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The cross-country effects of EU holidays on domestic GDP's

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ABSTRACT

The number and the distribution of non-working days during the year has recently entered the policy debate related to the slow pace of the European economy.The fact that the number of non-working days can affect the quarter to quarter performance of GDP is well known and hardly disputable. It has recently been argued that not only domestic holidays can in principle be important in each single economy, but also foreign ones, as far as there exist strict connections among the national economies. Given the existing evidence at the national level relative to the influence of calendar effects on GDP, the first step of the econometric analysis in the present research is a check on the existence (and significance) of international spillover effects.

Our investigation uses both structural time series models and the ARIMA model-based approach. These two different approaches are used jointly and their specific features are exploited to represent and estimate the time series components of our interest. The empirical evidence does not support the spillover hypothesis.

Key Words: trading days effects, national accounts, international spillover effects

JEL Classification: C22, E01, E32

NON-TECHNICAL SUMMARY

It is a consolidate empirical evidence that the number of non-working days produce a significant effect on the quarter to quarter performance of GDP in a country. The distribution of non-working days during the year has recently entered the policy debate as a factor influencing to the slow pace of the European economy. In particular, holidays in EU member states vary in number and nature, and the picture is further complicated by the practice of some countries to move certain holidays when falling on a week end ("Bank Holiday system"). Moreover, it has been argued that not only domestic holidays can in principle be important in each single economy, but also foreign ones, as far as there exist strict connections among the European national economies. In fact, in the presence of strong intra-EU economic interrelationships, a great degree of holidays dispersion and differentiation could significantly affect the EU GDP because of propagation and spillover phenomena that could make the aggregate EU calendar effect to exceed the sum of the influences of domestic holidays in each single country.

The main aim of the present paper is to empirically assess the extent to which this can be a relevant phenomenon. Given the existing evidence at the national level relative to the influence of calendar effects on GDP, the first step of the econometric analysis in the present research is a check on the existence (and significance) of international spillover effects.

Our investigation uses both structural time series models and the ARIMA model-based approach. These two different approaches are used jointly and their specific features are exploited to represent and estimate the time series components of our interest.

The empirical evidence does not support the spillover hypothesis. When some statistically significant result is found, this is generally small in absolute value and likely to be spurious and largely related to the extent of data mining used in the empirical analysis. In our view, the hypothesis that a harmonization of holidays in the EU countries would have a positive effect on European economy is not supported by the empirical results. Indeed, as far as we can see, such a policy would impose severe social costs, without significant positive economic effects.

EFFETTI MACROECONOMICI INTERNAZIONALI DELLA DISTRIBUZIONE DELLE FESTIVITÀ NEI PAESI DELL'UNIONE EUROPEA

SINTESI

Un'evidenza empirica molto diffusa è costituita dal fatto che il numero dei giorni non-lavorativi produce un effetto significativo sulla performance trimestrale del Prodotto Interno Lordo di un Paese.

La distribuzione dei giorni non-lavorativi nel corso dell'anno è recentemente entrata nel dibattito politico proponendosi anche come un fattore in grado di spiegare in parte la bassa crescita dell'economia Europea.

In effetti, le festività negli stati membri sono molto varie sia nel numero che nella natura, e il quadro è ulteriormente complicato dal fatto che alcuni stati spostano in altri giorni certe feste quando esse coinciderebbero con il fine settimana (il cosiddetto sistema anglosassone o del "Bank Holiday").

In virtù della strettissima connessione tra le economie dei vari paesi dell'Unione Europea, non solo le festività nazionali, ma anche quelle degli altri stati, potrebbero in linea teorica essere rilevanti per le singole economie nazionali.

Infatti, in presenza di forti relazioni all'interno delle economie appartenenti all'Unione Europea, un alto grado di dispersione e di differenziazione delle festività potrebbe negativamente influire sul Prodotto Interno Lordo Europeo.

Lo scopo principale del presente lavoro è di verificare empiricamente fino a che punto il fenomeno appena descritto può essere considerato rilevante. Data l'evidenza a livello nazionale dell'influenza degli effetti di calendario sul PIL, il primo passo dell'analisi econometrica è di verificare l'esistenza e la significatività degli effetti di spillover internazionali, per poter stabilire l'eventuale necessità di una omogeneizzazione delle festività tra i vari stati membri.

Nell'analisi si è fatto ricorso congiuntamente a due differenti metodologie: i modelli strutturali e l'approccio basato sui modelli ARIMA.

L'evidenza empirica ottenuta non supporta l'ipotesi dell'esistenza di spillover significativi e di conseguenza non supporta neppure l'ipotesi che l'armonizzazione delle festività tra gli stati membri possa avere un effetto positivo per l'economia dell'Unione Europea. Inoltre, una tale politica determinerebbe un severo costo sociale senza provocare significativi vantaggi economici.

Parole chiave: trading days, Contabilità Nazionale, effetti spillover

Classificazione JEL: C22, E01, E32

CONTENTS

1 INTRODUCTION[1]

The bearing of holidays on GDP depending upon the incidence on certain days of the work week is widely accepted and regularly monitored by public statistical agencies and private research institutes. Indeed, national statistical institutes currently release working days adjusted data for macroeconomic aggregate, following Eurostat's recommendations (see, e.g., Eurostat, 1999)[2].

Recently, the number and location of non-working days forcefully entered the economic policy debate, being related to the slow pace of the European economy (see e.g. "Il sole 24 ore", March 18, 2004). Holidays in EU member states vary in number and nature, and the picture is further complicated by the practice of some countries to move certain holidays when falling on a week end: this is the case of United Kingdom and Ireland, where the "Bank Holiday system" is in force. It has recently been advocated that not only the number of non-working days can adversely affect EU GDP, but also their distribution among EU member states[3]. In the presence of strong intra-EU economic interrelationships, a great degree of holidays dispersion and differentiation could in principle significantly affect the EU GDP because of propagation and spillover phenomena that make the aggregate EU calendar effect to exceed the sum of the influences of domestic holidays in each single country[4]. However, the extent to which this can be a relevant phenomenon remains to be assessed empirically. This is precisely the main goal of the present analysis.

