

# *Act.2*

## *Background Information Diagnosis*

### 2.4 The Italian Ecobonus Experience

ReteAutostrade  
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*Final Report*





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# Executive Summary

## Scope of the study

The present study deals with the socio-economic and environmental evaluation of the Italian Ecobonus scheme implemented within the framework of the Motorways of the Sea in the 2007-2010 period. More specifically, the effects of the policy on freight traffic on Roll-on/Roll-off (RoRo) routes between Italy and Spain will be measured.

## Overview of the incentive scheme

To foster the use of the Italian Motorways of the Sea (MoS), with the specific aim of shifting freight transport from «all-road» to «road-maritime» transport mode, in 2002 the Italian Government designed the so-called Ecobonus scheme.

Over the years the Italian Ministry of Transport identified 32 eligible maritime routes to be promoted by the incentive. The routes were selected according to potential volumes attracted from road traffic (presence of alternative road transport solutions) and the potential socio-economic and environmental benefits by shipping cargo on the given maritime route instead of by road.

The value of the incentive accounted for up to 30% of the RoRo fares charged to truckers, but a minimum of 80 trips/year had to be undertaken on each route for which the subsidy was requested. A premium was granted to truckers reaching 1,600 trips/year on a single route. Finally, the same boarding volumes had to be maintained for the three years following the interruption of the subsidy.

The level of subsidisation was based on maritime distance, land distance saved and the reduction of external costs achieved through modal shift. The calculation model to quantify external costs was developed by Italian NGO “Amici della Terra”, incorporating greenhouse gases emissions, atmospheric pollution, noise, congestion, accidents and fuel spillage. According to the mentioned study, €133 of positive externalities can be generated for 100 HGV km shifted from road to sea.

It is relevant to note that the European Commission in its decision concerning the Italian Ecobonus Scheme stated that the amount of money distributed as an incentive should not exceed the differential between the external costs generated by road transport and those generated by sea transport.

## Data Collection

To carry out the analysis that will follow in the next chapters, information has been mostly retrieved from the main stakeholders (i.e. road haulage companies and shipping lines operating along the RoRo transport chain) on the concerned routes and on comparable ones.

Part of information on traffic volumes for international routes has been gathered also from port authorities, Eurostat and Shippax, the leading provider of maritime statistics. Specifically, data covers traffic between Italy and Spain, as well as routes between Italy and the Western Mediterranean region for the whole 2004-2014 period.

Additionally, insights of a qualitative nature have been gathered from both road hauliers and shipping lines respectively through a survey and individual interviews.

Data relative to macroeconomic factors have been collected from statistical databases of proved reliability such as the ones provided by Eurostat, the World Bank and Istat (the Italian national institute of statistics).

## Modal Shift

Eight international routes have benefitted from Ecobonus subsidisation in the period between 2007 and 2010. All of the routes but one (i.e. the Civitavecchia-Toulon) connected an Italian port with a Spanish one. Two routes are no longer active: the Civitavecchia-Toulon was operated between 2005 and 2009; the route Livorno-Tarragona was operated only between 2006 and 2009. However, the competing route of the latter – the Livorno-Barcelona – is still operative.

As a matter of fact, traffic flows recorded on Ecobonus routes over the latter's implementation period (2007-2010) have been averagely 12% higher with respect to 2006 levels. In fact, between 2007 and 2010 approximately 155,000 trailers were being transported, on a yearly average, on Italian-Spanish Ecobonus routes compared to the 137,000 carried in 2006 and the 105,000 carried in 2005. However, if analysed in isolation, these growth figures are not sufficient to draw any conclusion on the impact of the incentive scheme.

Indeed, the years in which the Ecobonus has been implemented were characterised by unstable economic conditions. Because of this, it is not straightforward to isolate the effect of the Ecobonus on the traffic trends.

To overcome this issue, the proposed analysis identifies routes between Italy and Greece and between Italy and Turkey as a benchmark for traffic flows on routes not incentivised by the Ecobonus. For the 2007-2009 period, RoRo traffic volume trends on these routes were almost flat (2% higher on a yearly average). Over the same period, RoRo traffic between Italy and Spain was averagely 16% higher with respect to 2006 levels. If the whole Ecobonus deployment period (2007-2010) is considered, RoRo traffic volumes on Italian-Spanish routes were averagely 12.1% higher compared to pre-subsidisation levels. Therefore, it seems reasonable to assume that the 12.1% higher traffic volumes recorded between 2007 and 2010 are to be credited to the Ecobonus.

RoRo traffic demand is likely to be influenced by fares level on the supply side as well as by transport needs on the demand side. Therefore, in order to evaluate the effects of transport demand on RoRo traffic between Italy and Spain, international trade flow trends between Spain and the rest of the European Union have been analysed. Coherently, such trade figures are cross-compared with trade flows between EU Member States and the aggregate region of Turkey and Greece. During the 2007-2010 period, trade flow volumes between Spain and the rest of the EU have been averagely 3.8% lower compared to 2006. Over the same time frame trade flow volumes between Turkey+Greece and the EU28 were 3.9% higher than in pre-Ecobonus times.

Hence, it is reasonable to assume that the modal shift brought about by the Ecobonus does not only include the 12.1% excess RoRo traffic volumes observed during the incentive implementation period, but also the 3.8% share of existing RoRo traffic that would have otherwise been lost as a consequence of the decline in trade flow volumes.

This assumption is further supported by the trend of trade flows by road between Italy and Spain: freight traffic by road between the two countries decreases by almost 34% over the Ecobonus deployment period. Therefore, the amount of transported trailers resulting from the sum of the 12% annual average share of excess RoRo traffic and the 3.8% annual average share of existing – 2006 – RoRo traffic represents a both reasonable and conservative modal shift estimate.

By summing up the two identified modal shift components, the one deriving from the higher RoRo traffic levels and the one resulting from the avoided loss in the same kind of traffic, it is assumed that 14.2% of overall transported trailers have been shifted from “all-road” to “road-maritime” transport modality between 2007 and 2010. In absolute terms, out of the overall 618,318 trailers that boarded RoRo vessels operating on routes between Italy and Spain over the 2007-2010 period, 87,562 are to be credited to the Ecobonus-related modal shift. Put differently, during the Ecobonus implementation period a yearly average of 21,891 trailers were shifted from the over-congested Italian, French and Spanish road networks to Italian-Spanish RoRo routes.

As specified in the Commission's decision (C (2005) 1155 fin), one of the conditions that had to be met in order to benefit from the retroactive refunds granted by the Ecobonus scheme, was that road haulage companies should have undertaken the same number of yearly trips made on the concerned routes during the incentive implementation period also during the three years following the interruption of subsidisation. According to both the relevant stakeholders and the available data, those road haulage companies that benefitted from the

Ecobonus over the 2007-2010 period not only maintained their boarding rates, but are also considered to have increased the number of undertaken trips on the involved RoRo routes. Hence, it is assumed that, besides having operated a modal shift equal to a 14.2% share of RoRo traffic on routes between Italy and Spain during the 2007-2010 period, the Italian Ecobonus scheme has consistently sustained RoRo traffic demand on the said routes by the same extent also after the interruption of subsidisation, from 2011 to 2013. In absolute terms, this implies that further 1.332 million tonnes out of the 9.409 million that were transported over the 2011-2013 period on subsidised routes between Italy and Spain have to be credited to the Ecobonus.

## Evaluation

Throughout the whole implementation period €67 million out of approximately €240 million were distributed to road haulage companies travelling on eligible international Ecobonus routes between Italy and Spain (i.e. approximately 30%). In other words, international routes benefitted from 30% of the total amount subsidised, while the residual amount has been devoted to domestic routes.

In addition to the direct costs of the Ecobonus, i.e. the amount of Euros distributed as an incentive to road haulage companies throughout the whole implementation period, all additional costs that were incurred by RAM S.p.a. in order to prepare, execute and monitor the deployment of the Ecobonus must be considered in the evaluation. Road transport operators also incurred administrative and bureaucratic costs in order to apply for Ecobonus subsidisation. Indeed, they were required to submit, on a yearly basis, one application form for each eligible route on which they were boarding.

Taking into account both user-side and government-side administrative costs, total indirect costs incurred by stakeholders in order to benefit from/deploy the incentive sum up to approximately two working days per year and €3.66 per trip.

Environmental and socio-economic costs/benefits that are not directly borne/enjoyed by transport users, i.e., the Ecobonus externalities, are not directly and easily quantifiable in monetary terms. However, the use of the Marco Polo external cost calculator and the external cost coefficients derived from the study by the Italian NGO “Friends of the Earth” can support in estimating such externalities.

The Marco Polo external costs calculator that attaches standardised external cost coefficients for the environmental impacts (e.g. air quality, noise, climate change) and socio-economic impacts (e.g. accidents, road congestion) of a given amount carried on each traffic modalities (i.e. road, rail, inland waterways and short sea shipping). Each transport-mode specific coefficient is derived by computing the average of the aforementioned external costs per tonne-kilometre transported with a specific transport mode. The external cost calculations, in turn, are based on a combination of data and models results based on a set of assumptions, whose robustness has been accurately tested. The aim of the said cost calculator is to allow a direct comparison of the change in externalities brought about by competing, mutually exclusive, investment projects, i.e., new transport services. However, in the specific case most of the additional traffic was generated on existing routes. Hence, the external costs of short sea shipping transport have been considered only for freight shifted towards RoRo routes that were introduced during the Ecobonus implementation period. Under these assumptions, by transporting the 3.184 thousand tonnes of freight representing the Ecobonus-induced modal shift on RoRo routes between Italy and Spain instead of by road, environmental and socio-economic costs drop from €74.9 to approximately €4.4 million. This translates into a net reduction in external costs equal to €70.5 million. Hence, per each Euro invested in the incentive, environmental and socio-economic benefits accounting for approximately €1.1 were generated.

It must be recalled that one condition for the Ecobonus scheme to be approved by the Commission was that the amount of the subsidy should not have exceeded the difference between the external costs generated by maritime and road transport. Such difference was to be computed based on the study completed by the NGO “Friends of the Earth”. Coherently with the Commission’s decision, the net change in external costs has also been computed based on the coefficients provided by the said study. Under these assumptions the modal shift triggered by the Ecobonus is believed to have generated environmental and socio-economic cost savings equal to €389 million, translating into a net social benefit of €5.81 for each Euro invested in the incentive.

## Conclusions and recommendations

In terms of modal shift, positive results have been observed both for the policy's implementation period (2007-2010), as well as for the years following the interruption of Ecobonus subsidisation (2011-2014).

The selection criteria for route eligibility and the condition that short sea shipping fares are kept constant, exclude for distortions of competition with respect to existing maritime services and other ports.

Besides leading to significant traffic flow growth during economic expansion periods, the Ecobonus has widely mitigated the sharp drop in demand for maritime freight transport services recorded on comparable routes as a consequence of the 2009 financial crisis.

Considering that most of the freight shifted from "all-road" to "road-maritime" transport mode has been channelled towards already operative RoRo links, the Ecobonus is considered to have generated environmental and socio-economic benefits exceeding its cost, €1.1 (€5.8 according to the study quoted in the Commission's decision) of net reduction in externalities/subsidised Euro.

The short-term nature of the incentive scheme has held back shipping lines from committing to long-term investments to structurally enhance the provided services (e.g. offering a higher number of sailings per week, refurbishing/upgrading port facilities etc.). In case similar incentive schemes are implemented in the future, the duration of the subsidisation cycle should be extended.

Many Italian and Spanish road hauliers have formed partnerships in order for trailers travelling from Italy towards Spain, and vice-versa, unaccompanied. Collaboration among road haulage companies could be fostered by launching a dedicated IT platform where freight information and scheduled itinerary are shared, as well as financial agreements made.



# 1. Introduction

## *1.1. Scope and purpose of the document*

The present study deals with the socio-economic and environmental evaluation of the Italian Ecobonus scheme implemented within the framework of the Motorways of the Sea in the 2007-2010 period. More specifically, the effects of the policy on freight traffic on Roll-on/Roll-off (RoRo) routes between Italy and Spain will be measured. The Ecobonus was a retroactive refund system designed for all those road haulage companies and lorry drivers that would make use of short sea shipping services (SSS) instead of the over-congested Italian and European road network. More precisely, through the Ecobonus, the government would subsidise part of the price charged to road hauliers by shipping lines. The main objectives of the Ecobonus were:

- To operate a significant modal shift of Heavy Goods Vehicles from “all-road” to “road-maritime” transport modality in order to reduce negative externalities, i.e., socio-economic and environmental costs such as greenhouse gases emissions, noise, accidents and road congestion.
- As a secondary objective, and through specific measures that will be described later in the study, it was also intended to trigger a consolidation tendency in the highly fragmented and unstable Italian road haulage industry.

The present study aims at assessing the impact, in economic terms, of the potential benefits brought about by the implementation of the Ecobonus scheme. In order to do so, the political and legal framework within which the incentive scheme was introduced will be first analysed, by also explaining its compliance with EU regulation. Subsequently, its specific features, including its value, its calculation basis, routes selection and beneficiaries' eligibility criteria will be described, as to better understand the following chapters of the study, which are also the core ones.

As a matter of fact, the focus of the study will be on estimating the modal shift that occurred as a direct consequence of the incentive deployment. The size of the modal shift is of the utmost importance because it represents the first input based on which all the benefits and costs, as well as the final value judgement on the efficiency of the policy will be calculated. The said estimate will be performed through a comparative analysis between RoRo traffic trends on international routes subsidised by the Ecobonus and those that were not. An additional comparison with trends for freight traffic volumes on the alternative road transport solutions will be carried out. Adjustments for relevant exogenous factors, such as differences in economic performances and in trade flow volumes among countries, will be made.

Afterwards, the cost benefit analysis will start with the estimate of direct and administrative/bureaucratic costs of the incentive. Based on the estimated cost and size of the modal shift, measured in net tonnes of goods diverted from the road network to each RoRo route, the socio-economic and environmental benefits produced by the incentive implementation will be computed employing the Marco Polo modal shift calculator and the calculation model developed in a study by the Italian NGO “Friends of the Earth”. This tool attaches standardised costs coefficients to each external cost (air pollution, noise, climate change, road congestion and accidents) and computes their change by comparing the scenario in which the given policy, in this case the Ecobonus, has been implemented with the one in its absence. The result is a monetary value, representing the socio-economic and environmental return generated by each Euro that has been invested.

Information gathered through a survey addressed at road hauliers, as well as through direct consultations, will be investigated to determine if the structure of the Italian road haulage industry is currently more consolidated than before the Ecobonus deployment.

Finally, the conclusions and recommendations by the study authors will be presented.

## 2. The Italian Ecobonus scheme

### 2.1. Overview of the incentive scheme

The concept of *Motorways of the Sea* (hereafter referred to as MoS) was first introduced by the European Commission in the 2001 Transport White Paper “*European transport policy for 2010: time to decide*”<sup>1</sup> advocating for the promotion of sustainable and competitive alternatives to road transport. Within this framework, the Italian government developed an incentive scheme with the specific aim of shifting freight transport from “all-road” to “road-maritime” transport mode. The so-called “Ecobonus” was intended to foster intermodality by contemporarily encouraging innovation in the freight transport industry and the development of the logistic chains network. Shifting heavy goods vehicles (HGV) away from the over-congested European road network was identified as a promising strategy to reduce emissions of greenhouse gases and support sustainable development, a fundamental objective of the EU as defined in the 1997 Treaty of Amsterdam. The Ecobonus was an incentive directed to road haulage companies in order to promote the use of maritime links instead of the road network. More precisely, the said incentive provided for a partial retroactive refund to all those road transport operators that used any of the pre-identified national and international short sea shipping (SSS) routes over the alternative road transport solution.

### 2.2. Legal aspects

In November 2002, the effort by the Italian Government to develop an effective incentive scheme in order to favour the modal shift translated into Decree Law No 209 of the 24<sup>th</sup> of September 2002, converted with amendments into Law No 265 on the 22<sup>nd</sup> of November 2002, to specifically promote the Italian *Motorways of the Sea*. In 2004, *Rete Autostrade Mediterranee S.p.A.* (RAM) was established, with the core mission of supporting and coordinating actions for the development of MoS usage at the national and European level. However, as for any state aid pending for implementation in an EU Member State (MS), its compatibility with the Treaty on the Functioning of the European Union (TFEU) must first be assessed by the Commission.

Indeed, as defined by Article 107 (formerly Article 87 of the EC) of the aforementioned treaty, “any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the provision of certain goods, insofar that it affects trade between Member States, is incompatible with the internal market”<sup>2</sup>. According to the same article, in order for a financial support to be considered as state aid, all of the following criteria must be met:

- it must be granted by the State or through State Resources,
- it must favour certain undertakings or the production of certain goods (selectivity)
- it must confer an economic advantage on recipient undertakings
- distort or threaten to distort competition and affect trade between Member States.

