.185
Fischler*time		-0.002***		-0.002**		No
Observations	159	159	159	159	159	159
Adj R-squared	0.59	0.66	0.59	0.66	0.95	0.95
Chow test		10.25***		10.25***		
DW	0.17***	0.24***	0.17***	0.24***	1.01	1.03
Breusch-Pagan	10.32***	57.67***	10.32***	57.67***		

Source: own elaborations.

*,**,*** denote 10, 5, 1% significance level respectively.

Also in the case of corn, the Fischler reform might have had a positive effect on market integration (Table 4), at least according with the OLS results. In fact, corn and barley are the only cases in which results from OLS and Prais-Winston differ in detecting the presence of a structural break.

According to the OLS estimator, after the break, EPT almost doubled, increasing from 0.408 to almost unity. At the same time transaction cost decreased (but not totally disappeared) from 1.349 to 0.820. However, according to the Prais-Winsten estimation, the role of the Fischler reform in increasing market integration is negligible. The Dummy representing the reform and the interaction term are, in fact, non-significant, indicating that price transmission between the world and the European market did not change after January 2007 and remained quite low, just 0.169.

Table 5. Feed barley: long-run relationship between world and European prices.

Parameter	OLS		OLS (HAC std. Errors)		Prais-Winsten	
	No break	Break	No break	Break	No break	Break
Constant	0.643***	1.815***	0.643***	1.815***	1.513***	1.683***
Time trend	No	No	No	No	No	No
World price	0.708***	0.130*	0.708***	0.13	0.302***	0.216***
Fischler dummy		-1.662***		-1.662***		-0.347
Fischler*world price		0.804***		0.804***		0.165
Fischler*time		No		No		No
Observations	159	159	159	159	159	159
Adj R-squared	0.67	0.78	0.67	0.79	0.97	0.97
Chow test		41.59***		41.59***		
DW	0.14***	0.24***	0.14***	0.24***	0.99	1.00
Breusch-Pagan	2.87*	23.17***	2.87*	23.17***		

Source: own elaborations.

*,**,*** denote 10, 5, 1% significance level respectively.

Table 5 illustrates the results of the feed barley regressions. Also in this case OLS estimates support the a priori hypothesis that the Fischler reform contributed in increasing market integration between the world and the European markets, while the Prais-Winsten estimates do not. According to the OLS regression, EPT increased from almost zero before reform to 0.817 after, at the same time transaction cost decreased to almost zero. These results are in sharp contrast to those provided by the Prais-Winsten estimation, which do not support the a priori hypothesis.

Table 6. Butter: long-run relationship between world and European prices.

Parameter	OLS		OLS (HAC std. errors)		Prais-Winsten	
	No break	Break	No break	Break	No break	Break
Constant	2.298***	3.599***	2.298***	3.599***	2.787***	3.299***
Time trend	-0.001***	-0.001***	-0.001***	-0.001***	No	No
World price	0.398***	-0.020	0.398***	-0.020	0.220***	0.058
Fischler dummy		-1.766***		-1.766***		-0.800***
Fischler*world price		0.509***		0.509***		0.243***
Fischler*time		0.001***		0.001*		No
Observations	157	157	157	157	157	157
Adj R-squared	0.49	0.74	0.49	0.74	0.93	0.94
Chow test		50.70***		50.70***		
DW	0.13***	0.28***	0.13***	0.28***	1.97	2.01
Breusch-Pagan	14.84***	16.31***	14.84***	16.31***		

Source: own elaborations.

*,**,*** denote 10, 5, 1% significance level respectively.

Table 6 shows the results from the butter regressions. World price is the indicative export price of main producer countries such as Australia and New Zealand. In this case, the Fischler reform increased market integration between European and world markets according to both the OLS and the Prais-Winsten estimators. Also in this case the magnitude of changes is greater in the OLS regression but both estimators agree in saying that before the reform the European market was isolated to the world one: price transmission elasticity, before Fischler, was not significantly different from zero in neither case and transaction cost was quite high. After reform EPT increased to almost 0.5 according to the OLS estimator and to almost 0.3 according to Prais-Winsten. In both cases transaction cost decreased but remained high, maybe reflecting the long distance between the main places of production (Oceania) and of destination (Europe). The increase in butter market integration seems confirmed by the growing attention paid by European operators to price movements overseas.