As far as significant over-national effects are found, a holidays harmonization policy could be advocated to minimize the overall negative effect of non-working days on the EU economic activity. On the other hand, if spillover effects are not apparent, there is no reason to afford the social costs related to changing the customs and traditions of European people.

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1 We would like to thank, without implicating, Renato Brunetta and Sergio de Nardis for comments and discussion. The opinions expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of ISAE or its staff. Address for correspondence: Gianfranco Piras, University of Pescara, viale Pindaro, 42. I-65100 Pescara (Italy) gpiras@unich.it

2 Working days adjustment is usually carried out together with seasonal adjustment. The most frequently used software by official agencies is either TRAMO-SEATS (Gómez and Maravall, 1996) or X12-ARIMA (U.S. Census Bureau, 2002).

3 In this paper we consider the EU structure existing prior to the enlargement that took place on May, 1^{st} 2004. We also exclude Luxembourg.

4 Note that this aspect should not be confused with the synchronization of the phases of the business cycle in the different EU countries. In principle, there is no reason why foreign holidays should not affect domestic GDP even in the presence of asynchronous cycles.

The paper is organized as follows. Section 2 describes in detail the distribution of holidays among the EU member states. Section 3 deals with the main methodological issues. A description of data sources and their use follows. Section 5 reports the results of the empirical analysis. A final section concludes.

2 THE DISTRIBUTION OF EU HOLIDAYS

There are many different criteria according to which one could try to classify the diverse kinds of holidays. For example one might consider fixed versus moving holidays. The former occur every year on the same day and include both religious and civil holidays. Some of them recur in more than one country contemporaneously, while others are country-specific. On the contrary, moving holidays do not occur every year on the same day: in most cases they are religious holidays whose occurrence is connected to Easter Sunday (e.g. Ascension, Pentecost, Corpus Domini, Holy Thursday, Good Friday).

A different criterion is to distinguish holidays according to the nature of the event to be celebrated. In particular it is obvious to distinguish between religious and civil holidays. The former can in turn be subdivided into primary holidays, which have common dates in every country (such as Christmas and, with the exception of Greece, Easter Sunday), and secondary holidays, with common dates but not being celebrated across all EU members states; a typical example is given by patronal festivals. Civil holidays are often related to major historical events which have marked the birth of each nation or have contributed to shaping the countries' common feelings and cultures.

A final criterion is to classify holidays according to the "system" to which they belong. One can distinguish essentially between latin, orthodox, and anglo-saxon systems. The first is in force in the majority of the EU member states and is based on the Gregorian Calendar. The ortodox system is at present in force only in Greece: until some years ago it was used also in Finland. The main difference with the latin system is that of being based on the Julian Calendar. The anglo-saxon system is adopted in the United Kingdom and in Ireland, and is characterized by the use of the bank holidays. In the UK, the second Monday of May and August are non-working days. In Ireland, the first Monday of May, June, August and October are holidays.

In Table 1 we report the yearly number of non-working days for each EU country, distinguishing between religious and civil holidays, and indicating the system adopted by each country.

The festivities considered in the table are relative to the period 1980-2002. However, the total number of festivities is not necessarily equal to the number of non-working days in each year. In fact, moving holidays may sometimes occur during week-ends, in this way reducing the actual number of non-working days for that year. This cannot happen in those countries that adopt the anglo-saxon system. Furthermore, Easter and Pentecost are not considered in Tab. 1, since they fall on Sundays by definition[5].

Tab. 1 Classification of holidays: civil vs religious

Countries	Civil	Religious	Total
Latin System			
Italy	4	7	11
Germany	3	7	10
France	5	6	11
Spain	3	9	12
Netherland	3	5	8
Portugal	6	6	12
Sweden	2	8	10
Belgium	4	6	10
Austria	3	10	13
Denmark	2	8	10
Finland	4	6	10
Orthodox System			
Greece	4	8	12
Anglo-Saxon System			
Ireland	5	5	10
United Kingdom	5	5	10

The table shows that Austria is the country with more religious holidays (three more than Italy and one more than Spain). This seems strange, given that Italy and Spain are often considered the countries with the most widespread Christian tradition and culture. The country with less religious holidays is Ireland, followed by the UK and the Netherlands. This fact also appears odd, since the religious feeling in Ireland is very strong. The difference

[5] In the period considered in this paper, the Republic Day in Italy has been a non-working day only in 1986, and then again starting from 2001. January 6, has been observed only starting from 1986, but not before (1980-85). Furthermore, celebration of Ascension and Corpus Domini, which occur on Thursday, has been shifted to the first next Sunday and are not included in Table 1 for Italy. The data for Germany are referred to the period after 1989, year in which the National Unity Day was instituted.

between the maximum and the minimum number of religious holidays is six, with rather different values among the countries. France, Ireland, Portugal and the UK have more civil holidays than the other EU partners. For Portugal and Ireland this fact compensate the lower number of religious ones. The number of civil holidays varies from a maximum of six to a minimum of two. In the total the differences among the single EU member states is less evident.

However, if one looks at the distribution of holidays across the EU countries, the picture that emerges is quite different (see Tab. 2)[6]. In fact, there are 45 different holidays across the 14 EU members states considered here! The presence of heterogeneity in the distribution of national holidays across the EU member states stands at the core of our analysis. Indeed, our purpose is precisely to investigate the economic influence of the different distribution of non-working days across the EU countries.