After reviewing the Ecobonus scheme, on the 23<sup>rd</sup> of October 2003, the Commission’s Directorate-General for Competition (hereafter referred to as “DGCOMP”) concluded that the incentive scheme clearly constituted “state aid within the meaning of Article 107(1) TFEU for both road hauliers and maritime companies”<sup>3</sup>. As observed by DG COMP, the proposed incentive scheme, besides being granted by the State and through State resources (1), clearly favours only certain undertakings and it is therefore selective in that regards. The incentive generates a conspicuous economic advantage for road hauliers by subsidizing part of their operational

<sup>1</sup> *White Paper: European transport policy for 2010: time to decide*, European Commission (2001). Available at: [http://ec.europa.eu/transport/themes/strategies/doc/2001\\_white\\_paper/lb\\_com\\_2001\\_0370\\_en.pdf](http://ec.europa.eu/transport/themes/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf)

<sup>2</sup> *Consolidated version of the Treaty on the Functioning of the European Union, Article 107(1)*, European Union (2007). Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN>

<sup>3</sup> European Commission Decision on State Aid N 496/2003 – Italy, C(2005) 1155 fin (20<sup>th</sup> April 2005). Italian version available at: [http://www.ramspa.it/sites/default/files/allegati/aiuto\\_di\\_stat0496\\_03.pdf](http://www.ramspa.it/sites/default/files/allegati/aiuto_di_stat0496_03.pdf)

costs. Additionally, it definitely has the effect of stimulating market demand for certain maritime services, boosting their revenue streams. Therefore, it also provides an economic advantage for maritime operators. Finally, since both road haulage companies and maritime companies operate in competition with other undertakings on markets open to competition, the Ecobonus is also liable for distorting the competitive nature of business and affecting trade within the internal market.

However, Article 107 (TFEU) allows for exemptions in case of measures that clearly favour the development of a number of specific activities that serve the common interests of the Union. These measures include the implementation of financial aid schemes that, in line with the maritime guidelines set out in the aforementioned Transport White Paper, support the transport and logistics industry in operating a conspicuous modal shift of freight transport from the overwhelmed European road network to other, more environmentally friendly modes of transport. In this regard, the Commission recognised that the implementation of the Italian Ecobonus scheme would encourage the concentration of cargo flows, originating from and directed to Italy, on maritime routes. Additionally, it was observed that the subsidy would also rebalance the infrastructural costs, external and specific ones, related to competing modes of transport. To this extent, it is highlighted that prices for road transport do not reflect its real cost for society and that maritime services imply much higher starting, as well as operating costs. As a result, road transport operators would not choose short sea shipping services, if they had to base their decision exclusively on economic convenience. Therefore, the need for public intervention to compensate for the externalities caused by road transport is acknowledged and agreed upon by the Commission. Moreover, another feature of the measure, that has positively affected the Commission's judgement of the incentive scheme in terms of compatibility with European Regulations, is its long-term effectiveness. Actually, it should be mentioned that one of the conditions for road haulage companies to benefit from the subsidy is to keep their traffic volumes on subsidized routes constant for the three years following the Ecobonus implementation. Moreover, with respect to other European financing tools for the development of the MoS that are focused on supporting supply-side measures, i.e., the development of infrastructural upgrades to make maritime routes more attractive, the Ecobonus tackles the issue from the demand-side. As will be analysed in the following paragraph, this aspect has important implications with regard to European regulation on matters of market competition. With comparison to other modes of transport, sea shipping displays a fundamental difference. It does not connect one point to another in as straight a line as possible. Indeed, cargo originating from or destined to a broad hinterland is transported via a number of different competing ports. The most competitive and efficient ports for a particular trade will then be included in the various sailings. In this context, important considerations were made with regard to how incentive schemes might significantly hamper competition among ports in a given region. In its working document on the Motorways of the Sea, the European Economic and Social Committee (EESC) identified the Italian Ecobonus as a "well-directed aid without distortion of competition"<sup>4</sup>. According to the Committee, the concentration of cargo on a limited number of selected ports will have a negative influence on the efficient provision of maritime services and will undoubtedly lead to congestion in the ports and their surrounding areas. This, in turn, would not help the sustainable development of transport. By subsidizing road haulage companies, the Italian Ecobonus scheme does not undermine competition among ports. Instead, it incentivizes road hauliers to shift from "all-road" to "maritime-road" transport mode by selecting the ports that better fit their schedule and routes. Additionally, the impact of the measure on the demand for rail transport and already existing maritime routes was assessed in order to verify for the full absence of distortions of competition<sup>5</sup>. To this extent, it was concluded that:

- The subsidized routes are part of a different relevant market with respect to the rail transport services in question: the Italian Ecobonus aims at shifting consumer and perishable goods away from the road network, while conventional (non-intermodal) rail transport is mostly concerned with bulk goods such as wood, steel, crops and chemical products.
- The selection criteria for route eligibility (that will be discussed in the next section of the paper) and the condition that short sea shipping fares are kept constant (only adjustments for inflation are allowed), exclude for distortions of competition with respect to existing maritime services.

<sup>4</sup> *Opinion of the European Economic and Social Committee on the Motorways of the sea in the logistics chain (exploratory opinion)*, European Social and Economic Committee (2008). Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008AE0069&from=EN>

<sup>5</sup> Ibidem.

Considering all these factors, the Commission has deemed the Ecobonus and its extension for 2010 (C (2013) 4392 fin), compatible with EU Regulations, given that the following conditions were met:

- The aid must not exceed three years in duration and its purpose must be to subsidise a shipping service connecting ports situated in the territory of the Member States (this condition has later been revised, given the effects of the 2009 economic downturn).
- The service must be of such a kind as to permit transport (of cargo essentially) by road to be carried out wholly or partly by sea, without diverting maritime transport in a way which is contrary to the common interest.
- The aid must be directed at implementing a detailed project with a pre-established environmental impact, concerning a new route or the upgrading of services on an existing one, associating several ship-owners if necessary, with no more than one project financed per line and with no renewal, extension or repetition of the project in question.
- The purpose of the aid must be to cover up to 30% of the operational costs of the service in question.
- The aid must be granted based on transparent criteria applied in a non-discriminatory way to ship-owners established in the Community. The aid should normally be granted for a project selected by the authorities of the Member State through a tender procedure in compliance with applicable Community rules.
- The service, which is the subject of the project, must be of a kind to be commercially viable after the period in which it is eligible for public funding.
- The aid must not be cumulated with public service compensation (obligations or contracts).

On the 20<sup>th</sup> of September 2005, the Commission first approved the Italian Ecobonus scheme for a total duration of three years. In 2013, the duration of the state aid was authorised to be extended for two more years, given the economic downturn effect that more than offset the measure impact.

### **2.3. Beneficiaries**

As specified by the Commission in its decision, the beneficiaries of the Ecobonus were all EU road haulage companies embarking their vehicles and trailers, both accompanied and unaccompanied, on RoRo ships operating on those routes that were identified as eligible by the Italian Ministry of Transport and Infrastructure. Road haulage companies could apply for Ecobonus reimbursement independently or as members of either a temporary or a permanent association/consortium. These opportunities were used by several road haulage companies since, as to be eligible for Ecobonus reimbursements, road hauliers would have had to board at least 80 times on the given route, every year. Moreover, if the number of undertaken trips would have exceeded 1,600 on a yearly basis, transport operators were to benefit from an additional incentive. Such conditions were set as a supplementary measure in order to trigger a consolidation trend in the highly fragmented Italian road haulage industry and increase the load factor of ships used for freight transport. Additionally, applications submitted for Ecobonus funding had to include a commitment by the given road haulage company to maintain the same boarding volumes as during the subsidisation period, in terms of trips and quantity of goods transported, for the three years following the expiry of the scheme. The incentive was aimed at compensating part of the costs incurred by hauliers when choosing a short sea shipping solution over an “all-road” transport one. More precisely, the Ecobonus, taking the form of a non-reimbursable grant, was aimed at compensating the excess external costs generated by road transport with respect to those generated by maritime transport. The said difference would have been computed based on an environmental study performed by the Italian non-profit organisation Friends of the Earth. The calculation model developed by the said organisation incorporated factors such as greenhouse gases, atmospheric pollution, noise, congestion and accidents. According to the results of the study, hundred HGV km driven on a motorway cost society €212, while the same distance spent by HGVs on a RoRo vessel costs society approximately €79. The difference between the two, €133, represented the amount, in terms of external costs per 100 km, that society could save by shifting freight transport from road to sea. The said amount was identified as the basis for setting Ecobonus subsidies to road hauliers. The Ecobonus financing rate ceiling was set at 30% of the ticket prices charged on the selected short sea shipping routes, including potential extra bonuses. As will be analysed in the following section, the reimbursement rate

was adapted to each route's specific market condition. More specifically, a 20% aid was foreseen on existing MoS routes, while a 30% aid was granted on newly established MoS routes, both domestic and international ones. Finally, the Commission's decision clearly stated, that financial support could be provided only in case that short sea shipping tariffs on the given eligible route stayed constant, in line with the rate of inflation.

## 2.4. Management

The Ministerial Decree Law published on the 8th August 2008 identified national and EU routes to be subsidised through the Ecobonus initiative according to the following criteria:

- sustainability of the maritime route for fostering the shift of substantial amounts of traffic from road to sea;
- sustainability of the maritime route for reducing congestion on the Italian road network;
- foreseeable environmental improvement through the use of the maritime route compared with the corresponding road route.

Provided that the present study will focus on the international routes between Italy and Spain, the impact of the aforementioned criteria on the selection of domestic route will be neglected. In accordance with these criteria, international maritime routes that did not represent a real alternative to road transport were not eligible for a grant. Those were the routes between Italy and Albania, Croatia, Greece, Libya, Malta, Montenegro, Morocco, Tunisia, and Turkey (Adriatic axis and Mediterranean Sea).

Thus, the international routes identified as eligible for Ecobonus support (Table 1), were those facing competition from alternative and particularly competitive "all-road" transport solutions. As is possible to observe, the incentivized routes were all those crossing the Tyrrhenian and Ligurian Sea towards France and Spain, whose competition is to be found in the land transport network that, via the Ventimiglia border, connects Italy with Southern France and, eventually, Spain.

**Table 1 - International routes funded by the Ecobonus and relative financing rates**

International Routes	From 80 to 1599 trips done in the 2007-2009 period	More than 1600 trips done in the 2007-2009 period
Civitavecchia – Barcelona	20%	25%
Civitavecchia – Tarragona	20%	25%
Civitavecchia – Toulon	20%	25%
Genova – Algeciras	10%	12,5%
Genova - Barcelona	10%	12,5%
Livorno – Barcelona	20%	25%
Livorno – Tarragona	15%	18,75%
Livorno - Valencia	15%	18,75%
Palermo – Valencia	20%	25%
Salerno – Tarragona	20%	25%
Salerno - Valencia	20%	25%

Source: Ministerial Decree Law of the 8th of August 2008

The subsidisation rates were established by the Ministerial Decree Law of the 8th of August 2008. Such rates did not result from the application of a specific mathematic formula, instead they were defined in consideration of a number of criteria:

- 30% upper threshold for the legitimacy of state aids

- higher incentive for new routes versus existing routes
- higher incentive for longer road distance avoided on Italian territory and external costs saved through modal shift
- higher incentive in case more than 1600 trips were done by the same road haulier or consortium of road hauliers.

As it clearly emerges from the financing rates granted as a percentage of sea fare charged on the international routes selected by the Ministerial Decree, the longest routes were those benefitting from the largest incentive rates. By contrast, shorter routes, providing for the avoidance of shorter land distances, were benefitting from the smallest subsidisation rates.

Moreover, according to the route selection criteria, road hauliers were given the opportunity to initiate new sea routes not identified by the Ministerial Decree Law, if they were able to guarantee regular new connections not in competition with existing ones along the following sea corridors:

- North Adriatic and both, South Adriatic and Ionian Sea;
- North Tyrrhenian and South Tyrrhenian;
- Tyrrhenian and all the French and Spanish ports.

Finally, the Commission's decision (C (2005) 1155 fin) specifies that if the aid to be granted should have exceeded the budget planned for the implementation of the Ecobonus, additional funds may have been laid down through a specific Ministerial Decree Law.



## 3. Data gathering

To carry out the analysis that will follow in the next chapters, information has been mostly retrieved from the main stakeholders (i.e. road haulage companies and shipping lines operating along the RoRo transport chain) on the concerned routes and on comparable ones.

Part of Information on traffic volumes for international routes has been gathered also from port authorities, Eurostat and Shippax, the leading provider of maritime statistics. Specifically, data covers traffic between Italy and Spain, as well as routes between Italy and the Western Mediterranean region for the whole 2004-2014 period.

Additionally, insights of a qualitative nature have been gathered from both road hauliers and shipping lines respectively through a survey and individual interviews.

Data relative to macroeconomic factors have been collected from statistical databases of proved reliability such as the ones provided by Eurostat, the World Bank and Istat (the Italian national institute of statistics).

### **3.1. Quantitative data (traffic volumes, economic performance, trade flows and inflation)**

The trend analysis concerning the evolution of RoRo freight traffic volumes on Ecobonus routes between Italy and Spain mainly relies on:

- Traffic volumes measured in trailers/year. This data has been collected from Grimaldi Lines S.p.a. (hereafter referred to as “Grimaldi”) and Grandi Navi Veloci S.p.a. (hereafter referred to as “GNV”), as well as from the authorities of the different ports located on the analysed routes. Statistics on a limited number of years were retrieved from Shippax.  
Traffic data on routes towards Greece and Turkey has been retrieved from the European Commission study on the Revision of the MoS Initiative (2011). However, data is available only for the period until 2009 - the year before the subsidisation’s interruption.
- Traffic volumes data in tonnes/year, which is required in order to run both the Marco Polo modal shift calculator and further steps of the cost benefit analysis, has been obtained by converting traffic data available in trailers/year according to tonnage conversion rates employed and provided by GNV and Grimaldi.

As for complementary data regarding the different countries’ economic performance, trade flows between the interested regions (available for each transport mode) and changes in the level of prices (inflation), information has been collected respectively from databases made available by the World Bank, Istat and Eurostat.

In order to guarantee the highest possible coherence between different data sets, wherever possible, Italian reporting entities have been chosen for data extraction.

### **3.2. Stakeholders consultation**

#### **3.2.1 Interviews with shipping lines**

In order to deepen the understanding of the shipping lines’ perception on the benefits achieved from the Ecobonus implementation, individual interviews with Grimaldi<sup>6</sup> and GNV<sup>7</sup> have been conducted. Such

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<sup>6</sup> Telephone interview carried out on 17 May 2016.

interviews also served the purpose of assessing the robustness of the assumptions made when estimating the modal shift, as well as validating the traffic volumes-related time series that resulted from the integration of data provided from different reporting units. Considerations on the findings of the interviews will be made in the following sections, where the concerned topics are addressed.

### **3.2.2. Survey**

In order to better analyse the aforementioned points, and for the evaluation to be as accurate as possible, a survey was conducted with the aim of collecting hauliers' views with respect to the effects of the Ecobonus scheme. The survey served the purpose of complementing numerical data with qualitative considerations provided directly by road hauliers. In fact, a questionnaire (Annex 2) was distributed by RAM S.p.a. to all those road haulage companies and lorry drivers that benefitted from the Ecobonus scheme.

As of the 8<sup>th</sup> of May 2016, 14 road hauliers from five different countries had responded to the survey. The sample size does clearly not allow for a statistically significant analysis. However, general trends can be identified and considerations, of a qualitative nature, can be made in order to enrich the present study with the transport operators' perspective. In the attempt of driving up the survey's response rate, approximately 30 more road haulage companies (Italian and international), the ones for which telephone numbers were available, have been directly contacted by PwC. Even though the response rate has not been sufficiently improved, through those interviews additional comments and insights were gathered.

The survey touches, and provides interesting insights, on all aspects addressed in the present study, such as the degree of usage of RoRo services by road hauliers before, during and after the implementation period of the Ecobonus scheme, their motivations for either using or not using short sea shipping services (SSS), the bureaucratic costs incurred in order to benefit from the incentive, as well as the perceived increase in fares on the aforementioned routes (see Annex 2 for the complete set of questions). Therefore, reference will be made to the findings of the survey throughout the whole study, depending on the addressed topic. When relevant, complementary information acquired during the telephone interviews will be quoted.

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<sup>7</sup> Telephone interview carried out on 18 May 2016.



## 4. The modal shift

### 4.1. Introduction

The aim of this chapter is to assess the effects of the Italian Ecobonus Scheme, implemented between 2007 and 2010, in terms of the modal shift from “all-road” to “road-maritime” transport mode it has been able to induce. The analysis specifically focuses on RoRo traffic flows recorded on international routes between Italy and Spain. Given the unstable economic conditions that have characterised the years in which the Ecobonus has been implemented, RoRo traffic trends on a set of additional routes have been analysed for comparison. In this respect, the following analysis identifies routes between Italy and Greece and between Italy and Turkey as a benchmark for traffic flows on routes not incentivised by the Ecobonus. More precisely, the modal shift estimate will also rely on the comparative analysis between traffic trends recorded on incentivised routes and those observed on non-incentivised southeast Mediterranean routes, adjusted for a number of relevant exogenous factors.

As a matter of fact, the analysis also takes into account external macroeconomic factors, which are likely to have influenced the level of transport demand over the concerned period; namely country economic performance (i.e. GDP) and international trade flows of goods (i.e. the sum of import and export in terms of volumes, measured in tonnes traded per year).