5. CONCLUSIONS

This paper assessed whether the full implementation of the Fischler reform positively affected price transmission elasticity (EPT) between the world and some European agricultural markets and therefore increased market integration. Commodities considered were soft and durum wheat, corn, feed barley, and butter: amongst the most important ones for human consumption and animal feed. Whether and the extent to which EPT changed after the Fischler reform has been investigated through OLS regression techniques allowing for structural breaks, and controlling for heteroskedasticity and autocorrelation. The decision of preferring the OLS approach over other, more sophisticated, techniques such as cointegration analysis has been taken after many experimentations and on previous works' experience (Mela & Canali, 2012 and Mela&Canali, 2011). Data used are monthly figures, less prone to be subjected to short-term market fluctuations that may alter relationships between price pairs.

Before the full implementation of the Fischler reform (January 2007, chosen as break date), EPT was almost zero for soft wheat, feed barley, and butter. In all these cases the degree to which prices are transmitted from the world to the domestic market increased: to almost unity (perfect transmission) for soft wheat and feed barley and to almost 0.5 in the case of butter, which market has historically been strongly protected by the European Union. For durum wheat and corn, OLS estimation results show that a certain degree of price transmission was present also before the full implementation of the Fischler reform: before 2007 EPT was almost 0.4 in both cases. Also in these two cases the reform increased market integration: durum wheat EPT increased to almost 0.8, while that of corn to almost 0.9. The Fischler reform also had an effect on transaction cost, approximated by the intercept. They have decreased in all cases, dropping almost to zero for soft wheat and barley. Transaction cost declined also for durum, corn, and butter but relatively less than for the other two commodities. In absolute terms the highest transaction cost is that affecting butter, probably because of the great distance between the main area of production (Oceania) and the fact that the European market had been isolated from the world one for a long time, meaning that maybe trade practices still have room for improvement. It must be highlighted that, over such a long time span, transaction cost are unlikely to have remained constant, however, the inclusion of freight rates data did not significantly improve the model.

Two lessons can be learned from this paper and from previous work. The first is a methodological one. Results seem to be sensitive to the methodology used (OLS vs Prais-Winsten), the length of the time span considered, and data frequency. The time series properties of the series change if weekly data are used instead than monthly figures, consequently affecting the type of econometric techniques that can be used to measure EPT changes (cointegration vs. conventional OLS). The second lesson is a policy one. The Fischler

reform seems to have played an active and positive role in increasing market integration between world and European markets, even though many other factors may have played a role as well. First of all, the sharp increase in biofuel production in the US that inflated demand for corn, which in turn triggered an increase in the price of other agricultural commodities because of substitution effect, and the progressive financialization of agricultural markets. Nowadays agricultural commodities are not traded only by sector operators anymore but have become like any other commodity (like gold or silver or oil) and are being the target of financial operators and investment funds as well.

The full implementation of the Fischler reform took place almost exactly at the same time as the price bubble of the 2007-08, which might have represented the beginning of a new kind of relationship between agricultural prices. One might argue that the change in ETP was something that could have happened also if the Fischler reform did not take place. However, results from the butter equation show how the reform did have an effect and also a quite strong one. Analysing the butter matter allows to "isolate" the effects of the Fischler reform from those of other factors, since butter is much less affected by speculation, rising global demand, and biofuel production than cereals. Also in the case of cereals, however, it is likely that the reform had a positive effect on market integration, acting as a "magnifier" in transmitting the effects of increased global demand, financialization, and biofuel production, from the world to the European producers.

Further research would benefit from both a wider dataset and the use of more advanced econometric techniques. It would be interesting to widen the analysis taking into account biofuel production (and prices) and other factors that might have been affecting price relationships in the last decade such as financial transactions. However such data are far from easy to obtain, when available at all. Better and most sophisticated econometric methods could also be employed on the current dataset but it is likely that the data availability problem is a much more limiting factor than the methodological one.

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