3 AIM OF THE ANALYSIS

We want to test if the disperse distribution of non-working days among EU member states exerts a negative impact on EU GDP as a whole that goes beyond the sum of the single domestic effects. It can be reasonable to expect that the influence of national and over-national non-working days are appreciably different among sectors and countries so that the analysis has to be carried out by considering, instead of GDP, the sectoral value added in each country. The sectors considered here reflect the NACE-6 classification scheme (A6, ESA 95: see Eurostat 1998). More disaggregate data would be even more informative, but the analysis is hampered by the lack of comparable data for all the EU countries. The significance of over-national calendar effects on domestic sectoral value added should be taken as a confirmation that spillover effects are important in determining the level of domestic economic activity.

[6] In table 2, Christmas Day and New Years Day are not reported because they are holidays observed in all EU states. For this reason they do not contribute to heterogeneity.

Tab. 2 **All countries holidays**

Holidays	Ita	Ger	Fra	UK	Gre	Por	Spa	Net	Fin	Ire	Bel	Den	Aus	Swe
Religious														
Epiphany	*				*		*		*				*	*
St. Patrick's Day				*						*				
Easter Monday	*	*	*	*					*	*	*	*	*	*
Easter Friday		*		*		*	*	*	*	*		*		*
Easter Thursday							*					*		
Corpus Christi		*				*	*						*	
Ascension		*	*					*	*		*	*	*	*
Pentecost		*	*					*			*	*	*	*
Great Prayer Day												*		
Assumption	*		*		*	*	*				*		*	
All saint's day	*		*			*	*				*		*	*
Immaculate Conception	*				*	*	*						*	
St.Stephen's day	*	*		*			*	*	*	*		*	*	*
Easter Monday (O)					*									
Easter Friday (O)					*									
Easter Monday (O)					*									
Pentecost (O)					*									
Civil														
2/1				*										
25/3					*									
25/4	*					*								
30/4								*						
Labor Day	*	*	*		*	*	*		*		*		*	*
May Bank H				*						*				
5/5								*						
8/5			*											
June Bank H										*				
1st Friday of June									*					
2/6	*													
5/6												*		
10/6						*								
12/7				*										
14/7			*											
21/7											*			
August Bank H				*						*				
October Bank H										*				
3/10		*												
5/10						*								
12/10							*							
26/10													*	
28/10					*									
11/11			*								*			
1/12						*								
6/12									*					

4 ANALYTIC TOOLS

The bulk of the analysis is carried out by means of unobserved components models. The appeal of this approach lies in the fact that it can be seen has a flexible generalization of the simple linear regression approach. Consider for example a variable y_t (e.g. the value added for country j and sector i) and a variable x_t (e.g. the number of working days). A simple model to measure the effect of x_t on y_t is the linear regression model

$$y_t = a + bx_t + \beta t + \sum_{j=1}^{11} \gamma_j z_{jt} + \varepsilon_t \qquad (1)$$

where t is a deterministic linear time trend and z_{it} are seasonal dummy variables such that for $j = 1, 2, ..., 11$

$$z_{jt} = \begin{cases} 1 & \text{if } t = j, j+s, j+2s... \\ 0 & \text{if } t \neq j, j+s, j+2s... \\ -1 & \quad \text{if } t = s, 2s, 3s... \end{cases}$$

Model (1) hypothesizes a linear time invariant relation between x_t and y_t, with the presence of a deterministic trend and seasonal effects. It can be estimated by OLS and the coefficient b gives the response of y_t to x_t net of deterministic growth and seasonals. The main drawbacks of model (1) is that of being far too simplistic. Indeed, the only stochastic part is ε_t. A more general formulation includes the possibility that β, γ and b evolve over time in a stochastic way, thus leading from the static formulation (1) to a regression with time-varying parameters, where the trend (usually the trend-cycle) and the seasonal components are unobserved and stochastic.

The practical applications of unobserved components models are mainly based on structural times series (Harvey, 1989) and ARIMA model-based approach (Maravall, 1995). These approaches, although sharing a common framework, are nevertheless characterized by some important differences. Structural time series models are based on a representation conceptually similar to (1), where the time series components, instead of being deterministic, are explicitly modelled as stochastic processes. An ARIMA model, interpreted as the reduced form of a structural time series model is the starting point for the

ARIMA model-based approach. In this case an ARIMA model is identified from the observed series, and the unobserved components are subsequently derived, using some identifying assumptions. In our analysis this might even be an unnecessary step, given that we are mainly concerned with the effect of x_t on y_t, rather than on the estimation of the single components *per se*.

Let us consider an economic time series y_t and the vector of *k* variables X_t. The series y_t can be represented as the sum of a trend (μ_t), a seasonal (γ_t), an irregular component (ε_t) plus a regression effect given by X_t times a vector of time invariant parameters δ:

$$y_t = X_t\delta + \mu_t + \gamma_t + \varepsilon_t. \qquad (2)$$

The components μ_t, γ_t and ε_t are stochastic and in our investigation are defined as follows. The trend is described by the model:

$$\begin{aligned} \mu_t &= \mu_{t-1} + \beta_{t-1} + \eta_t \\ \beta_t &= \beta_{t-1} + \zeta_t \end{aligned}$$

where ζ_t is NID $(0, \sigma_\zeta^2)$ and η_t is NID $(0, \sigma_\eta^2)$.

The seasonal component is expressed in trigonometric form:

$$\omega_t = \sum_{j=1}^{2} \omega_{jt}$$

where:

$$\begin{aligned} \omega_{jt} &= \omega_{j,t-1} \cos\lambda_j + \omega_{j,t-1}^{*} \sin\lambda_j + \kappa_{jt} \\ \omega_{jt}^{*} &= -\omega_{j,t-1} \sin\lambda_j + \omega_{j,t-1}^{*} \cos\lambda_j + \kappa_{jt}^{*} \end{aligned}$$

and κ_{jt} and κ_{jt}^{*} are NID$(0, \sigma_{\kappa_j}^2)$. For quarterly data, the term λ_j is equal to $2\pi j/4$. ε_t is a Gaussian zero mean white noise with variance σ_ε^2.