### 4.2. Trend analysis

#### 4.2.1. Number of trailers transported by RoRo

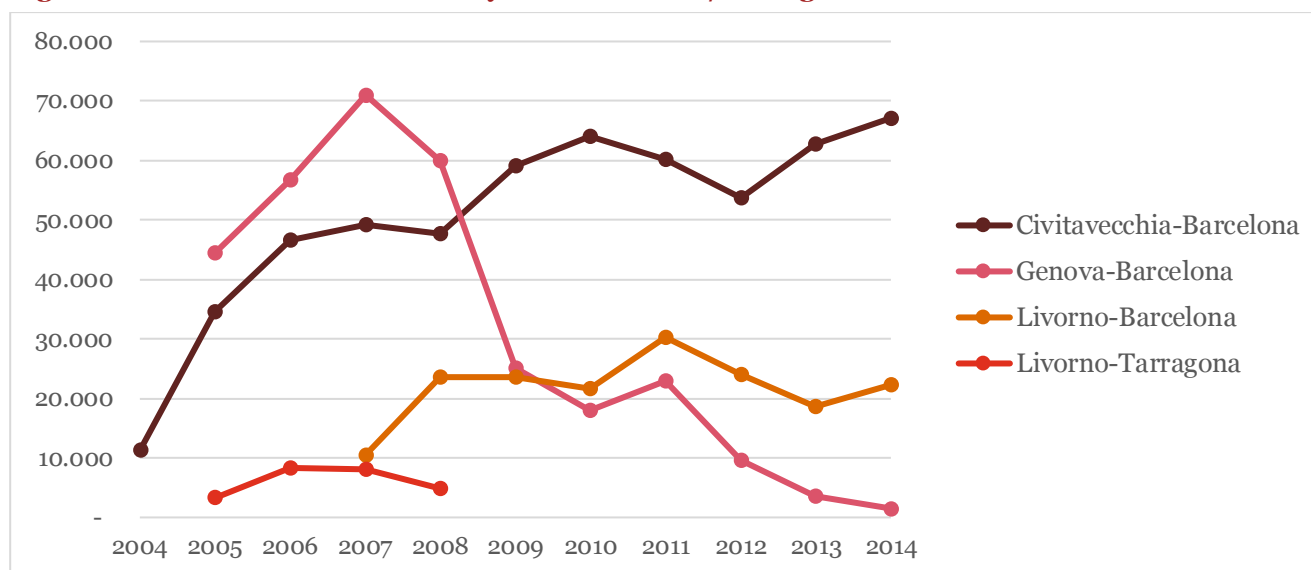
As described in the previous chapter, eight international routes have benefitted from Ecobonus subsidisation in the period between 2007 and 2010. All of the routes but one (i.e. the Civitavecchia-Toulon) connected an Italian port with a Spanish one. Two routes are no longer active: the Civitavecchia-Toulon was operated between 2005 and 2009; the route Livorno-Tarragona was operated only between 2006 and 2009. However, the competing route of the latter – the Livorno-Barcelona – is still operative.

Data employed for analysis in this section, available in transported trailers/year, has been provided by WestMos project, Grimaldi, GNV, Shippax and different port authorities depending on the interested route. To this extent, it has to be mentioned that in a number of cases the aforementioned entities have derived trailers/year figures from data originally measured in linear meters by employing different conversion factors. In some cases this has resulted in data discrepancy. The said data has been accurately elaborated and adjusted in order to allow for a coherent trend analysis and the comparability of time series<sup>8</sup>. Finally, the consolidated data set has been delivered for examination to the concerned shipping lines that have validated its soundness and accuracy.

Figure 1 displays traffic trends, in terms of accompanied and unaccompanied trailers, on routes between Italy and Barcelona and Tarragona. As of today, with more than 67,000 accompanied and unaccompanied trailers transported over 2014, the Civitavecchia-Barcelona is the busiest RoRo route between Italy and Spain.

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<sup>8</sup> For those cases, Annexes including calculation sheets along with a detailed description of the adjustments have been attached at the end of the document.

**Figure 1 - RoRo traffic between Italy and Barcelona/Tarragona: number of trailers**

Source: PwC elaboration based on data from Grimaldi, GNV, WestMoS and Shippax, data collected on April 2016

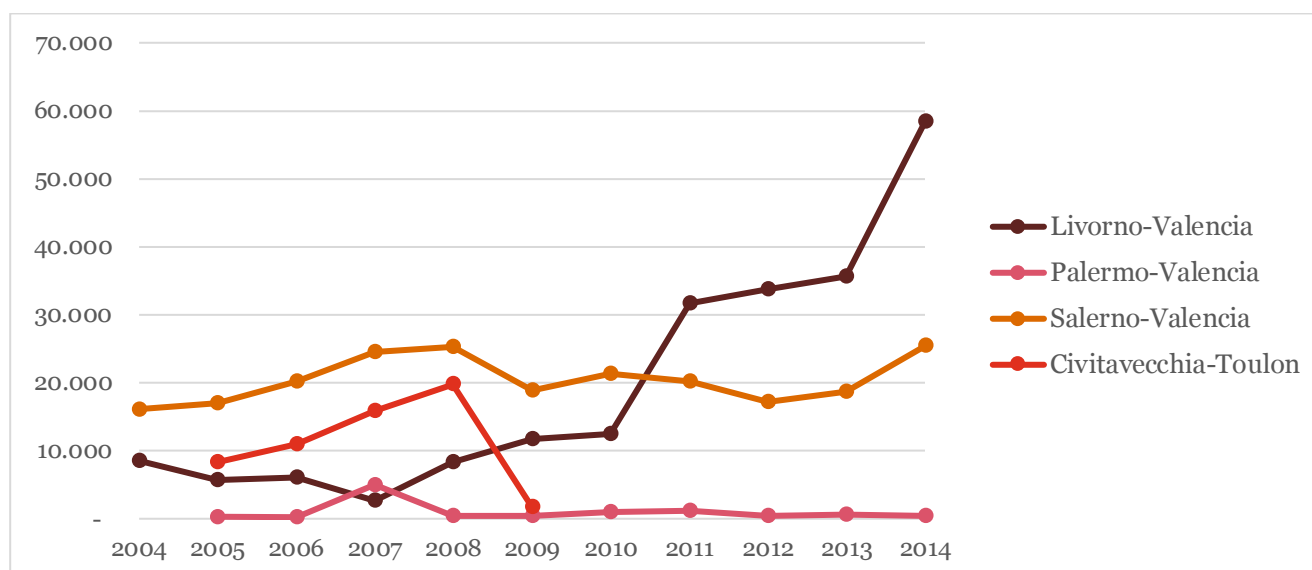
It is interesting to observe how the Genova-Barcelona route, the busiest RoRo route until 2008, experienced a sharp decline in traffic volumes from the second year of the Ecobonus deployment onwards. According to data provided by GNV, the maritime shipping company operating the route, in 2014 only 1,500 trailers were transported between Genova and Barcelona compared to the 71,000 of 2007. As stated by the shipping line during the aforementioned interview, such a decline in traffic volumes is due to competition from other alternative routes and, mostly, to the restructuring of the company's maritime services supply that has been shifted towards other, more profitable, routes. More precisely, the restructuring of the company's supply on the route at stake consisted in the gradual reduction of the number of sailings per weeks offered, which dropped from one sailing per day in 2006 (i.e. seven per week) to three per week in 2013.

Nevertheless, freight previously flowing on the said route seems to have been more than absorbed by the Livorno-Barcelona<sup>9</sup> and Civitavecchia-Barcelona routes with the sailing frequency on the latter increasing by three sailings per week and the former being newly established in 2007. A share of the RoRo traffic flowing on the Genova-Barcelona route might have also been diverted towards the Livorno-Valencia route. In fact, such routes have recorded exponential traffic flows growth, probably in excess of newly formed demand for RoRo services. By contrast, it seems very unlikely that part of the aforementioned traffic has shifted to road transport modality, given that international trade by road between Italy and Spain has sharply decreased during and after the implementation period of the Ecobonus (Figure 12).

Trailers per year data for the Genova-Barcelona route has been provided by a collection of different sources. It has to be reported that significant discrepancies have been observed between figures provided by the different entities, including GNV and the Genova Port Authority. However, nearly identical growth/decline trends were identified and an adjustment based on the most conservative data set has been performed.

Figure 2 depicts RoRo traffic on routes between Italy and other ports in the Western Mediterranean (i.e. Valencia and Toulon). Livorno-Valencia after posting impressive growth over the recent years represents currently the second-best performing route between Italy and Spain. By contrast, the Salerno-Valencia route has historically held a relevant share of RoRo market between Spain and Italy; however, this route recovered very slowly from the conspicuous traffic volumes decline recorded in 2009 as a direct consequence of the economic crisis.

<sup>9</sup> In 2009 Grimaldi and Flota Suardiaz merged their Livorno-based operations by giving rise to the joint venture Grimaldi & Suardiaz Lines. As a consequence, the Spanish shipping line dismissed the Livorno-Tarragona route by transferring its vessels to the aforementioned joint entity operating on the Livorno-Barcelona one. Hence, for 2009, it is reasonable to assume that most of the traffic recorded until 2008 on the Livorno-Tarragona route shifted to the Livorno-Barcelona.

**Figure 2 – RoRo traffic between Italy and other ports in the West Mediterranean: number of trailers**

Source: PwC elaboration on data from Grimaldi and Shippax, data collected on April 2016

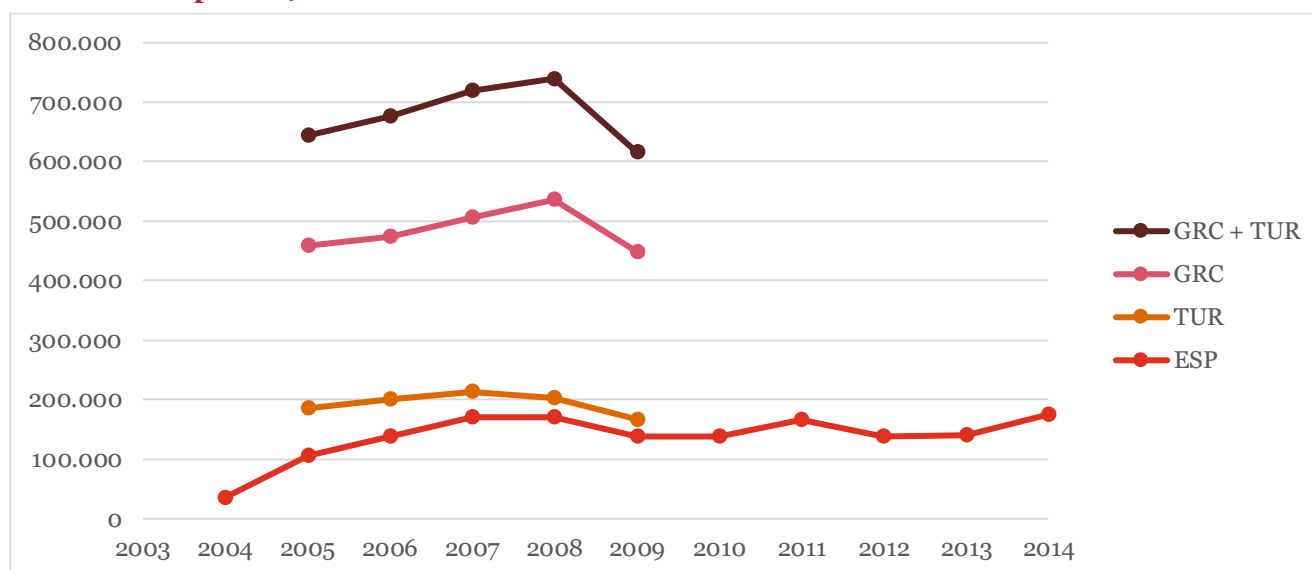
All variations considered, it is evident that traffic flow declines observed on certain RoRo routes between Italy and Spain have been more than offset by significant traffic growth on international routes between the two countries. As a matter of fact, traffic flows recorded on Ecobonus routes over the latter's implementation period (2007-2010) have been averagely 12% higher with respect to 2006 levels. In fact, between 2007 and 2010 approximately 155,000 trailers were being transported, on a yearly average, on Italian-Spanish Ecobonus routes compared to the 137,000 carried in 2006 and the 105,000 carried in 2005. However, if analysed in isolation, these growth figures are not sufficient to draw any conclusion on the impact of the incentive scheme.

Therefore, in order to evaluate the effects of Ecobonus subsidisation on international routes between Italy and Spain, it is proposed to analyse trends of other international RoRo routes connecting to Italy that have not benefitted from the incentive. To this aim, routes connecting with Greece and Turkey, respectively, the first and second largest international origin or destination for RoRo routes connecting to Italy, have been analysed for comparison. Unfortunately, traffic data for such routes is only available for the period between 2005 and 2009. Nevertheless, even though it is not possible to base the modal shift calculations on the comparative analysis between the two sets of routes, any significant difference observed in the trend of traffic flows over the 2007-2009 period, adjusted for relevant exogenous factors, will provide a first partial estimate of the Ecobonus impact on traffic volumes growth.

In the chart below (Figure 3), traffic trends observed on routes subsidised through the Ecobonus (i.e., routes between Italy and Spain) are compared to those recorded on non-subsidised routes connecting Italy to the aggregate region of Turkey and Greece. It is worth mentioning that, in absolute terms, RoRo traffic between Italy and the latter countries is consistently higher with respect to traffic volumes on Italian-Spanish SSS routes. More precisely, with 675,327 trailers transported on the aforementioned southeast Mediterranean routes over 2006, RoRo traffic between Italy and the aggregate region of Turkey and Greece was almost five times larger than the same kind of traffic on Ecobonus routes, on which 137,883 trailers were transported over the same year. This is due to the fact that no real road alternative is available for freight transport between Western Europe and both Turkey and Greece.

Apparently, RoRo traffic towards the said region has also been growing during the period in which the Ecobonus was deployed on western Mediterranean routes, although a sharp decline in traffic volumes, causing the number of transported trailers to touch an overall low of 616,132 units, is to be observed for 2009, the year of the great recession. Not surprisingly, for 2009 a very similar trend has been recorded on Ecobonus routes between Italy and Spain.

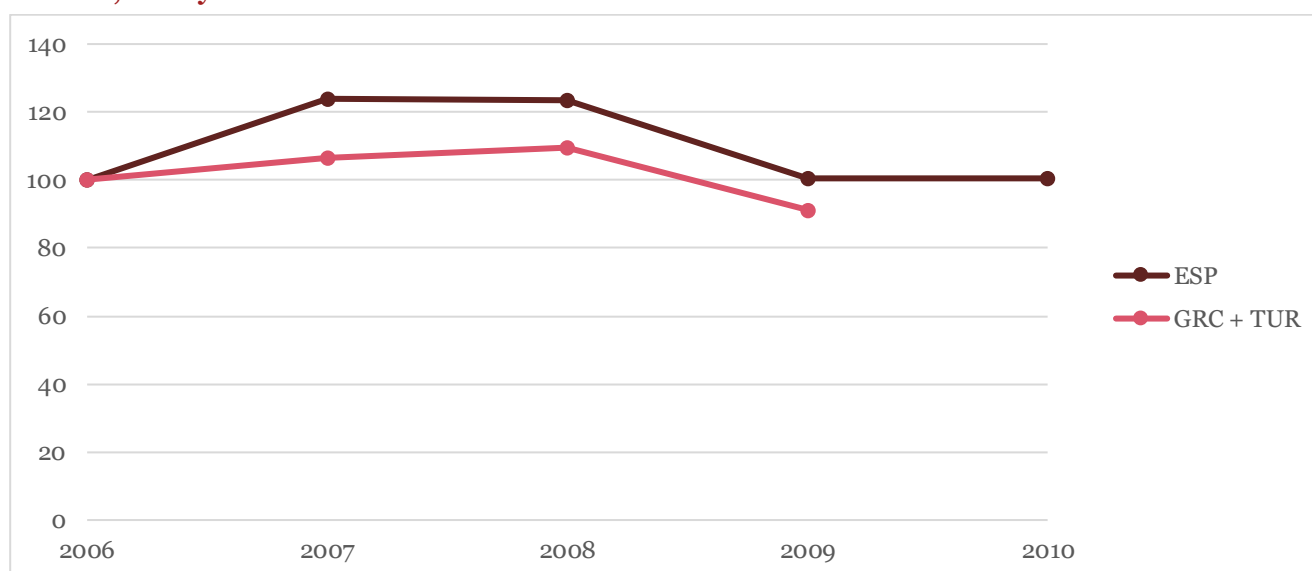
**Figure 3 – RoRo traffic between Italy and selected countries: number of trailers (accompanied and unaccompanied)**



Source: PwC elaboration on data from Grimaldi, GNV, Shippax and concerned port authorities

In order to make the comparison between traffic trends on both sets of routes clearer, in the graph below (Figure 4) traffic volumes that had previously been displayed in absolute terms, have been indexed with 2006 as a base year. During the period of deployment of the Ecobonus, Spain clearly outperformed the aggregate region of Turkey and Greece in terms of RoRo traffic towards Italy. More precisely, during the first year of Ecobonus deployment RoRo traffic on Italian-Spanish routes has grown by 24% with respect to a modest 6% growth recorded on the routes selected for comparison. On average, over the 2007-2009 period, RoRo traffic volumes on the latter routes were averagely 2% higher with respect to 2006 levels. Throughout the same period, traffic volumes on RoRo routes between Italy and Spain were averagely 16% higher compared to 2006 levels, implying a 14% better traffic performance of Ecobonus routes as compared to non-subsidised ones.