The model (2) is very similar to what is commonly referred to as the *Basic Structural Model* (Harvey, 1989). The only difference is the presence of a set of regressors X_t, with no major consequences on estimation and testing.

In particular, the unknown variances of the components and the vector of parameters δ can be jointly estimated by means of the Kalman filter. Moreover, a covariance matrix for the vector δ can be obtained at the same time, allowing inference on the vector itself as in an ordinary regression model.

In order to investigate the significance of exogenous variables X_t on y_t, we make use also of the ARMA(p,q) intervention model (ARMAX) in the form:

$$y_t = a_0 + A(L)y_{t-1} + \delta X_t + B(L)\varepsilon_t, \qquad (3)$$

where $A(L)$ and $B(L)$ are polynomials in the lag operator L. The variables X_t are allowed to have any deterministic time path, or to be any exogenous stochastic processes. The crucial assumption in a context like this just described is that the exogenous process evolves independently of the sequence $\{y_t\}$. In other words, innovations in $\{y_t\}$ are assumed to have no effect on the exogenous process. Given that in our investigation X_t represent holidays, this is a reasonable assumption.

Some restrictions are necessary to identify and estimates the parameters of the three lag polynomials (see *e.g.* Maravall, 1995).

5 DATA SOURCES AND THEIR USE

The empirical analysis carried out in the present research exploits two distinct data-sets. In order to estimate the effects of heterogeneity in EU countries' holidays on EU GDP, the quarterly sectoral value added concerning the 12 countries involved in the analysis have been gathered and used in the estimates. The preferred data version in this study is without any form of seasonal and/or calendar effects adjustments[7]. All the value added data are expressed at 1995 constant prices, disaggregated according to the ESA 95 A6 sectors, namely:

1. Agriculture, hunting and forestry; fishing and operation of fish hatcheries and fish farms;
2. Industry, including energy;

[7] Exceptions are represented by the UK and Portugal, whose series are only available adjusted both for seasonality and working-days. This is an important issue and rises several questions: one of these concerns the goodness and the degree of homogeneity of correction procedures adopted by each single country.

3. Construction;
4. Wholesale and retail trade, repair of motor vehicles and household goods, hotels and restaurant; transport and communications;
5. Financial, real-estate, renting and business activities;
6. Other service activities.

The data source is the EUROSTAT New Cronos Data Base, so that these are official data as far as the value added of the EU countries is concerned. The data on quarterly value added are available for all EU member States with the exception of Greece and Ireland. The value added time series have been gathered for the longest available sample. The majority of the series start from 1980, but in some cases the sample period is shorter. For Germany, for example, data start from 1991 in order to consider the series after reunification; data for the Netherlands start from 1987, those for Austria from 1988, and those for the United Kingdom from 1991. As far as Portugal is concerned, total value added is available from 1991, while the series disaggregated into the six sectors start from 1995.

A second data-set has been used to construct the weights through which to measure empirically the influence of other EU countries’ holidays on each EU country value added. Such series consist of bilateral export of goods between EU member countries, retrieved from the OECD External Trade database.

5.1 Influence of other countries’ holidays: the weighting problem

The procedure discussed in this section concerns the construction of the regressors used to measure the influence in each single country of the other EU countries’ holidays. In fact, we need to construct for each country a regressor which is a weighted sum of the non-domestic holidays that do not coincide with the domestic ones.

First, a specific vector, identifying the daily position of national holidays along the whole sample period, has been built for each country, with “1” denoting each non-working day and “0” otherwise. For convenience, those variables have been named with the same name as the reference country. In this way we have, for each country, a daily time series identifying the exact position of non-working days through the whole sample. Further, differences in each country national calendar with respect to that of the other EU member states have been taken into account and summarized in country-specific additional variables. The latter have been calculated as the pairwise differences between country-specific daily position vectors. As an example, the above variables for Italy have been built up as GERMANY-ITALY, SPAIN-ITALY, and so on. The resulting variables indicate the presence and the position of those foreign holidays that do not coincide with the domestic ones.

In this way, we obtain three possible results: 0 for each day which is either a working day or a holiday in both countries; -1 for each day which is a non-working day only in the reference country; 1 for each foreign, but not domestic, holiday. We then transform all the -1's into 0's. So, we have obtained a vector of zeros and ones, where the ones indicate the presences of a foreign but not domestic holiday.

Once these variables are computed pairwise for all the countries, we have to find a way to aggregate them into a single indicator that is the main regressor to be used to measure the influence of the other countries' holiday on domestic GDP for each country. However, it is reasonable to think that the effect of foreign holidays on domestic GDP must depend on which foreign country is considered, and an appropriate weighting scheme must be found. A possible criterion is to weight foreign holidays using the share of domestic production exported in the foreign country. The sum is normalized to unity dividing each share for the country's export.

In order to gather additional evidence, we use also another regressor constructed using alternative weights based on the distance between countries. There are many ways to translate the concept of distance. We use a connectivity matrix, that is a $n \times n$ binary matrix (with n denoting the number of countries) whose generic element a_{ij} is zero if countries i and j do not confine, and one if they have a common border. In fact, we use a variant of this method. In order to have a great degree of differentiation, the matrix can assume more than two values (Tab. 3). In particular, each cell of the matrix reports the number of countries that one must go through before arriving in the EU member we are considering[8]. For example, Italy and Germany are not border countries, but to arrive in Germany starting from Italy it is necessary to cross Austria; so in the cell corresponding to the row "Italy" and to the column "Germany" there is the number two. To arrive in Italy starting from the Netherlands, you must cross Germany and Austria, so the number you find in the corresponding cell is three.

[8] As one can notice from Table 3, Greece has been considered to be bordering Italy, United Kingdom France, Belgium Netherland, and Denmark Sweden, even if all these countries are separated by the sea.

Tab. 3 **Connectivity Matrix**

	Ita	Ger	Fra	UK	Gre	Por	Spa	Net	Fin	Ire	Bel	Den	Aus	Swe
Ita		2	1	3	1	3	2	3	5	4	2	3	1	4
Ger	2		1	2	2	3	2	1	3	3	1	1	1	2
Fra	1	1		1	2	2	1	2	4	2	1	2	2	3
UK	3	2	1		3	3	2	1	5	1	1	3	3	4
Gre	1	2	2	3		4	3	4	6	5	3	4	2	5
Por	3	3	2	3	4		1	4	6	4	3	4	4	5
Spa	2	2	1	2	3	1		3	5	3	2	3	3	4
Net	3	1	2	1	4	4	3		4	2	1	2	2	3
Fin	5	3	4	5	6	6	5	4		5	4	2	4	1
Ire	4	3	2	1	5	4	3	2	5		2	4	4	5
Bel	2	1	1	1	3	3	2	1	4	2		2	2	3
Den	3	1	2	3	4	4	3	2	2	4	2		2	1
Aus	1	1	2	3	2	4	3	2	4	4	2	2		3
Swe	4	2	3	4	5	5	4	3	1	5	3	1	3	

This operation is carried out for all the countries obtaining a 12×12 symmetric matrix. To obtain the weights the reciprocal of these numbers have been considered and have been normalized to sum to unity. This second set of weights is applied to the same non-working days vectors as above, using the same procedure.

Hence, we have two separate sets of regressors to be used to check the robustness of our results.

In both cases, the regressors can be formalized as follows:

$$X_{it} = \sum_{j=1}^{12} w_j \Delta_{jt} \qquad (4)$$

in which, i represents the index for the country taken as the reference one, w_j are spatial weights, and Δ_{jt} are the variables reporting the differential in the number and the position of non-working days between the country taken as reference and all other EU member states. The indicators are finally temporally aggregated to obtain quarterly time series.

Tab. 4 p-values of δ in Equation (2), using trade-weighted indicators

Value added	Tot.	Agric.	Ind.	Const.	Serv.	Fin.	Other
Italy	0.4122	0.8807	0.9362	0.1164	0.4532	0.6100	0.3788
France	0.1835	0.0872	0.0784	0.2669	0.2713	0.7871	0.5823
Germany	0.1260	0.6891	0.1095	0.2584	0.2460	0.4295	0.7489
Austria	0.8493	0.7948	0.3523	0.7188	0.0455	0.8571	0.6965
Belgium	0.4295	0.3681	0.7039	0.8571	0.3270	0.8258	0.0323
Denmark	0.6312	0.7338	0.6965	0.3681	0.2669	0.0203	0.1118
Finland	0.5961	0.1310	0.7641	0.6527	0.2005	0.6100	0.2262
Spain	0.7794	0.6100	0.4009	0.5028	0.1095	0.3270	0.9601
Sweden	0.3030	0.4653	0.0098	0.9680	0.4179	0.3320	0.4472
Netherland	0.7113	0.0307	0.1235	0.5823	0.2262	0.9601	0.6170
UK	0.6312	0.1470	0.1211	0.7871	0.4839	0.6744	0.5286
Portugal	0.1362	0.9601	0.0031	0.5092	0.9124	0.5754	0.2149

Tab. 5 p-values of δ in Equation (2), using distance-weighted indicators

Value added	Tot.	Agric.	Ind.	Const.	Serv.	Fin.	Other
Italy	0.2301	0.7948	0.6170	0.0989	0.41794	0.5485	0.6312
France	0.2186	0.2301	0.0891	0.1615	0.1498	0.9760	0.6599
Germany	0.8650	0.7948	0.54850	0.2113	0.2076	0.2713	0.7871
Austria	0.7565	0.8728	0.0511	0.8571	0.0127	0.7263	0.8336
Belgium	0.5619	0.5961	0.6599	0.7113	0.2301	0.9044	0.0465
Denmark	0.7113	0.7565	0.9124	0.3077	0.1527	0.0285	0.1802
Finland	0.4009	0.2420	0.9124	0.7263	0.5485	0.3953	0.2757
Spain	0.7565	0.5619	0.3734	0.3843	0.1936	0.5286	0.9203
Sweden	0.1738	0.6030	0.0285	0.6599	0.5686	0.2937	0.5221
Netherland	0.0836	0.0002	0.0433	0.4715	0.2380	0.9282	0.6455
UK	0.6671	0.1936	0.1235	0.7489	0.4653	0.5221	0.7263
Portugal	0.1260	0.9760	0.0002	0.6100	0.3421	0.5823	0.1031

Tab. 6 t **statistics of the parameter** δ **in Equation (3), using distance-weighted indicators. 95% critical values in brackets**