**Figure 4 – RoRo traffic between Italy and selected regions: Index numbers based on number of trailers; base year = 2006**



Source: PwC elaboration on data from Grimaldi, GNV, Shippax and concerned port authorities

Through the graph above, it also becomes evident that, despite having recorded similar traffic decline rates in 2009, RoRo traffic on routes between Italy and the aggregate region of Turkey and Greece has dropped below 2006 levels, compared to a return to pre-Ecobonus levels for traffic volumes between Italy and Spain. In other

words, the traffic volumes expansion experienced on incentivised routes in the first years of Ecobonus deployment has smoothen the drawbacks of the 2009 recession. Finally, if the whole incentive implementation period is considered (i.e. from 2007 to 2010), the increase in the level of trailers transported on RoRo routes between Italy and Spain drops from a 16% average to a 12.1% one, less than the difference obtained by comparing traffic volumes on subsidised and non-subsidised routes over the 2007-2009 period (14%).

Whether the described higher traffic volumes and the limited impact of the crisis on routes between Italy and Spain is to be totally credited to the Ecobonus deployment cannot yet be established. However, it has clearly emerged that routes supported by the incentive scheme have performed consistently better with respect to the rest of RoRo routes connecting to Italy.

In the following sections of this chapter, other relevant factors that are likely to have had an impact on RoRo traffic volumes on both sets of routes, such as general economic performance, international trade flow trends and the change in freight volumes transported by road will be inspected. By cross comparing the trends observed in those variables the share of RoRo traffic volumes growth to be considered as Ecobonus-related modal shift will be established.

### ***4.2.2. Effects of the recent economic crisis on RoRo traffic***

Short Sea Shipping transport as other modes of transport have been affected by the recent economic crisis. The economic slowdown was initially triggered by events in the American banking sector<sup>10</sup>. As Europe entered into recession in 2009, a problem that started in the banking sector was about to start affecting sovereign debts of peripheral countries of the Eurozone. The crisis quickly spilled over to Greece, Italy and Spain and other non-Mediterranean countries like Ireland and Portugal. Turkey was affected by the Global and European economic crisis as well, although the effects were not as severe as for the above-mentioned countries.

#### ***4.2.2.1. Economic performance***

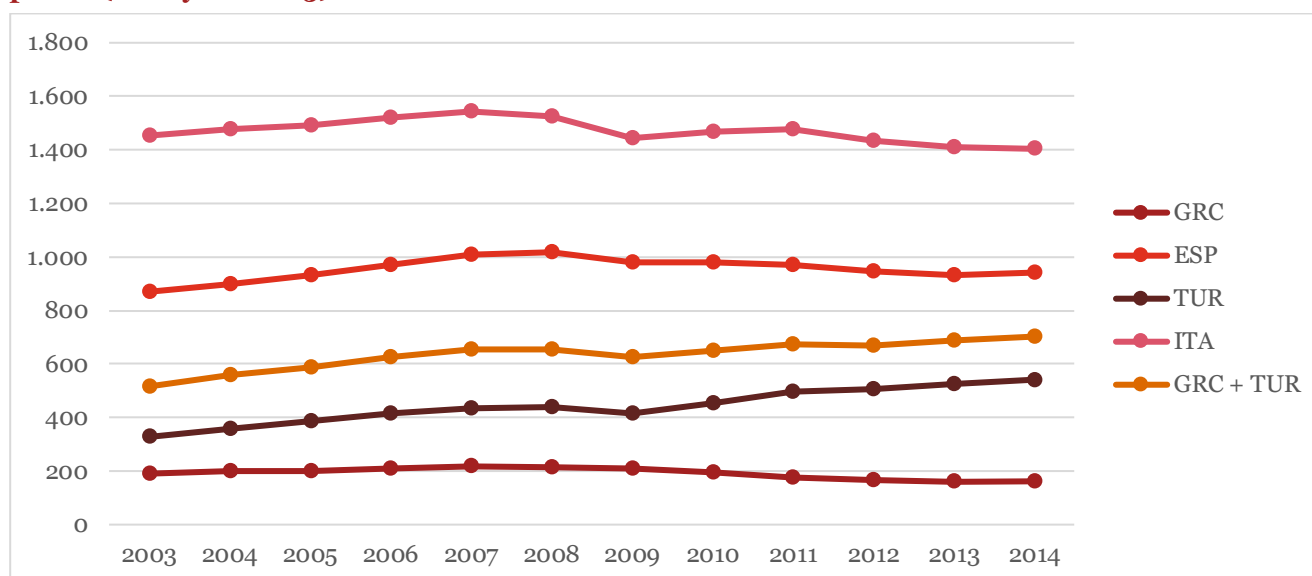
Economic performances of countries and regions are generally assessed by observing GDP trends. GDP can be defined as the sum of consumption, investments, government spending and net exports. It is therefore highly correlated with level of imports and exports, which are directly affecting freight transport traffic between countries.

As depicted in the chart below (Figure 5) the economic slowdown was particularly severe in 2009 – 3<sup>rd</sup> year of deployment of the Ecobonus. In 2010 – 4<sup>th</sup> year of deployment of the Ecobonus – the Gross Domestic Product (GDP) declined in Greece, it was stable in Spain and it fully recovered in Turkey.

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<sup>10</sup> On September 15, 2008, US's fourth largest investment bank, Lehman brothers, collapsed under the weight of its bad investments, scaring other banks and investors with which it did business.

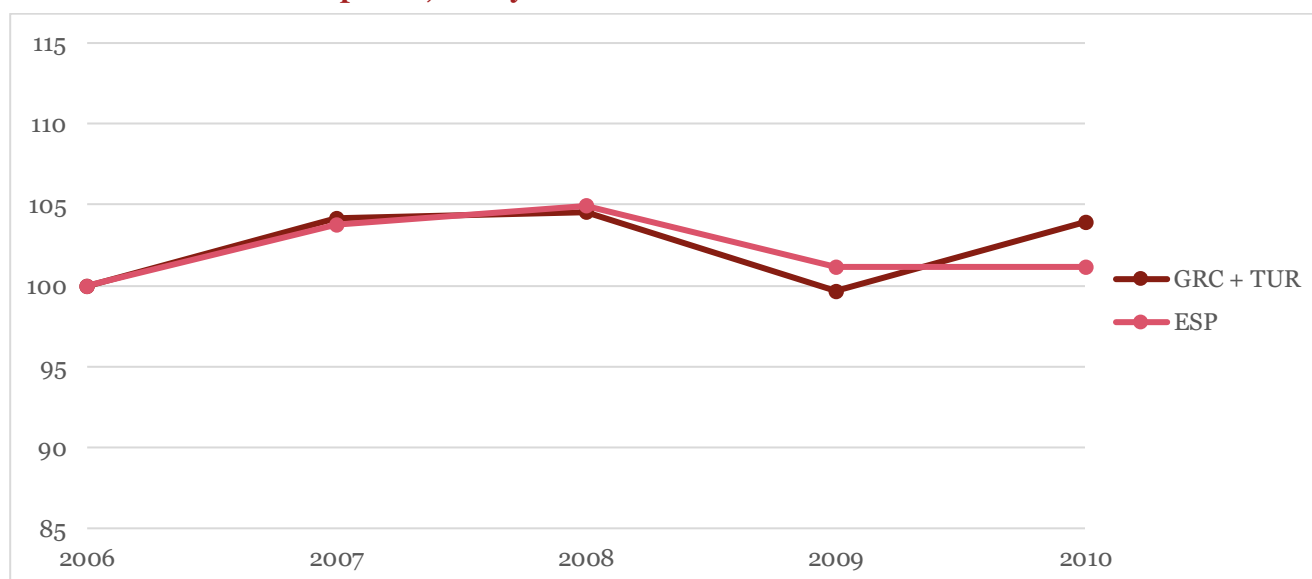
**Figure 5 - GDP at market prices in selected Mediterranean countries, Euro billion at constant prices (base year 2005)**



Source: PwC elaboration on data from World Bank, World Development Indicators, accessed on April 2016

The next chart (Figure 6) provides for index numbers of GDP growth taking 2006 as a reference year. The chart compares Spain with the aggregate of Greece and Turkey.

**Figure 6 - GDP at market prices in selected Mediterranean countries, Index number based on Euro billion at constant prices; base year = 2006**



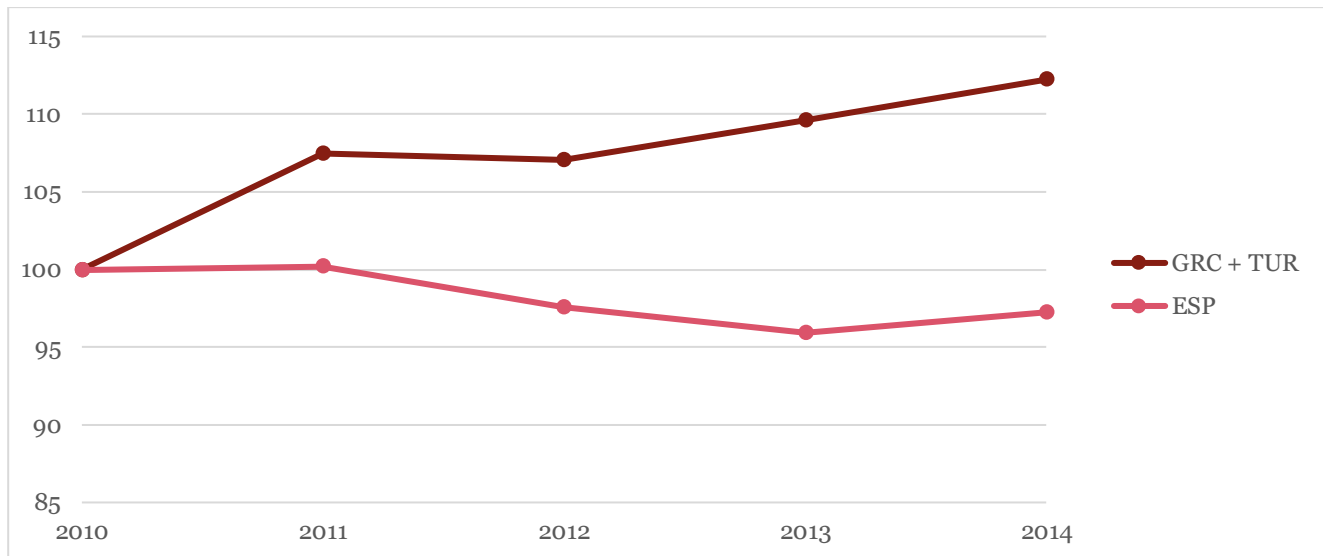
Source: PwC elaboration on World Bank, World Development Indicators, accessed on April 2016

In 2007 and 2008 both regions recorded similar GDP increases compared to their 2006 levels. In 2009 the economic crisis hit harder in the aggregated region of Greece and Turkey as compared to Spain. Conversely, in 2010, Greece and Turkey experienced a consistent economic recovery, while Spanish economic output stayed constant on 2009 levels.

Figure 7 compares the economic performance of Spain against the aggregate economic performance of Greece and Turkey over the period following the interruption of Ecobonus deployment on routes between Italy and Spain. The aggregated region of Greece and Turkey recorded a robust GDP increase over the period as the

combined effect of strong economic growth in Turkey and economic slowdown in Greece. By contrast, Spain's GDP was constantly below its 2010 levels.

**Figure 7 - GDP at market prices in selected Mediterranean countries, Index numbers based on Euro billion at constant prices (base year, 2010 = 100)**



Source: PwC elaboration on World Bank, World Development Indicators, accessed on April 2016

All variations considered, over the analysed period (2007-2010), the aggregate economic output of Turkey and Greece was, on average, 3.1% higher compared to its 2006 levels. Over the same period, Spain recorded 2.8% averagely higher GDP levels with respect to 2006, implying 0.3% less favourable economic conditions as compared to the aggregate region of Turkey and Greece.

Hence, it is expected that demand for transport services between Italy and Greece and Turkey was positively affected by the economic performance of the involved region whereas it is expected that the transport demand between Italy and Spain was negatively affected by the economic slowdown observed in Spain.

#### 4.2.2.2. *International trade performance*

International trade is an even more accurate proxy of freight transport demand between countries than pure economic performance. However, trade statistics do not account for freight transiting in a country, which is not origin or destination of trade. For instance, cargo transported between Germany and Turkey is likely to transit through Italy, hence generating RoRo traffic between Italy and Turkey, but it is not going to be accounted into trade statistics between Italy and Turkey. Indeed, according to a recent study by Isfort on data from a survey carried out by the Port Authority of Ancona among truck drivers embarking to Greece or Turkey, up to 71% of them were arriving from outside Italy. In other words, less than 30% of RoRo traffic between Italy and the South East Mediterranean region has Italy as an origin or a destination.

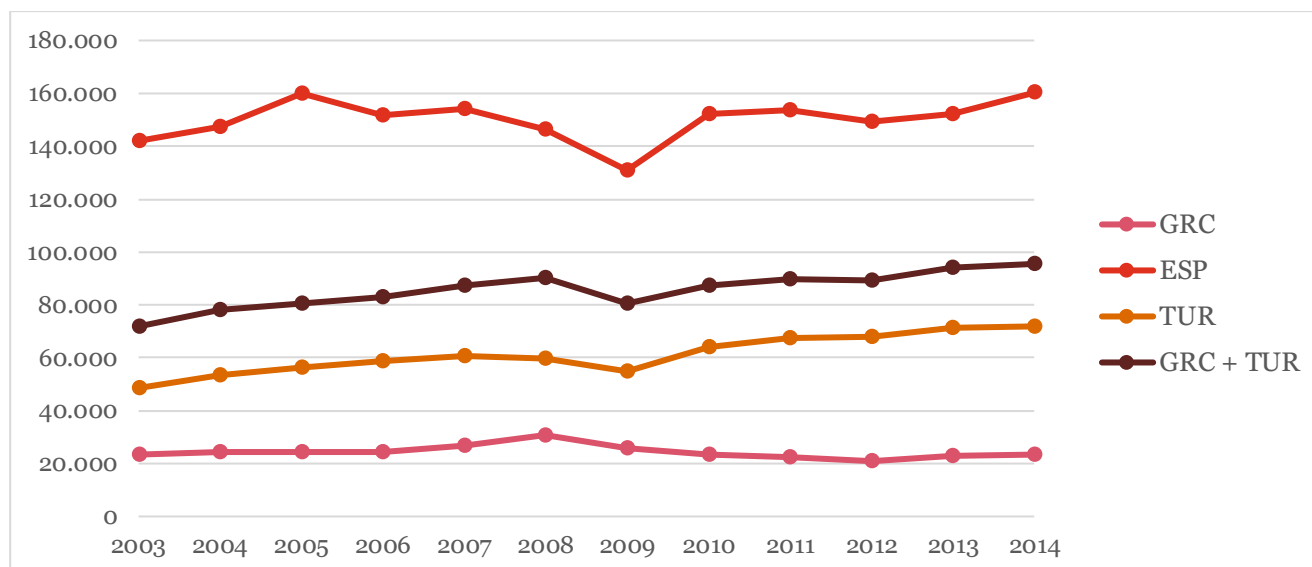
Even if to a lesser extent, this is true also for RoRo traffic between Italy and Spain. In fact, as is to be observed in the contact list of Ecobonus beneficiaries provided by RAM S.p.a., road haulage companies from countries such as Greece, Portugal and Austria have also benefitted from the incentive throughout its period of deployment, signalling the presence of transit traffic also on Ecobonus routes. This phenomenon is further supported by road hauliers from the aforementioned nationalities being among the respondents of the survey on the effects of the Ecobonus, in which they claim to have made extensive use (boarding rates range from 30-80% of total transported freight) of SSS services on the concerned routes during the incentive deployment period.

Therefore, in order to evaluate the effects of international trade on RoRo traffic between Italy and Spain, in the present section international trade flow trends between Spain and the rest of the European Union will be



analysed (Figure 8). Coherently, such trade figures are cross-compared with trade flow volume trends between EU Member States and the aggregate region of Turkey and Greece.