Value added	Tot.	Agric.	Ind.	Const.
Italy	−1.20 [−1.990,1.990]	0.26 [−1.990,1.990]	−0.50 [−1.984,1.984]	1.65 [−1.984,1.984]
France	−1.23 [−1.984,1.984]	−1.20 [−1.984,1.984]	−1.70 [−1.990,1.990]	1.40 [−1.990,1.990]
Germany	−0.17 [−2.021,2.021]	−0.26 [−2.021,2.021]	−0.60 [−2.021,2.021]	1.25 [−2.021,2.021]
Austria	0.31 [−2.009,2.009]	0.16 [−2.009,2.009]	−1.95 [−2.009,2.009]	0.18 [−2.009,2.009]
Belgium	0.58 [−1.990,1.990]	0.53 [−1.990,1.990]	−0.44 [−1.990,1.990]	−0.37 [−1.990,1.990]
Denmark	0.37 [−1.990,1.990]	0.31 [−1.984,1.984]	0.11 [−1.984,1.984]	1.02 [−1.984,1.984]
Finland	0.84 [−1.984,1.984]	1.17 [−1.990,1.990]	0.11 [−1.990,1.990]	0.35 [−1.990,1.990]
Spain	0.31 [−1.990,1.990]	−0.58 [−1.990,1.990]	−0.89 [−1.990,1.990]	0.87 [−1.984,1.984]
Sweden	−1.36 [−1.984,1.984]	0.52 [−1.984,1.984]	−2.19 [−1.990,1.990]	−0.44 [−1.984,1.984]
Netherland	1.73 [−2.000,2.000]	3.64 [−2.000,2.000]	−2.02 [−2.000,2.000]	0.72 [−2.000,2.000]
UK	−0.43 [−2.021,2.021]	1.30 [−2.021,2.021]	−1.54 [−2.021,2.021]	−0.32 [−2.021,2.021]
Portugal	1.53 [−2.009,2.009]	0.03 [−2.021,2.021]	−3.66 [−2.021,2.021]	0.51 [−2.021,2.021]

Tab. 7 t **statistics of the parameter** δ **in Equation (3), using distance-weighted indicators. 95% critical values in brackets**

Value added	Serv.	Fin.	Other
Italy	–0.81 [–1.990,1.990]	–0.60 [–1.984,1.984]	0.48 [–1.984,1.984]
France	–1.44 [–1.984,1.984]	–0.03 [–1.984,1.984]	–0.44 [–1.990,1.990]
Germany	–1.26 [–2.021,2.021]	–1.10 [–2.021,2.021]	–0.27 [–2.021,2.021]
Austria	2.49 [–2.009,2.009]	0.35 [–2.009,2.009]	–0.21 [–2.000,2.000]
Belgium	1.20 [–1.990,1.990]	–0.12 [–1.990,1.990]	1.99 [–1.990,1.990]
Denmark	1.43 [–1.984,1.984]	–2.19 [–1.990,1.990]	–1.34 [–1.984,1.984]
Finland	0.60 [–1.984,1.984]	0.85 [–1.984,1.984]	–1.09 [–1.990,1.990]
Spain	1.30 [–1.984,1.984]	–0.63 [–1.990,1.990]	0.10 [–1.984,1.984]
Sweden	–0.57 [–1.984,1.984]	1.05 [–1.990,1.990]	0.64 [–1.984,1.984]
Netherland	1.18 [–2.000,2.000]	0.09 [–2.000,2.000]	0.46 [–2.000,2.000]
UK	0.73 [–2.021,2.021]	–0.64 [–2.021,2.021]	0.35 [–2.021,2.021]
Portugal	0.95 [–2.021,2.021]	0.55 [–2.021,2.021]	–1.63 [–2.021,2.021]

Tab. 8 t **statistics of the parameter** δ **in Equation (3), using distance-weighted indicators. 95% critical values in brackets**

Value added	Tot.	Agric.	Ind.	Const.
Italy	–0.82	0.15	–0.08	1.57
	[–1.990,1.990]	[–1.990,1.990]	[–1.984,1.984]	[–1.984,1.984]
France	–1.33	–1.71	–1.76	1.11
	[–1.984,1.984]	[–1.984,1.984]	[–1.984,1.984]	[–1.990,1.990]
Germany	–1.53	–0.40	–1.60	1.13
	[–2.009,2.009]	[–2.021,2.021]	[–2.021,2.021]	[–2.021,2.021]
Austria	0.19	–0.26	–0.93	–0.36
	[–2.009,2.009]	[–2.009,2.009]	[–2.009,2.009]	[–2.009,2.009]
Belgium	0.79	–0.90	–0.38	–0.18
	[–1.990,1.990]	[–1.984,1.984]	[–1.990,1.990]	[–1.990,1.990]
Denmark	0.48	0.34	0.39	0.90
	[–1.990,1.990]	[–1.984,1.984]	[–1.984,1.984]	[–1.984,1.984]
Finland	0.53	1.51	–0.30	0.45
	[–1.984,1.984]	[–1.990,1.990]	[–1.990,1.990]	[–1.990,1.990]
Spain	0.28	–6.44	–0.84	0.67
	[–1.990,1.990]	[–1.984,1.984]	[–1.990,1.990]	[–1.984,1.984]
Sweden	–1.03	0.73	–2.58	–0.04
	[–1.984,1.984]	[–1.984,1.984]	[–1.984,1.984]	[–1.984,1.984]
Netherland	–2.34	2.16	–2.03	–0.55
	[–2.000,2.000]	[–2.000,2.000]	[–2.000,2.000]	[–2.000,2.000]
UK	1.49	0.05	–2.95	0.66
	[–2.021,2.021]	[–2.021,2.021]	[–2.021,2.021]	[–2.021,2.021]
Portugal	–0.48	1.45	–1.55	–0.27
	[–2.009,2.009]	[–2.009,2.009]	[–2.009,2.009]	[–2.009,2.009]

Tab. 9 t statistics of the parameter δ in Equation (3), using distance-weighted indicators. 95% critical values in brackets