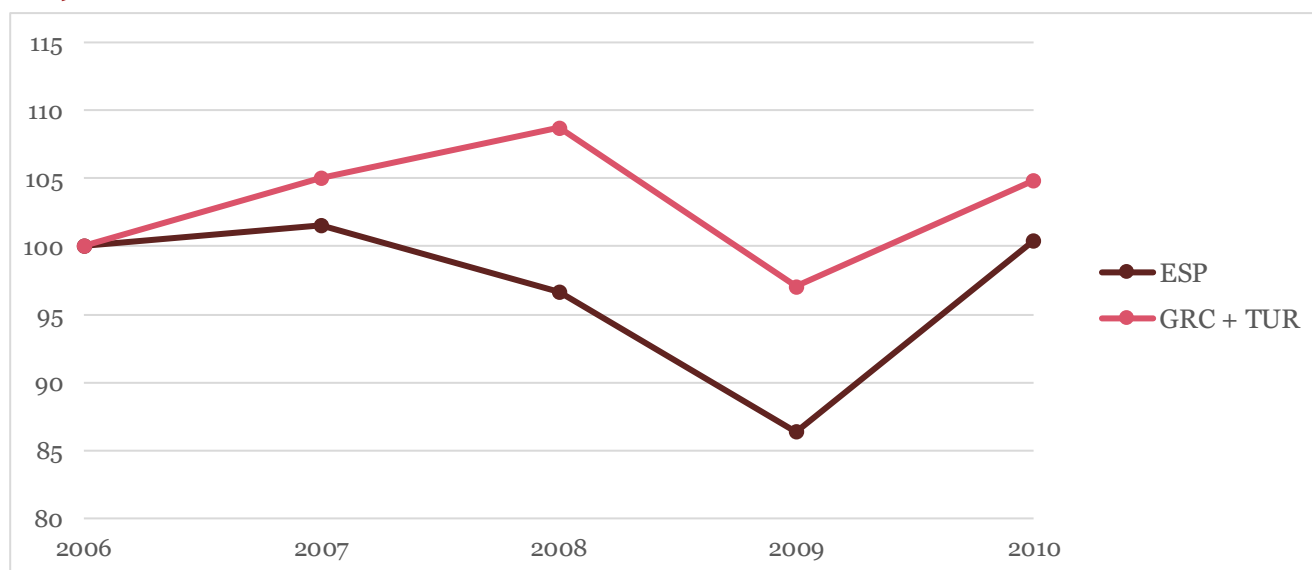
**Figure 8 - International trade flows between selected Mediterranean countries and EU28, thousand tonnes**



Source: PwC elaboration on data from Eurostat, accessed on April 2016

Trade flows between Greece and the rest of the EU declined as a direct effect of the 2009 economic crisis and never fully recovered ever since. Similarly, trade flows between Turkey and the EU experienced a conspicuous decrease during the 2009 recession. However, this drop was more than compensated by a strong and steady growth of trade flow volumes between Turkey and the EU during subsequent years. As a result, the consolidated level of traffic flows between the aggregate region of Turkey and Greece and the rest of the EU over the 2007-2014 period has been averagely higher than that observed in 2006. Conversely, trade flows between Spain and other EU Member States have been declining by a much larger extent between 2006 and 2009. However, since 2010, trade flow volumes have started to recover. Finally, in 2014, trade flows were set back to 2005 levels.

**Figure 9 - Trade flows between EU28 and selected Mediterranean countries (base year, 2010 = 100)**



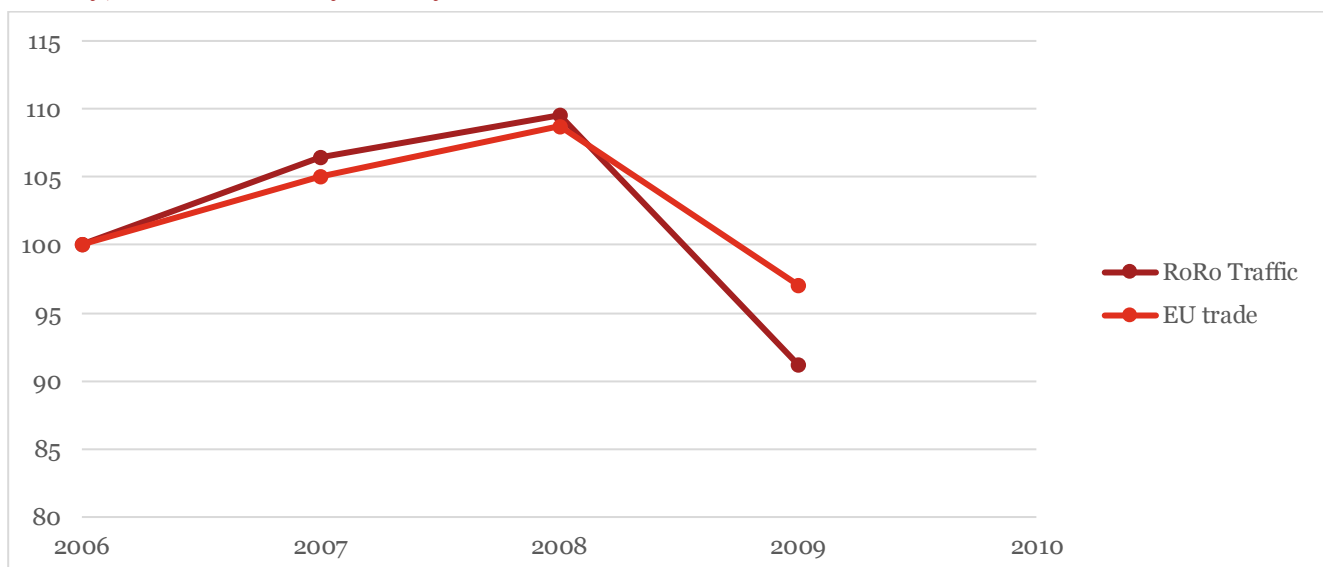
Source: PwC elaboration on data from Eurostat, accessed on April 2016



Figure 9 shows the index numbers for changes in trade flows between the European Union and the two regions, specifically for the Ecobonus deployment period. It is to be observed that, over the said period, trade flows between EU Member States, Turkey and Greece were, on average, 3.9% higher than 2006 levels. Oppositely, trade flow volumes observed between Spain and the rest of the EU have been averagely 3.8% lower than those recorded in 2006. The analysis suggests that RoRo traffic between Greece, Turkey and Italy has benefitted from a relevant increase in trade flows between the concerned regions and the European Union in the period of deployment of the Ecobonus. By contrast, over the same period, trade flows between Spain and the rest of the EU were consistently lower than before the implementation of the Ecobonus scheme.

In other words, between 2007 and 2009, 14% higher RoRo traffic volumes on Ecobonus routes as compared to non-subsidised routes have been reached despite slightly lower levels of output and a 7.7% negative difference in international trade flow volumes. This would suggest that the Ecobonus has not only contributed to RoRo traffic growth during its implementation period, but also that in the absence of it, traffic volumes on routes between Italy and Spain would have declined at a rate very similar to the one of trade flows contraction provided above. The said phenomenon becomes clearer when trade flow and RoRo traffic trends are analysed jointly for both regions.

**Figure 10 - Trade flows between Turkey, Greece and EU28 compared to RoRo traffic between Turkey, Greece and Italy (base year = 2006)**



Source: PwC elaboration on data from Grimaldi, GNV, Shippax, the concerned port authorities and Eurostat, accessed on April 2016

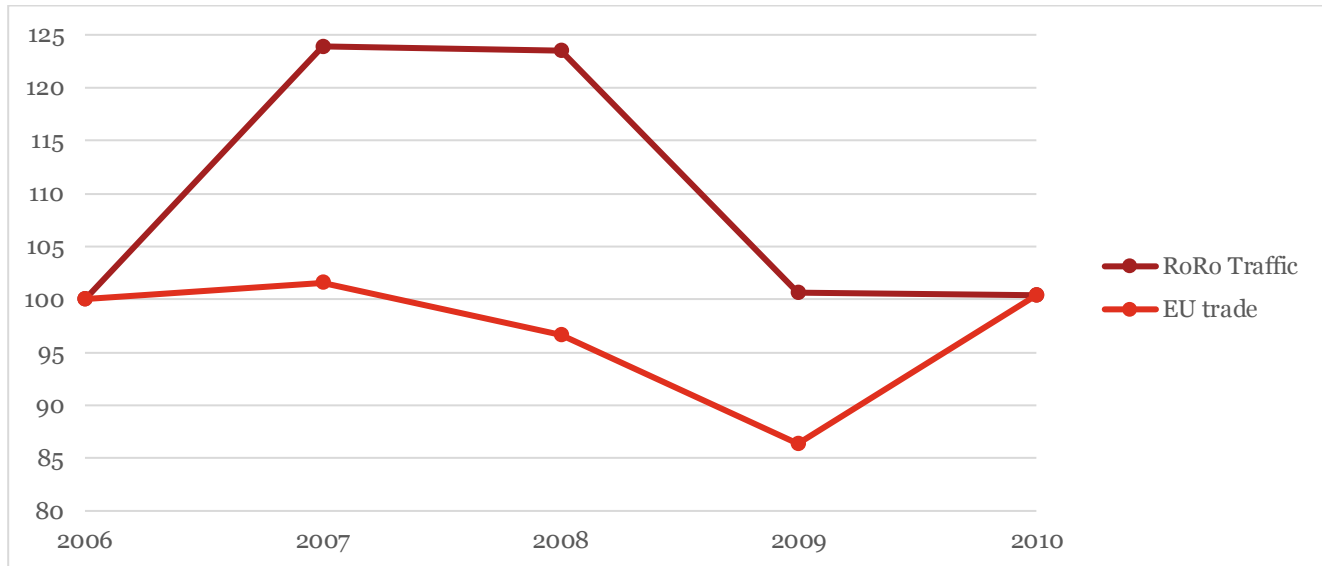
The graph above (Figure 10) depicts the clear relationship between RoRo traffic among Turkey, Greece and Italy and international trade flows between the former countries and the European Union, supporting the assumption that most of the freight flowing between the two regions has not Italy as either the origin or the final destination of trade. It is possible to observe that, over the 2007-2008 period, the increase in RoRo traffic between Turkey, Greece and Italy is almost identical to the one recorded for trade flow volumes between Turkey, Greece and EU Member States. As for 2009, RoRo traffic volumes between the concerned countries drop by a considerably larger amount (19 base points) compared to the decline in international trade flows recorded between Turkey, Greece and the EU28 (12 base points).

Considering that, as mentioned in the beginning of the present section, also on RoRo routes between Italy and Spain a significant share of RoRo traffic volumes represents freight that has neither Italy nor Spain as either the origin or final destination of trade, a decline in RoRo traffic similar to the drop in international trade flow volumes would be expected.

However, as is possible to observe in the next graph (Figure 11), despite significantly decreasing trade flow volumes between Spain and the rest of the Union, throughout most of the Ecobonus implementation period significant increases of RoRo traffic levels between the two countries are to be observed. Indeed, as mentioned

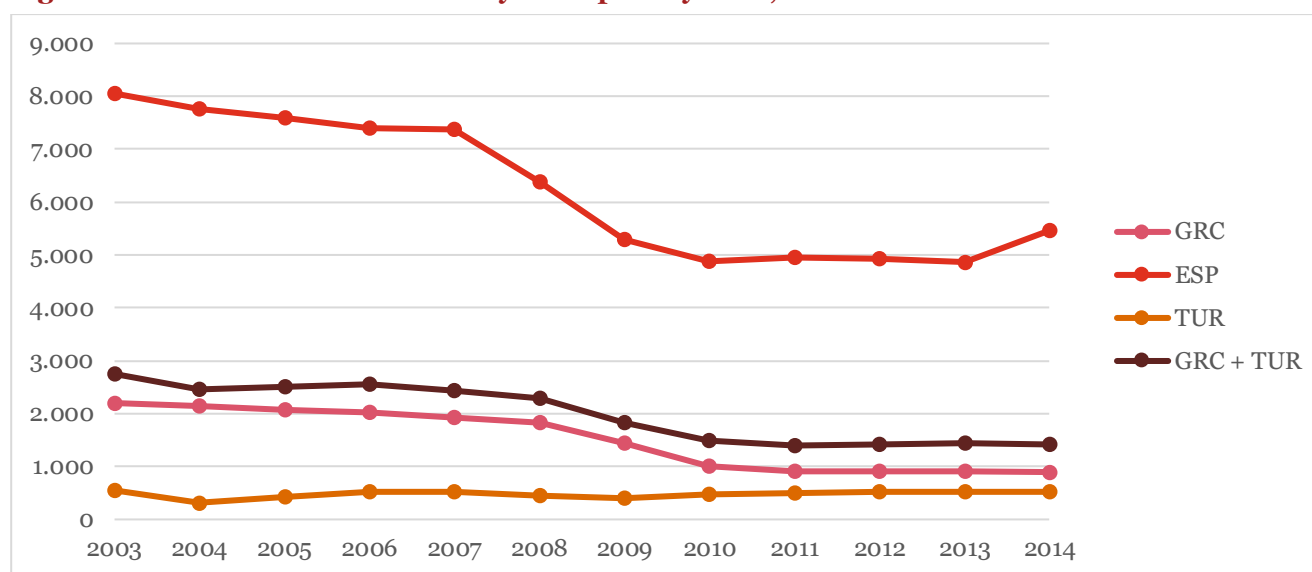
previously in this section, between 2007 and 2010, international trade flow volumes between Spain and other Member States are, on average, 3.8% below 2006 figures, while RoRo traffic volumes between Italy and Spain are averagely 12% higher than pre-Ecobonus levels.

**Figure 11 - Trade flows between Spain and EU28 compared to RoRo traffic between the two countries (base year = 2006)**



Source: PwC elaboration on data from Grimaldi, GNV, Shippax, the concerned port authorities and Eurostat, accessed on April 2 016

Hence, it is reasonable to assume that the modal shift brought about by the Ecobonus does not only include the 12.1% excess RoRo traffic volumes observed during the incentive implementation period, but also the 3.8% share of existing RoRo traffic that would have otherwise been lost as a consequence of the decline in trade flow volumes. This assumption is further supported by the trend of trade flows by road between Italy and Spain. Figure 12 displays the trade flow trends between Italy and the countries selected for the comparative analysis according to data extracted from Istat Coeweb. Differently from Eurostat, this source provides also for indication of the means of transportation employed for accessing the country of trade. In this specific case, data relative to the international trade of goods transported by road between Italy and the selected business partners is presented. It is impressive to observe that freight traffic by road between the two countries decreases by almost 34% over the Ecobonus deployment period, signalling that the amount of transported trailers resulting from the sum of the 12% annual average share of excess RoRo traffic and the 3.8% annual average share of existing – 2006 – RoRo traffic represents a both reasonable and conservative modal shift estimate.

**Figure 12 - Trade flows between Italy and Spain by road, thousand tonnes**

Source: PwC elaboration on data from Istat Coeweb, accessed on April 2016

It is also interesting to notice that trade flows by road between Italy and Spain have declined both in the period of deployment of the Ecobonus and in the period following the interruption of Ecobonus subsidisation. Similar trends are observed with regard to goods traded between Italy and Greece and Turkey by road. However, in the latter cases, the magnitude of the decline has been of negligible size.

### 4.3. Modal shift computations

In the previous paragraphs, we have analysed RoRo traffic between Italy and Spain from 2004 to 2014. The selected period considers the trends before the introduction of the Ecobonus (2004-2006), the effect of the Ecobonus in the period between 2007 and 2010 and, finally, its effect following the interruption of the subsidisation programme from 2011 onwards. As resulted from the analyses performed in the previous sections, RoRo traffic trends on the concerned routes were significantly influenced by a number of exogenous factors, such as the economic development rates of the involved regions and international trade flows. These have been carefully taken into account throughout the modal shift estimate that is going to be presented in the following paragraphs.

The main findings of our analysis are synoptically summarised as follows (Table 2):

**Table 2 -Comparison between Italian-Spanish Ecobonus routes and other international routes not supported by Ecobonus subsidisation**

#	Indicator	ESP (yearly average increase over 2006)	GRC + TUR (yearly average increase over 2006)	Yearly average difference
a	RoRo traffic in number of trailers (2007 to 2009)	+16%	+2%	+14%
b	RoRo traffic in number of trailers (2007 to 2010)	+12.1%	n.a.	n.a.
c	GDP (2007 to 2010)	+2,8%	+3,1%	-0,3%
d	Trade flows with EU28 in tonnes (2007 to 2010)	-3,8%	+3,9%	-7,7%

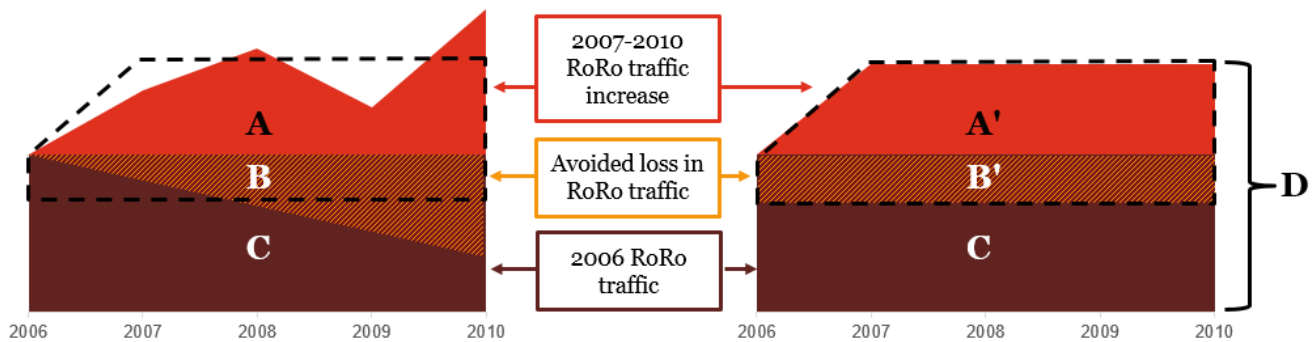
Source: PwC elaboration on various sources, April 2016

In the first three years of Ecobonus deployment (2007-2009), the number of trailers embarked on RoRo ships operating between Spain and Italy (a) was, on average, 16% higher on a yearly basis compared to 2006. In the same period RoRo traffic in terms of the aggregate number of trailers towards/from Turkey and Greece was substantially stable, posting 2% higher traffic levels on a yearly average with respect to those recorded in 2006. These figures relate to just a portion of the Ecobonus implementation period and, therefore, cannot be employed for computing the size of the modal shift. However, given the resulting yearly average RoRo traffic difference of 14% between Italian-Spanish routes and south-eastern Mediterranean ones, as observed previously in the analysis, crediting the portion of RoRo traffic in excess of pre-Ecobonus levels for routes between Italy and Spain appears reasonable.