Value added	Serv.	Fin.	Other
Italy	-0.75	-0.51	0.88
	$[-1.984, 1.984]$	$[-1.984, 1.984]$	$[-1.984, 1.984]$
France	-1.10	-0.27	-0.55
	$[-1.984, 1.984]$	$[-1.984, 1.984]$	$[-1.990, 1.990]$
Germany	-1.16	-0.79	-0.32
	$[-2.021, 2.021]$	$[-2.021, 2.021]$	$[-2.021, 2.021]$
Austria	2.00	0.18	-0.39
	$[-2.009, 2.009]$	$[-2.009, 2.009]$	$[-2.000, 2.000]$
Belgium	0.98	0.22	2.20
	$[-1.990, 1.990]$	$[-1.990, 1.990]$	$[-1.990, 1.990]$
Denmark	1.11	-2.32	-1.59
	$[-1.984, 1.984]$	$[-1.990, 1.990]$	$[-1.990, 1.990]$
Finland	1.28	0.51	-1.21
	$[-1.984, 1.984]$	$[-1.984, 1.984]$	$[-1.990, 1.990]$
Spain	1.60	2.80	0.05
	$[-1.984, 1.984]$	$[-1.984, 1.984]$	$[-1.984, 1.984]$
Sweden	-0.81	0.97	0.76
	$[-1.984, 1.984]$	$[-1.990, 1.990]$	$[-1.984, 1.984]$
Netherland	1.21	0.05	0.50
	$[-2.000, 2.000]$	$[-2.000, 2.000]$	$[-2.000, 2.000]$
UK	0.11	0.56	-1.24
	$[-2.021, 2.021]$	$[-2.021, 2.021]$	$[-2.021, 2.021]$
Portugal	0.70	-0.42	0.63
	$[-2.009, 2.009]$	$[-2.009, 2.009]$	$[-2.009, 2.009]$

6 MAIN RESULTS

For each country, the effect of calendar heterogeneity is evaluated according to constant prices sectoral Value Added growth rates figures. The two methodological approaches we follow (unobserved component models, ARIMA model-based approach) can be considered as complementary since each of them provides empirical estimates on the aggregate non-working days “differential effects". Findings from both analytical approaches will be discussed below. For each analytic tools, we consider the adoption both of external trade and of distance-weighted indicators. In the present section, we consider in detail those obtained using trade-weighted indicators. The degree of economic integration among EU Member States could be extremely different both across sectors of economic activity, and selected groups of countries. In this view, trade-weighted variables can be assumed as the most reliable indicators. Detailed evidence for each country is reported in tables 4-9.

Full estimates do not signal any really significant effect, attributable to different allocation of holidays, on each single EU country GDP dynamics. All in all, 288 models have been identified and estimated, with a strong analytical and statistical burden. Though some significant effects emerged for single countries in specific sectoral field, as a general rule these have to be considered as spurious results, especially when they may be attributable to specific data properties. Typical cases are those of UK and Portugal, for which only seasonally adjusted series have been available on a shorter time span. On the other hand, few true differential calendar effects would have been estimated as significant but quantitatively small in some specific sectors for some countries. In spite of their importance, the main conclusion of the present research is that diversities in holidays allocation among EU countries national calendars does not have any significant effect in terms of national GDP growths, both at aggregate and sectoral level.

When we consider total value added figures for each country, evidence does not suggest that the non-working days aggregate effect exceeds the sum of influences of the national ones. The null hypothesis that excess holidays variables are not significantly different from zero can not be practically rejected for any country and any sector. The only exception is represented by Portugal, which show a relative sensitivity to the differential effect of holidays as a whole. In this latter case, the impact of calendar effects has been estimated highly significant and positively correlated to GDP growth. In spite of the statistical significance, the above result must be considered carefully. First of all, Portuguese National Accounts are only available corrected for seasonality and trading day effects. Moreover, parameter estimates are strongly affected by the shorter time horizon considered. Table 4 reports the significance of parameters for the trade-weighted regressors, in the form of p-values. The significance of the parameter in the ARMAX models is presented in tables 8 and 9.

With reference to the Agriculture sector, results obtained using structural models with external trade indicators suggest that there is no evidence of any significant excess holiday effect in the majority of European countries. Production in agriculture is strongly triggered by seasons: it weakly react over the business cycle and, presumably, to the differential allocation of non-working days among exporting countries. Quantitative results are coherent with such a priori assumptions. Contrary to the main evidence, a significant and positive impact has been found for The Netherlands (which presents one of the most competitive and innovative agricultural sector across European regions). A positive effect, though less significant (at the 10% confidence level) has also been found for Finland, where Agriculture represents a relatively small sector (about 4% of GDP in 2001). On one hand, such positive sectoral impacts could depend on the degree of innovation carried out in both countries. On the other hand, one should consider that few significant results over a large empirical analysis could be interpreted as a consequence of excessive data mining. In this view, additional significant effects, though quantitatively very small, have been found for the UK Agriculture sector. Those evidences have been obtained from seasonally adjusted and working days corrected time series. In all these cases, it should be considered that estimates could reflect spurious effects due to time series estimation and/or data construction. Some differences emerges considering ARIMA results. Significant findings refer only to The Netherlands and France (at 10% level). The other evidences concerning UK and Finland have not been confirmed. Any other relevant evidence has not been found for the remaining countries.

The industrial sector seems to be the most reactive to the different number and position of cross-country holidays. Size and significance of such impacts vary significantly across European countries. In the majority of European regions, such effects do not result significant. Exceptions refers to two Mediterranean countries (Portugal and France) and to some North-European States (The Netherlands, Sweden and UK). For all these countries, differential calendar effects have been estimated to exist and to be significantly negative. The Swedish industrial sector appears to be the most sensitive: estimated impacts are larger than those calculated for the remaining countries. Also Portugal presents larger effects in comparison to those estimates for the other countries. It is reasonable to assume that each National economy is increasingly exposed to the differential cross-country allocation of holidays if export destination markets are represented by a reduced number of countries. Evidences based on recent OCDE bilateral trade data show that, for many European countries, a large share of manufacturing exports is mainly sold to few markets. The most important destination markets for UK are represented by EU, which absorbs more than half of the whole manufacturing production; USA covers 15% of UK exports. Sweden sells about 20% of domestic production to Scandinavian countries, approximately the same amount is exported to UK and USA, 11% to Germany. For The Netherlands, a large share of production is exported to its own border countries: Germany, Belgium, UK and France absorb about 80% of whole exports to EU Member States. The same applies for Portugal. Those evidences may provide a possible interpretation of structural models results. If export destination markets are not widely differentiated or, otherwise, if a reduced number of countries show a high degree of economic integration, the exporting economy could be more exposed to so-called “calendar" effects. In this view, the “trade channel" can be considered as the main way of diffusion of such fluctuations. Results from ARIMA models are characterized by a greater coherency: only estimates for UK have not been confirmed. Trade indicators are significant for Sweden and Portugal, at the 10% for France.

With reference to the Building and Construction sector, none of the European countries shown any significant effect due to differential non-working days composition. Results are consistent both at 5% both at 10% confidence level. According to this evidence, such sector may be assumed to do not react to holidays differentials across countries. Building and construction concern activities carried out in a given region which output is not currently exported. Exports may play an important role in the context of intermediate production (materials for final production and accessories). In any case, both productions are normally planned and carried out on a medium-long time horizon, presumably incorporating the effects attributable to different working days and holidays allocation across countries.

In the present analysis, Services consists in a very heterogeneous sector, as it covers activities related to wholesale and retail trade, repair of motor vehicles and household goods, hotels and restaurants, transport, storage and communications. Each of them can be thought as differently related to the degree of economic integration among countries. Transport services highly benefit of trade relationships among regions (like the accommodation sector as a whole). Other industries are more related to domestic economic activities. As a common feature, all those activities are such to supply services at the time they are demanded. Usually, with reference to National Accounts data, value added series for Service sectors are not adjusted to account for working days and/or trading days effects. Those factors are assumed to do not affect such aggregates. Empirically, they have been found to be not significant. On the basis of these results, the differential holidays composition of National calendars across European countries should not affect the Service as well. Exceptions for Austria and Spain can be considered as spurious and not related to any true calendar effect.

Estimates for Financial Services sector did not present any significant result. The only significant effect concerns the Danish sector. It shows a negative sign and can presumably be attributed to the strong link Danish financial and intermediation activities present with those of Germany and UK, the most developed financial markets in Europe. It can be assumed that closing days of German (and/or British) credit and financial markets could constraint related (financial) Danish activities, thus significantly affecting the value and level of value added. ARIMA model-based evidences concerning Construction, Real Services and Financial Services are completely in line with those from structural models.

Public Administration National Accounts figures are not corrected for trading/working days factors. Potential effects due to the different position and number of non-working days in other European countries calendars should be considered as spurious, largely attributable to the methodologies each country adopts for quarterly time series data construction. Alternatively, they could also depend on the degree of economic integration among countries. In this view, a significant and positive effect could be expected for Belgium, since a lot of international and European institutions have been localized in this country. Evidences from trade weighted variables indicates very significant effects for Denmark, Belgium and UK. In the latter two countries they are negative, greater than zero in the former country. A moderate effect (significant at the 10% level) has been found for Austria.

The above findings have been generally confirmed by estimates obtained using distance variables. Results for the aggregate value added figures largely confirm those from structural models. The only relevant exception refers to The Netherlands, which effects have been estimated more significant (slightly below the 5% bounds) using ARIMA models. Concerning the industrial sector, relevant exceptions refer to i) The Netherlands, which effect, presenting the same size as in the above exercise, has been estimated more significant; ii) France, for which the importance of holidays distributional effects, definitely vanishes. For the Building and Construction sector, differences refer to Germany and The Netherlands, which sectors present positive effects, significant at the 10% level. As far as Service sector is concerned, distance variables estimates (from both Structural both Model-based approach) show significant impacts for Austria;

those for Spain definitely disappear. Also for Financial services, the analysis based on distance variables confirms previous results. As far as Public Administration is concerned, inferences from structural models generally provide less significant results, signalling a greater explicative power of “trade" regressors. Concerning model-based estimates, the only significant result was found for Belgium. This evidence is similar to those from structural models and provides a strong empirical evidence on the importance of the role played by the Public Sector, which size, largely above those of other European countries, significantly contributes to Belgium economic performances.

7 CONCLUDING REMARKS

The number and the distribution of non-working days during the year has recently entered the policy debate related to the slow pace of the European economy. The fact that the number of non-working days can affect the quarter to quarter performance of GDP is well known and hardly disputable. It has recently been argued that not only domestic holidays can in principle be important, but also foreign ones, as far as there exist strict connections among the national economies. If this is the case, the calendar effects on the EU GDP is likely to be larger than the mere sum of the domestic effects on the single domestic economies. As a consequence, it has been suggested that this would call for the planning of a “harmonization” of the national calendars. However, such a policy would be socially costly and could have a potential justification only as far as strong spillover calendar effects create a multiplicative (negative) influence on the EU GDP as a whole.

In this paper we investigate if this is indeed the case, using two alternative methodologies and two slightly different data sets. The methods we use are related to those applied by national statistical agencies to remove calendar components from official statistics. We don’t find robust evidence supporting the spillover hypothesis. When some statistically significant result is found, this is generally small in absolute value and likely to be spurious and largely related to the extent of data mining used in the empirical analysis.

It might well be that using very disaggregate data could highlight the existence of some spillovers in very specific sectors. However, in order to maintain international comparability and use relatively long time series, we have to rely on official 6-sector data. In any event, if only extremely specific sectors were influenced by cross-national calendar effects, their aggregate influence on the EU GDP would be presumably very small.

In our view, the results do not support the hypothesis that a harmonization of holidays in the EU countries is needed. Indeed, as far as we can see, such a policy would impose severe social costs, without significant positive economic effects.

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