Average excess RoRo traffic (b) amounts to 12.1% for the 2007-2010 period on a yearly basis with respect to 2006 levels. This represents an average 10.8% share of total freight transported over the analysed period or, alternatively, 16,696 trailers per year. In other words, the modal shift component deriving from Ecobonus-related RoRo traffic growth throughout the 2007-2010 period accounts for slightly more than one tenth of overall transported freight.

The economic performances of the two regions selected for the comparison were approximately equivalent (c), however, routes between Italy and Spain suffered from averagely 3.8% (d) lower international trade flow levels on a yearly basis compared to 2006. By contrast, routes between Italy and the aggregate region of Turkey and Greece benefitted from averagely 3.6% higher trade flow levels on a yearly basis compared to 2006, translating into a difference of more than 7% in terms of trade flow performances among the two sets of routes. As mentioned in the previous chapter, by analysing the correlation between international trade flows towards EU28 countries and RoRo freight traffic in a market not supported by subsidisation schemes, the one for RoRo freight transport between Italy and the aggregate region of Turkey and Greece, it emerges that, on average, a 1% change in the level of trade flow volumes is usually related to a slightly more than 1% change in the level of RoRo freight traffic. In other words, a nearly perfectly positive correlation appears to exist between international trade flow trends and those in the level of RoRo traffic. As a consequence, it would be reasonable to infer that in the absence of the Ecobonus scheme, freight traffic on RoRo routes between Italy and Spain would have probably been, on average, more than 3.8% lower with respect to 2006 volumes. However, in the present study, it is conservatively assumed that, besides the aforementioned traffic growth, a yearly average loss exactly equal to a 3.8% share of baseline (2006) RoRo traffic volumes has been avoided thanks to the implementation of the Ecobonus. This translates, on average, into an avoided freight traffic loss of 5,194 trailers per year and a 3.4% share of total freight transported on Italian-Spanish RoRo routes over the 2007-2010 period on a yearly basis. The said share represents the second modal shift component.

Finally, by summing up the two identified modal shift components, the one deriving from the higher RoRo traffic levels and the one resulting from the avoided loss in the same kind of traffic, it is assumed that 14.2% (10.8% + 3.4%) of overall transported trailers have been shifted from “all-road” to “road-maritime” transport modality between 2007 and 2010 (see Figure 13). In absolute terms, out of the overall 618,318 trailers that boarded RoRo vessels operating on routes between Italy and Spain over the 2007-2010 period, 87,562 are to be credited to the Ecobonus-related modal shift. Put differently, during the Ecobonus implementation period a yearly average of 21,891 trailers were shifted from the over-congested Italian, French and Spanish road networks to Italian-Spanish RoRo routes.

**Figure 13 - Modal Shift infographic**

$$A+B = A'+B' = \sim 15.9\% C$$

**Modal shift as average of yearly RoRo traffic volumes  $(A'+B' : D) = \sim 14.2\%$**

The analysis of responses collected through the survey on the effect of the Italian Ecobonus scheme that has been thoroughly described in chapter 3, also suggests that a significant modal shift from “all-road” to “road-maritime” transport modality has occurred because of the Ecobonus scheme’s deployment. Actually, 13 out of the 14 responding road haulage companies claimed that the amount of boarded freight, as a percentage of the overall transported one, increased during the implementation period of the Ecobonus. The average increase in the share of boarded freight reported by respondents was of about 40%. Even though this figure cannot be deemed accurate from a statistical point of view nor give a quantitative measure of the actual modal shift, it surely supports the estimate above. Moreover, four of the survey’s respondents have also claimed that they started making use of SSS as a direct consequence of the incentive scheme’s implementation, pointing out that the analysed subsidisation tool is very likely to have contributed to the growth of the Italian-Spanish RoRo market in terms of customer base.

For the purpose of the next steps of the study (i.e., to evaluate the environmental and socio-economic impact of the Ecobonus-related modal shift), RoRo traffic and modal shift figures have been converted into tonnes/year figures according to a conversion coefficient – derived from information provided by GNV and validated by Grimaldi – equal to 21.15 tonnes/trailer. According to the aforementioned elaboration, a yearly average of approximately 463 thousand tonnes was shifted from “all-road” to “road-maritime” transport modality during each year of Ecobonus implementation (Table 3). Over the whole incentive deployment period (2007-2010), the modal shift consisted in 1.852 million tonnes out of the 13.077 million that have been transported on RoRo routes between Italy and Spain over the same period, i.e., the already mentioned 14.2% modal shift share. Coherently with those claims made by road haulage companies in the conducted survey, which were reported in the previous paragraph, it appears evident that Ecobonus subsidisation on the concerned routes has contributed to a consistent expansion of the Western Mediterranean RoRo market in 2007 and 2008. Conversely, during and following the 2009 economic downturn the incentive deployment has led RoRo traffic on subsidised routes to decline to a lesser extent than on non-subsidised ones, preventing the said market from collapsing. Nevertheless, both in 2009 and in 2010 the amount of freight transported on RoRo routes between Italy and Spain was still larger than the one recorded in 2006, i.e., before the beginning of the Ecobonus deployment.

This view is fully supported by GNV and Grimaldi. During the recent interview that PwC conducted with the two shipping lines, both operators have confirmed the fact that the introduction of the Ecobonus has led to an expansion of the companies’ existing customer base. In the case of Grimaldi, this has translated into traffic volumes increases on most of the routes operated between Italy and Spain during the 2006-2010 period. By contrast, for GNV, operating the troubled Genova-Barcelona route, the Ecobonus has contributed to a moderate customer base expansion in 2007 only. For the rest of the Ecobonus deployment period the company considers

the incentive to have significantly slowed down the steady decline in boarding rates that have been recorded on the said routes between 2008 and 2010. In this regard, with reference to the sole 2009 year, Grimaldi has stated that, in the absence of the subsidisation scheme, traffic flows on both domestic and international RoRo routes would have probably suffered a contraction similar to the one recorded for HGV traffic on the road between Italy and Spain, i.e., a drop of approximately 34% over the 2007-2010 period compared to 2006 levels.

As specified in the Commission's decision (C (2005) 1155 fin), one of the conditions that had to be met in order to benefit from the retroactive refunds granted by the Ecobonus scheme, was that road haulage companies should have undertaken the same number of yearly trips made on the concerned routes during the incentive implementation period also during the three years following the interruption of subsidisation. In this respect, during the aforementioned telephone interview, Grimaldi representatives have stated that boarding volumes by road haulage companies have more than stayed constant over the 2011-2013 period and that the effect of the incentive scheme is likely to have extended to the period following the interruption of Ecobonus subsidisation. More precisely, it was claimed that, having become aware of the advantages of SSS, most of the road haulage companies that were not making use of RoRo services between Italy and Spain before the introduction of the Ecobonus, kept on boarding also after the interruption of subsidisation on the said routes. In other words, the incentive is likely to have triggered a flywheel effect, which has driven the consolidation of RoRo transport demand also after 2010. A similar statement was made by the shipping line in a survey conducted by RAM and published in the "report on the monitoring of incentive schemes" issued by the company in April 2015<sup>11</sup>. Here, Grimaldi claimed that, on average, between 2011 and 2013 growth in the level of RoRo traffic volumes had been recorded on Ecobonus routes, both international and domestic ones. In the same survey, GNV stated that, on those incentivised RoRo routes it had been operating, freight traffic volumes stayed mostly constant. Moreover, in the above-cited report, an official statement by CONFITARMA (the Italian association of vessel owners) is published, in which the possibility for a modal backshift to have occurred in the years following the Ecobonus deployment is categorically excluded. The phenomenon described by the shipping lines and their association is coherently reflected by RoRo traffic volumes observed on the analysed routes that, after recording a 20% increase in 2011, have never dropped below 2010 levels ever after.

In a nutshell, according to both the relevant stakeholders and the available data, those road haulage companies that benefitted from the Ecobonus over the 2007-2010 period not only maintained their boarding rates, but are also considered to have increased the number of undertaken trips on the involved RoRo routes. Hence, taking into account exclusively the 14.2% share of RoRo traffic that occurred over the 2011-2013 period as part of the Ecobonus-related modal shift appears as a conservative and solid assumption. Put differently, it seems reasonable to assume that, besides having operated a modal shift equal to a 14.2% share of RoRo traffic on routes between Italy and Spain during the 2007-2010 period, the Italian Ecobonus scheme has consistently sustained RoRo traffic demand on the said routes by the same extent also after the interruption of subsidisation, from 2011 to 2013. In absolute terms, this implies that further 1.332 million tonnes out of the 9.409 million that were transported over the 2011-2013 period on subsidised routes between Italy and Spain have to be credited to the Ecobonus.

In conclusion, it can be alleged that, between 2007 and 2013, 3.184 million tonnes out of the 22.487 overall transported ones were shifted from "all-road" to "road-maritime" transport mode as a consequence of the Ecobonus scheme implementation. In terms of vehicles, the incentive-related modal shift consists of 150,566 trailers out of a transported amount of 1.063 million over the analysed period.

**Table 3 - RoRo traffic between Italy and Spain and modal shift in thousands of tonnes (conversion rate = 21.15 tonnes/trailer)**

	2006	2007	2008	2009	2010	2011	2012	2013	Total (2007-2013)
<b>Tonnes (000s) Italy-Spain</b>	2,916	3,613	3,602	2,936	2,926	3,524	2,928	2,958	22,487

<sup>11</sup> Monitoraggio incentivi di cui al DPR n. 205 dell'11 Aprile 2006 – Incentivo Ecobonus, RAM S.p.A. (28<sup>th</sup> April 2015)

	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>Total (2007-2013)</i>
<b><i>Modal Shift in tonnes (000s)</i></b>	-	512	510	416	414	499	415	419	3,184

*Source: PwC Elaboration on Grimaldi, GNV, Shippax and Port Authorities data*

## 5. The Evaluation

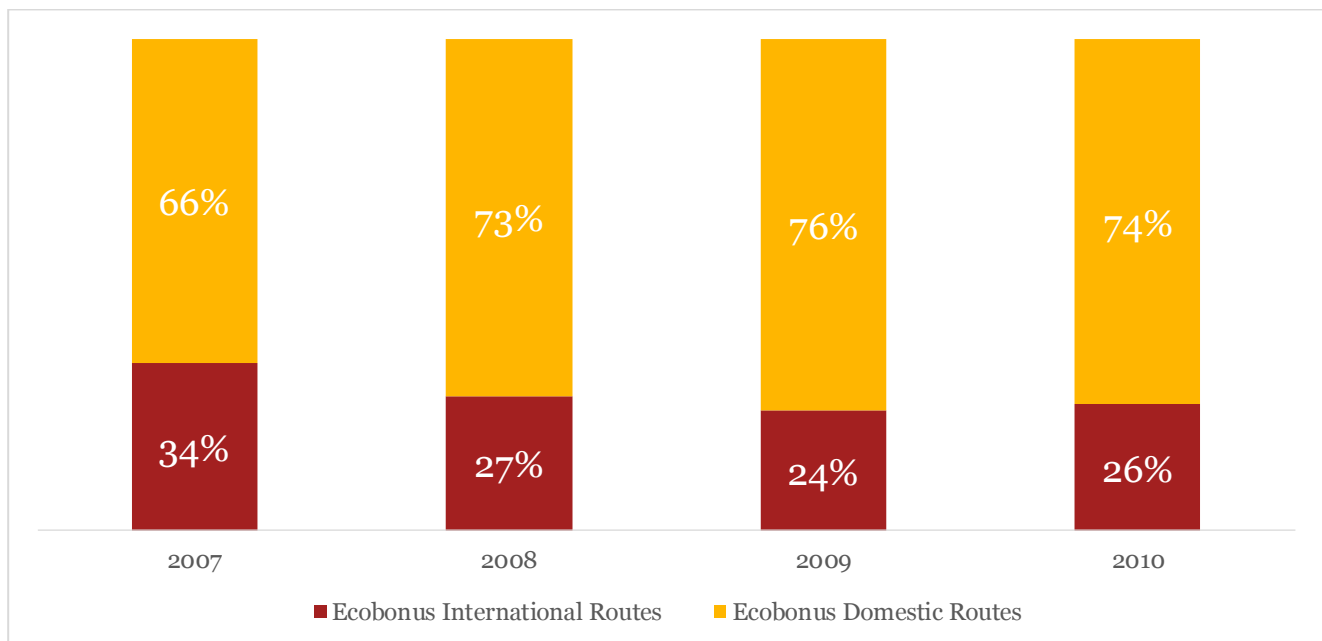
The size of the modal shift, which has been measured in the previous section, represents the first input in order to assess the environmental and socio-economic benefits related to the implementation of the Ecobonus. The aim of the present evaluation is to determine the amount of socio-economic and environmental benefits generated by each euro spent on the incentive. In order to do so, the direct and indirect (administrative costs) related to the implementation of the Ecobonus will first be analysed. Subsequently, the external benefits brought about by the incentive will be estimated by making use of the Marco Polo external cost calculator provided by the European Commission. Moreover, an estimate of the net reduction in external costs according to the calculation model by the Italian NGO “Friends of the Earth”, on which the decision by the European Commission (C (2005) 1155 fin) on the approval of the Ecobonus scheme was based, will be provided.

Furthermore, it will be assessed if, and to which extent, the Ecobonus scheme has been successful at achieving its other objective, i.e., fostering the consolidation of the fragmented Italian road haulage industry. Ultimately, it will be established if the conditions that short-sea shipping fares have not increased more than the yearly inflation rates observed during the implementation period and that, for the three years after the interruption of the incentive deployment, road haulage companies have undertaken the same number of trips as during the implementation period of the Ecobonus.

### 5.1. Direct costs: size and distribution of the subsidy

According to data provided by RAM S.p.A., throughout the whole implementation period €69.8 million (€66.9 million for international routes between Italy and Spain) out of approximately €240 million were distributed to road haulage companies travelling on eligible international routes between Italy and Spain and Italy and France. In other words, international routes benefitted from 30% of the total amount subsidised, while the residual amount has been devoted to domestic routes.

**Figure 14 - Share of Ecobonus on International and Domestic Routes**



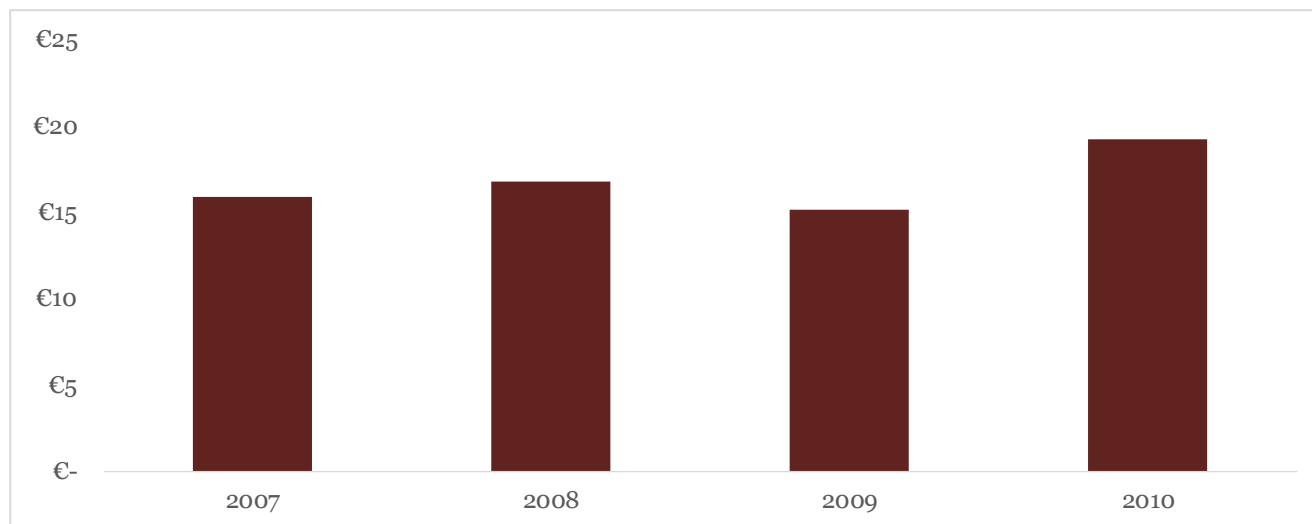
Source: PwC elaboration based on RAM data

If data relative to the share of Ecobonus granted on domestic and international routes is analysed for each year, it is possible to observe that the share of subsidies distributed to road haulage companies boarding on international routes decreases by 8% with respect to the overall subsidised amount over the 2007-2010 period.



As depicted in the chart below (Figure 15), with the exception of 2009, a growing amount of subsidies was distributed as Ecobonus on international routes since 2007. Only throughout that year, €15.8 million have been dispensed to subsidise road haulage companies making use of short sea shipping services on international routes between Italy and Spain. This amount rose to €16.8 million in 2008 and to an overall high of €19.1 million in 2010 after a sharp decline both in the eligible and actually distributed amount in 2009, reflecting the effects of the economic crisis.

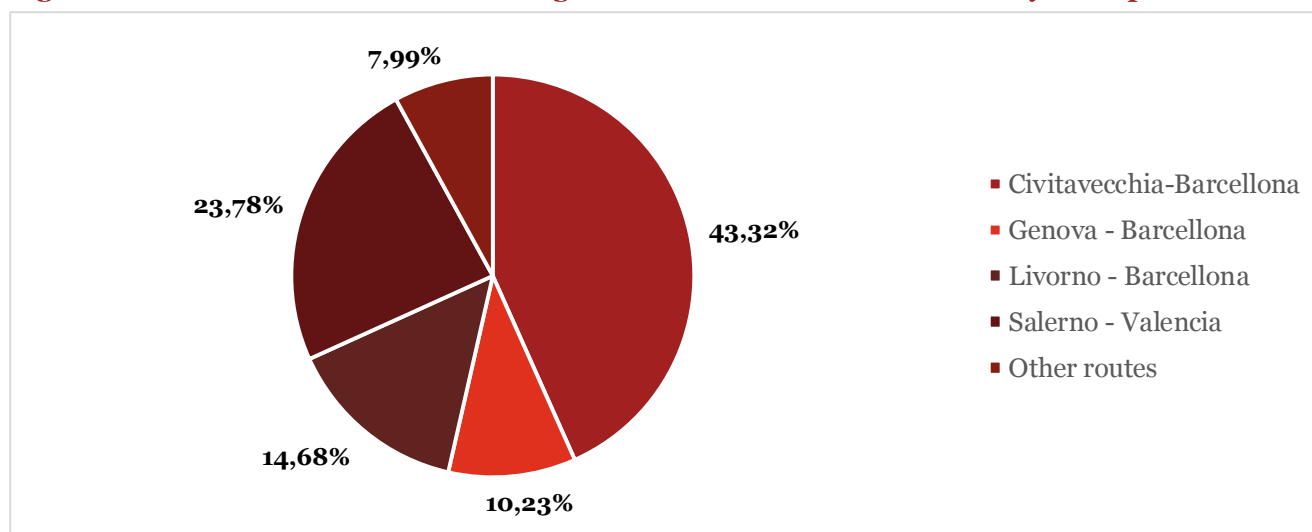
**Figure 15 - Ecobonus distribution on international routes (millions of €)**



Source: RAM funding management data

As mentioned in the previous section, the size of the modal shift induced by the Ecobonus varies greatly across routes. In this respect, analysing the amount allocated as a subsidy to each individual route is crucial to identify a potential correlation between the number of trips subsidised and the size of the modal shift. As depicted in the graph below (Figure 16), the largest share of subsidies granted on international routes between 2007 and 2010 was deployed on the Civitavecchia-Barcelona route, which has absorbed 43.3% of total subsidies distributed on the aforementioned routes over the same period. The Salerno-Valencia and the Livorno-Barcelona routes, having benefitted respectively of a 23.78% and 14.68% of the Ecobonus distributed on international routes, represent the second and third routes in terms deployed subsidies. In absolute terms, almost €55 million have been distributed as a subsidy to road haulage companies boarding on those three routes, i.e., approximately 82% of the Ecobonus devoted to international routes.

**Figure 16 - Ecobonus distribution among international routes between Italy and Spain**



Source: PwC elaboration based on RAM data.

The 10.2% share of subsidisation observed for the Genova-Barcelona route reflects the steady decline in traffic volumes recorded on it since 2008. Routes that were active only temporarily throughout the implementation period of the Ecobonus, such as the ones between Marina di Carrara and Castellon de la Plana and the one between Livorno and Tarragona, obviously benefitted from only from a negligible share of Ecobonus subsidisation.

## 5.2. Indirect and administrative costs

In addition to the direct costs of the Ecobonus, i.e. the amount of Euros distributed as an incentive to road haulage companies throughout the whole implementation period, all additional costs that were incurred by RAM S.p.a. in order to prepare, execute and monitor the deployment of the Ecobonus must be considered in the evaluation. However, road transport operators also incurred administrative and bureaucratic costs in order to apply for Ecobonus subsidisation. Those will be considered and taken into account in the present evaluation. In fact, for the purpose of the analysis at stake, the administrative/bureaucratic burden will be classified into two different categories, i.e., government (RAM)-side costs and user (road haulage companies)-side costs.

Taking into account both user-side and government-side administrative costs, total indirect costs incurred by stakeholders in order to benefit from/deploy the incentive sum up to approximately two working days per year and €3.66 per trip. Further details on how these cost figures were derived are provided in the next sections.

### 5.2.1. Government-side costs

According to a report provided by the Italian Court of Audit (“Corte dei Conti”), RAM S.p.a. recorded costs (Table 4), related to all activities that were necessary in order for the Ecobonus scheme to be put in place, accounting for approximately €5 million over the 2006-2014 period. More precisely, these figures include initial research and investigation, as well as monitoring and marketing expenditures related to the subsidisation schemes connected to the development of the MoS, as well as to environmental analyses regarding the therein-concerned transport modes. Since the Ecobonus represents the only subsidisation scheme related to the development of the MoS designed and deployed by RAM S.p.A. up to 2016, it is reasonable to allocate them to the said incentive. In fact, this approach is the same as the one applied by the Italian Court of Audit in its assessment. However, given the absence of a specific “Ecobonus costs” item in the company’s income statement, it is important to highlight that cost figures employed in the present analysis are likely to be overstated.

**Table 4 - Costs incurred for the development and deployment of MoS initiatives, including the Ecobonus scheme**

2006/07	2008	2009	2010	2011	2012	2013	2014
€ 445,760	€ 745,693	€ 1,243,320	€ 925,188	€ 603,773	€ 608,246	€ 546,777	€ 505,023

Source: RAM S.p.a.

The cost figures presented above relate to the development and deployment of MoS initiatives as a whole, while the present evaluation only concerns benefits and costs generated by the Ecobonus on international routes. Therefore, an adjustment is required in order to estimate the cost figures that can be actually traced back to the subsidy’s deployment and management on international routes only (Table 5).

**Table 5 - Share of cost to be allocated to the development of international MoS initiatives, including Ecobonus deployment on international routes**

2006/07	2008	2009	2010	2011	2012	2013	2014
€ 142,388	€ 238,195	€ 397,150	€ 295,530	€ 192,862	€ 194,290	€ 174,655	€ 161,318

Source: PwC Elaboration based on data provided by RAM S.p.a.

The administrative costs should be computed as the expenditure for each handled Ecobonus application. Being this figure not available, the number of subsidised trips has been taken as a proxy for such unit of measure and employed as the cost allocation base.

Trips that were supported by Ecobonus subsidisation on international routes account for 32% of total trips subsidised throughout the entire implementation period of the incentive. In other words, slightly less than one third of all Ecobonus trips were undertaken on international routes. Therefore, the same share of administrative costs was allocated to the handling of files related to the said routes (Table 5).

In absolute terms, 491,212 trips were subsidised through the Ecobonus and thereto-related operating costs accounting for €1,796,388 were incurred by RAM S.p.a., over the entire implementation period. That translates into an expenditure, in terms of administrative costs, of €3.66 for each trip subsidised on international routes.

### 5.2.2. User-side costs

As for the costs incurred by road haulage companies requesting subsidisation for their RoRo trips between Italy and Spain, information has been collected through the survey on the evaluation of the Italian Ecobonus scheme. In this respect, respondents were asked to indicate the number of men-hours that were required, on a yearly basis, in order to request and being granted the subsidy (Annex 2, Q15).

In order to be granted Ecobonus subsidisation, road haulage companies were required to submit, on a yearly basis, one application form for each eligible route on which they were boarding. Respondents to the survey claim to have employed from 4 to 32 men-hours per year to apply for Ecobonus subsidisation. On average, approximately 19 men-hours a year were devoted to Ecobonus-related activities. Put differently, for the average road haulage company, slightly more than two full working days were required as to deal with the whole subsidisation process. Considering that hauliers could potentially benefit from economic support on more than 1,600 trips per individual route, which, multiplied by the average RoRo fare translates into hundreds of thousands of Euros, the required effort appears to be negligible.

## 5.3. Socio-economic and Environmental impact

As mentioned in the preamble of the chapter, most of the environmental and socio-economic costs/benefits that are not directly borne/enjoyed by transport users, i.e., the Ecobonus externalities, are not directly and precisely quantifiable in monetary terms. In the present study, such costs/benefits, as well as their net reduction/increase brought about by the implementation of the Ecobonus scheme, are measured through the “External cost calculator for Marco Polo freight transport proposals” (hereafter referred to as the “Marco Polo external cost calculator”). The said tool attaches standardised external cost coefficients to the environmental impacts (air quality, noise, climate change) and socio-economic impacts (accidents, road congestion) generated by freight transport on each mode (e.g. road, rail, inland waterways and short sea shipping) per tonne-kilometre shifted. Finally, each transport mode-specific coefficient is derived by computing the sum of the different external costs incurred when moving freight on the given transport mode. The calculation of external cost coefficients, in turn, is based on a combination of data and model results relying on a set of different assumptions, whose robustness has been accurately tested in those studies in which they have first been made<sup>12</sup>. The final output of the calculator is summarised in the following two indicators:

- Environmental and socio-economic benefits for each subsidised Euro;
- Environmental and socio-economic benefits for each tonne-kilometre shifted.

<sup>12</sup> HEATCO 2006, Bickel P. et al. (2006). Developing Harmonised European Approaches for Transport Costing and project assessment. Deliverable 2: State-of-the-art in project assessment. Stuttgart: Universität Stuttgart.

IMPACT 2008 Maibach M, Schreyer C, Sutter D (INFRAS), van Esse HP, Boon BH, Smokers R, Schrotten A (CE Delft), Doll (Fraunhofer Gesellschaft – ISI), Pawlowska B, Bak M (University of Gdansk) (2008). Handbook on estimation of external costs in the transport sector. Internalisation Measures and Policies for All external Cost of Transport (IMPACT). Version 1.1. Delft, CE, 2008.

CAFE 2005 Holland M, (EMRC), Pye S, Watkiss (AEA technology), Droste-Franke B, Bickel P (IER) (2005). Damages per tonne of PM<sub>2.5</sub>, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>X</sub>, and VOC's of EU25 Member State (excluding Cyprus) and surrounding seas. Service Contract for carrying out cost-benefit analysis of air quality related issues, in particular in the Clean Air For Europe (CAFE) programme. Didcot: AEA Technology Environment.

The first version of the Marco Polo external cost calculator was released in 2004 (i.e. the Marco Polo I). Subsequently, the tool was updated by fine-tuning both the coefficients and the methodology employed in its original version and a second version was issued in 2011 (i.e. the Marco Polo II). The actual aim of the Marco Polo external cost calculator is to allow a direct comparison of the change in externalities brought about by competing, mutually exclusive, investment projects. For the purpose of the present analysis, the Marco Polo II external cost calculator has been employed to provide for an objective monetary estimate of the environmental and socio-economic enhancements introduced by the Ecobonus. The amount of freight, measured in net tonnes per year that has been plugged into the calculator is the 14.2% share of total traffic volumes transported on the concerned RoRo routes between 2007 and 2013 that has been identified as the modal shift in the previous chapter of the present study. This amount is considered as having been fully shifted from “all-road” transport modality to the “road-maritime” one for the specific distance that is currently covered by the RoRo links between Italy and Spain.

The Marco Polo external cost calculator has been designed for assessing the environmental and socio-economic impact of competing investment projects, i.e., new transport services. Therefore, it attaches a cost coefficient to each tonne-kilometre boarding on the proposed new RoRo transport leg, assuming that the service will be provided only, or predominantly, for freight subject to the estimated modal shift. However, exception made for the Livorno-Barcelona route, which was introduced during the incentive deployment period, the Italian Ecobonus scheme operated a modal shift towards existing RoRo transport services. Accordingly, an incremental approach should be followed when estimating the Ecobonus impact on the external costs generated by vessels on the concerned SSS services. In this respect, the 14.2% modal shift induced by the analysed policy is likely to have had only a negligible impact on the negative externalities generated on the already existing routes between Italy and Spain. Put differently, the presence of an additional 14.2% share of freight does not determine an increase in fuel consumption and greenhouse gases emissions produced by vessels that would have sailed anyway on the concerned routes. This assumption is supported by the two following facts:

- As reported by shipping lines, if the load factor of vessels (in terms of tonnage) does not exceed a given threshold, ballast water is loaded in order to reach the desired vessel stability and allow for the safe operations of ships. This implies that, in a vast number of cases, loading an additional unit of cargo does not result in a vessel's increase in weight.
- The aggregate number of weekly sailings undertaken on the analysed routes has stayed constant over the Ecobonus implementation period. As mentioned in the previous chapters of the study, the increase in the frequency of weekly sailings on routes such as the Livorno-Valencia and the Salerno-Valencia has not even been sufficient to compensate for the reduction in sailings on the Genova-Barcelona route and the dismissal of the Livorno-Tarragona one. Newly established routes have been duly considered in the external costs estimate.

Accordingly, the net change in external costs caused by the Ecobonus has been computed by taking into account the negative externalities of sea transport exclusively for the Livorno-Barcelona route, which was introduced during the incentive deployment period.

Under these assumptions, according to the Marco Polo external cost calculator, by transporting the 3.184 thousand tonnes of freight representing the Ecobonus-induced modal shift on RoRo routes between Italy and Spain instead of by road, environmental and socio-economic costs drop from €74.9 to approximately €4.4 million. This translates into a net reduction in external costs equal to €70.5 million. Disaggregating this figure according to the cost coefficients employed in the calculator, it emerges that benefits accounting for €40.2 million (57%) derive from a net reduction in environmental costs, implying a reduced impact of freight transport on air pollution, climate change/greenhouse gases emission and noise. The residual €30.3 million (43%) represent a net reduction in the socio-economic costs generated by road transport, that is to say, accidents and road congestion.

It is possible to observe that, by adjusting the Marco Polo calculations for the contingency that more than 80% of the freight considered to have been shifted across transport modes was channelled towards existing RoRo links, the environmental and socio-economic benefits brought about by the Ecobonus exceed its cost. As a

matter of fact, by dividing the €70.5 million net reduction in external costs by the €67.0 million distributed as a subsidy to road haulage companies boarding on the concerned eligible routes, it emerges that for each Euro invested in the incentive, environmental and socio-economic benefits accounting for approximately €1.1<sup>13</sup> were generated. In other words, the value of the distributed subsidy does not exceed the differential between the external costs generated by road transport and those generated by sea transport, which was one of the conditions set out by the Commission in its decision.

Transferring freight transport from the road network to already operative maritime links - instead of to new ones – obviously translates in a higher efficiency of the resulting modal shift. In fact, the net environmental and socio-economic benefits generated by the incentive scheme for each tonne-kilometre shifted consists in €0.017. As a conclusion, it is legitimate to state that the Ecobonus has produced net benefits for society that go beyond its material cost.

### **Box 1 – Socio-economic and environmental impact according to other relevant calculation models**

#### **The Ecobonus effect according to Marco Polo I (2004)**

At the time the Ecobonus scheme was designed and, then, approved by the European Commission in 2005, the Marco Polo I was the external cost calculator in use. Accordingly, the thereto-related net reduction in external costs has been computed hereafter.

If the net positive externalities generated by the implementation of the Ecobonus scheme are computed, under the same assumptions made in the previous sections of the study, by employing the first version of the Marco Polo external cost calculator that was released in 2004, results change significantly. Indeed, the net reduction in external costs brought about by the estimated incentive-related modal shift increases to €139 million. This translates into net environmental and socio-economic benefits accounting for €2.1<sup>14</sup> for each Euro invested in the incentive. Consequently, also the efficiency of the modal shift increases accordingly. In fact, the net external benefits produced for each tonne-kilometre shifted rise to approximately €0.034.

#### **The Ecobonus effect based on ex-ante assumptions**

In its decision (C (2005) 1155 fin) the European Commission approved the implementation of the Italian Ecobonus scheme. Herein, for the differential between the externalities generated by road and sea transport, the study on the external costs of transport by the Italian NGO “Friends of the Earth” was taken as a reference. Indeed, the Ecobonus scheme, designed in 2002, was based on the aforementioned study, which, at that time, was widely accepted. As mentioned in the first chapter of the present document, in the said study a calculation model for the externalities generated on the different transport modes, incorporating factors such as greenhouse gases, air pollution, noise, congestion and accidents, was developed. According to it, hundred HGV km driven on a motorway cost society €212 compared to €79 if the same distance is covered by an HGV that is loaded on a vessel. By considering an HGV load factor consistent with the other computations in this study, i.e., 21.15 tonnes/trailer, such figures translate into €0.1005 of negative externalities per tonne-kilometre transported by road and €0.0375 per tonne-kilometre carried on RoRo vessels. This, in turn, implies that 3.184 thousand tonnes of freight – the size of the modal shift - transported by road on the itineraries alternative to the Italian-Spanish subsidised RoRo routes would have generated environmental and socio-economic costs equal to €407 million. Instead, thanks to the Ecobonus-induced modal shift, the same amount of freight carried on the concerned routes has generated approximately €18 million in negative externalities. In other

<sup>13</sup> It must be mentioned that, throughout the present study, when referring to net environmental and socio-economic benefits for each Euro invested in the incentive, these figures do not take into account the €1 being transferred from the Italian government to beneficiaries. That is to say that such figures are net of the subsidised amount of money. For the total (gross) benefit to be obtained the subsidised €1 must be added back to the quoted figures. Hence, in this case the total (gross) environmental and socio-economic benefits generated by the incentive would amount to €2.1 per subsidised Euro.

<sup>14</sup> The total (gross) environmental and socio-economic benefits generated by the incentive would amount to €3.1 per subsidised Euro [fn. 11].

words, according to the study by the “Friends of the Earth”, the analysed incentive scheme has led to a net reduction in external costs equal to €389 million, translating into a net social benefit of €5.81<sup>15</sup> for each Euro invested in the incentive. In other words, according to the study quoted in the Commission’s decision, in which the Ecobonus scheme was first approved, the incentive deployment has generated net environmental and socio-economic benefits almost six times larger than its total implementation cost.

### 5.3.1. Industry consolidation

In addition to achieving a net reduction in external costs, the Ecobonus scheme was also intended to induce consolidation in the Italian road haulage industry that had, until then, emerged as extremely fragmented and particularly unstable, especially with respect to changes in the demand for transportation services. To this extent, the minimum threshold of 80 trips per year on each route was introduced as a condition to benefit from Ecobonus funding. By following the same approach, the further premium, in terms of subsidisation rate, for road haulage companies undertaking more than 1,600 trips per year on each route was also intended to give rise to large industry players. Road haulage companies were then allowed to pool into consortia, to merge and to acquire each other as to reach the thresholds mentioned above.

However, based on the results of our survey and phone interviews, there is no evidence that industry consolidation has occurred, nor during nor following the period of Ecobonus deployment. In fact, only one respondent claims to have participated to a consortium in order to benefit from the incentive. None of the respondents declares to either have acquired or have been acquired by a competitor during the subsidisation period. Moreover, all of those consortia representatives that have been contacted by phone claim to have ceased their operations after the interruption of the Ecobonus deployment. This fact suggests that consortia might have been formed, on a temporary basis, exclusively to benefit from the incentive and that cooperation among road haulage companies has not been further developed.

### 5.3.2. RoRo fare analysis

As mentioned in the first chapter of the present study, the EC clearly stated in its decision that retroactive funding foreseen by the Ecobonus scheme could only be granted provided that RoRo fares on the concerned routes stayed constant – did not increase more than the yearly inflation rate – during the Ecobonus implementation period (2007-2010). In this section the evolution of RoRo ticket prices on international Ecobonus routes, measured as the annual percentage rate of change over the previous year, is compared to the annual average rates of change in the Italian Harmonised Index of Consumer Prices (HICP) that has been recorded by Eurostat during the Ecobonus deployment period<sup>16</sup>. The HICP is considered as the best measure of inflation by most European institutions, including the ECB<sup>17</sup>.

Figure 17 depicts the percentage increase in RoRo fares for both self-propelled and non-self-propelled units over the 2007-2010 period, as well as the percentage increase in inflation as captured by the HICP. As is possible to observe, RoRo fares growth rates for the 2007-2009 period are consistently in line with the inflation rate recorded during the same period. More precisely, in 2007 RoRo fares on the concerned international routes have increased by approximately the inflation rate for that year. In fact, the aforementioned fares have increased by 2.2% for self-propelled units and 2.6% for non-self-propelled units with respect to a 2% growth in consumer prices, i.e., an increase in excess of the inflation rate of respectively 0.2% and 0.6%. Such a difference

<sup>15</sup> The total (gross) environmental and socio-economic benefits generated by the incentive would amount to €6.81 per subsidised Euro [fn. 11].

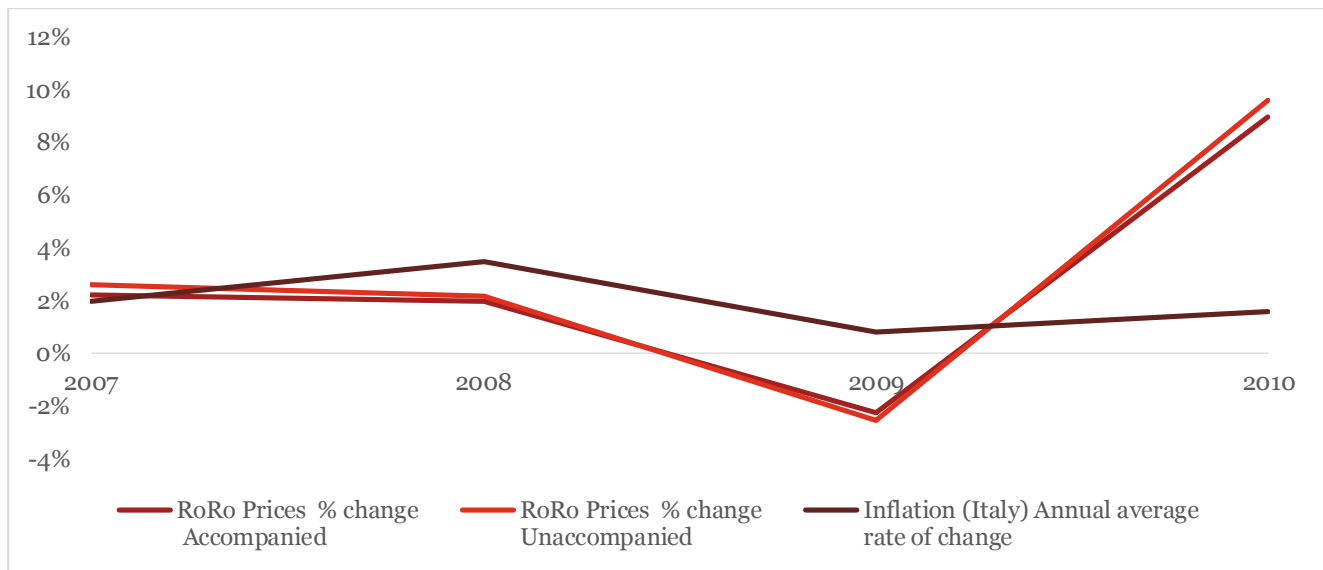
<sup>16</sup> Please note that RoRo fares data were made available by the concerned shipping lines only with respect to the following routes: Civitavecchia-Barcellona; Livorno-Valencia; Livorno-Barcellona; Palermo-Valencia; Salerno-Valencia; Genova-Barcelona. Data for the Livorno-Tarragona and Marina di Carrara-Castellon de la Plana has not been made available yet. Therefore, the RoRo fare analysis relies on the first set of routes, which represent nearly the whole RoRo market between Italy and Spain.

<sup>17</sup> HICP definition by the ECB available at: <https://www.ecb.europa.eu/stats/prices/hicp/html/index.en.html>



can be considered as negligible when comparing the increase in prices for a specific service with the average growth in prices of a whole basket of goods and services, also taking into account error margins that are intrinsic to both measurements.

**Figure 17 - RoRo prices and Inflation: annual (year-on-year) rate of change**



Source: Grimaldi, GNV, Eurostat

As for 2008 and 2009, the yearly increase in RoRo fares is consistently lower than the growth recorded for consumer prices by the HICP. More precisely, fares increased by 2% for self-propelled units and by 2.2% for non-self-propelled units, compared to a 3.5% growth in the HICP index. For 2009, RoRo fares did even decrease by an approximate average amount of 2.4% for both self-propelled and non-self-propelled units, compared to a positive yearly inflation rate of 0.8%. This might possibly be a result of the drop in demand for maritime transport services suffered as a consequence of the economic downturn. Therefore, until 2009 the condition for RoRo fares growth to not exceed the yearly inflation rate has been more than respected.

However, after two consecutive years of moderate growth, in 2010 RoRo fares on routes selected for analysis surge both for self-propelled and non-self-propelled units by respectively 9% and 9.6% with respect to just a 1.6% increase in the level of prices. Nevertheless, besides being partially compensated by the 2009 price decrease and by the 2008 less than inflation rate growth, such an increase in RoRo fares is likely to be attributable to the upgrade of the service on some of the concerned routes. In fact, new vessels were introduced on the Livorno-Valencia and Civitavecchia-Barcelona routes around that year.

It must also be mentioned that only two out of the fourteen road hauliers that have responded to the survey have noticed noteworthy growth in the level of fares charged on the concerned routes, while the rest has either recorded a negligible or no increase at all in the said level of fares.

## 6. Conclusions and Recommendations

The Italian Ecobonus scheme has been developed to induce a transfer of freight transport from the over-congested domestic and European road network to the more environmentally friendly maritime transport mode. At the international level, the incentive scheme focused on subsidising road haulage companies boarding on RoRo routes between Italy and Spain, where “all-road” transport solutions were particularly competitive.

In this regard, throughout the present study, positive results have been observed both for the policy implementation period (2007-2010), as well as for the years following the interruption of Ecobonus subsidisation (2011-2014).

According to the analysis of freight traffic flows performed for the concerned short sea shipping (SSS) routes between Italy and Spain, the incentive scheme deployment has resulted in a 12.1% increase in RoRo traffic compared to pre-Ecobonus levels (2006), on top of avoiding a traffic volumes contraction equal to approximately 4% deriving from the decline in trade flow volumes. More precisely, it has been observed that, besides leading to significant traffic flow growth during economic expansion periods, the Ecobonus has widely mitigated the sharp drop in demand for maritime freight transport services caused by the 2009 financial crisis.

Based on these findings, in consideration of the 34% drop for freight transported by road between Italy and Spain, as well of wider macroeconomic trends, a modal shift resulting in a 14.2% share of RoRo freight traffic between Italy and Spain has been estimated for the policy’s implementation period (2007-2010).

Moreover, despite a consistently non-favourable macroeconomic context, as well as decreasing international trade flow volumes, freight traffic on the concerned RoRo routes has stayed persistently over pre-Ecobonus levels and in line with volumes recorded for 2010 also during the 2011-2013 period. Doubtlessly, the condition that those road haulage companies, which had benefitted from the incentive, should have undertaken the same number of trips as in the Ecobonus period for the three years following the interruption of subsidisation has been met. Consequently, the portion of RoRo traffic between 2011 and 2013 deriving from the maintenance of undertaken SSS trips has been considered as part of the Ecobonus-induced modal shift. Hence, the resulting modal shift for the overall 2007-2013 period consists of 3.184 thousand tonnes (150,566 trailers) compared to a total transported amount of 22,487 thousand tonnes (1.063 million trailers). Coherently with its objectives, the policy at stake has also increased the awareness of road hauliers with respect to the advantages of RoRo maritime transport solution and has, accordingly, produced positive effects in a long-term perspective as well.

Taking into account the implementation cost of the given measure, whose administrative and bureaucratic component has been established to be negligible, the Ecobonus is considered to have generated environmental and socio-economic benefits that abundantly exceed its cost. Actually, provided that nearly all of the involved freight transport has been shifted towards already operative RoRo routes between Italy and Spain, the Ecobonus scheme has brought about a net social benefit for society amounting to €70.5 million, i.e., €1.1 for each subsidised Euro. If the net reduction in negative externalities is estimated by employing the external costs calculation model that was taken as a reference in the European Commission’s decision on the approval of the Ecobonus scheme, the net social benefit per subsidised Euro rises to €5.8.

It is worth noticing that the Ecobonus scheme did not operate any market distortion. In its working document on the Motorways of the Sea, the European Economic and Social Committee (EESC) identified the Italian Ecobonus as a “well-directed aid without distortion of competition”<sup>18</sup>. By subsidizing road haulage companies, the Italian Ecobonus scheme does not undermine competition among ports and maritime services. Instead, it

<sup>18</sup> *Opinion of the European Economic and Social Committee on the Motorways of the sea in the logistics chain (exploratory opinion)*, European Social and Economic Committee (2008). Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008AE0069&from=EN>



incentivises road hauliers to shift from “all-road” to “maritime-road” transport mode by selecting the ports and the maritime services that better fit their schedule and origin-destination. Indeed, the selection criteria for route eligibility and the condition that short sea shipping fares are kept constant, exclude for distortions of competition with respect to existing maritime services and other ports.

Nevertheless, lessons can be learned from the past to increase both the effectiveness and the efficiency of comparable schemes. In particular, the Ecobonus has been provided to any road haulage company regardless of whether it was already making extensive use of RoRo transport services or not. This has certainly resulted in reducing the amount of tonne-kilometres shifted for each subsidised Euro, i.e., the efficiency of the incentive scheme. Put differently, funding has been granted also to a considerable number of companies that would have made use of SSS services also in the absence of subsidisation. In this respect, eligibility criteria for beneficiaries could be revised and coherently modified.

Before 2006, the start-up of several new RoRo routes connecting Italian to Spanish ports led to a considerable increase in the overall maritime freight traffic between the two countries. Subsequently, the implementation of the Ecobonus scheme resulted in a significant shift of freight traffic between Italy and Spain from “all-road” to “road-maritime” transport mode. In other words, the demand required for the launch of SSS services was first created and, then, strengthened, as well as consolidated by implementing the Ecobonus scheme. In this regards, the incentive has also contributed to achieve higher vessel load factors and to induce a significant optimisation of the existing supply. However, in a stable market, growth in the demand for maritime transport services has proven to be supply-dependent, i.e., it relies on the provision of efficient and reliable high-frequency services. On the supply side, short-term subsidisation has prevented shipping lines from undertaking those investments that are necessary for SSS services with such features to be provided. In other words, in most of the cases, the short-term nature of the incentive scheme has held back shipping lines from committing to long-term actions to boost, structurally enhance the provided services (e.g. refurbishing/upgrading the relevant port facilities, introducing more, newer vessels, offering a higher number of sailings per week). Hence, at the current market development stage, any further incentive scheme should be targeted at encouraging shipping lines to undertake long-term capital investments aimed at enhancing and expanding the provision of RoRo transport services. This, in turn, would finally lead to the desired upward shift in the demand curve for the concerned services, implying higher RoRo freight traffic levels at any given price point. Therefore, in case similar incentive schemes are implemented in the future, the duration of the subsidisation cycle should be extended to, at least, a ten-year period.

In addition, the time-management of the Ecobonus might be enhanced with appropriate publicity being made well in advance. If such an incentive scheme is announced following the thereto-related subsidisation period, it is inevitable that instead of incentivising the shift to another transport mode, it will just result in part of the transportation costs being transferred from private road haulage companies to the state, i.e., to taxpayers.

As emerged from the telephone interview held with Grimaldi representatives, the Ecobonus has doubtlessly increased the awareness of road haulage companies with respect to RoRo transport services. According to the shipping line, many new Italian and Spanish users (road hauliers) have formed partnerships in order for unaccompanied trailers travelling from Italy towards Spain, and vice-versa, to be picked up at the port, driven until their final destination and back to the port by the road haulage company of the given destination country. Allowing for a larger number of trailers to travel unaccompanied from both the motor unit and the driver, such arrangements lead to a considerable increase in the efficiency of freight transport. Hence, it is suggested for the concerned public entities to promote the creation of partnerships of this kind. One way of fostering collaboration among road haulage companies boarding on RoRo routes between Italy and Spain could be to launch a dedicated IT platform where freight information and scheduled itinerary are shared, as well as financial agreements made. In this regard, it may also be discussed whether the aim to reduce fragmentation in the road haulage industry can be efficiently achieved through such a scheme. No evidence has been collected that the request of a minimum number of trips per year has helped to consolidate the industry by favouring the rise of less, bigger market players in the medium-term. Differently, even if to a negligible extent, it has increased the administrative burden that road hauliers had to comply with. Also in this case, a long-term incentive scheme might encourage road haulage companies to shift from forming temporary consortia to committing to more structured, permanent kinds of partnership.

Finally, the importance of complementary policies in fostering the development of the Motorways of the Sea should not be neglected. For an upward shift in the demand for RoRo transport services to occur, the implementation of incentive schemes by itself is not sufficient. Indeed, the deployment of similar subsidisation policies should be coupled with other support actions, such as the granting of government funds for the upgrade of both the relevant physical and digital port infrastructure.

# Annex I. Traffic data

## I.1. Traffic volumes data relative to the main Ecobonus routes between Italy and Spain (trailers/year)

As mentioned throughout the study, traffic volumes data provided in trailers/year has been gathered from a set of different sources, including the concerned port authorities, Grimaldi Lines and Shippax. However, oppositely to the case of the Genova-Barcelona route that will be addressed in a separate annex, the present traffic data has been directly measured as the number of accompanied and unaccompanied trailers that have boarded on the addressed routes each year. No conversion coefficient has been employed in order to derive those figures.

For most routes, data provided by Grimaldi was available exclusively from 2009/2010 onwards. This implied potential data discrepancies for the section of the time series relative to the implementation period of the Ecobonus. Therefore, the whole data set was presented to the shipping line in order for the accuracy and coherence of the time series to be assessed.

Traffic volumes data for the Livorno-Tarragona route, which was operated by the Flota Suardiaz are deemed accurate and coherent since they have been provided by an individual reporting entity: the Livorno Port Authority.

**Table 6 – Traffic volumes data for the main Ecobonus routes between Italy and Spain, measured in trailers/year**

Nr.	Route	Source	Nr. Of trailers/year										
			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Civitavecchia-Barcelona	Civitavecchia PA Shippax Grimaldi	11,247	34,451	46,542	49,228	47,678	58,994	63,963	60,164	53,645	62,697	67,129
2	Livorno-Barcelona	Livorno PA Grimaldi				10,436	23,604	23,685	21,574	30,276	23,970	18,654	22,222
3	Livorno-Tarragona	Livorno PA		3,280	8,321	8,076	4,810						
4	Livorno-Valencia	Livorno PA Shippax Grimaldi	8,611	5,747	5,982	2,649	8,385	11,663	12,535	31,713	33,680	35,675	58,370
5	Palermo-Valencia	Shippax Grimaldi		293	294	5,000	506	509	986	1,188	408	552	471
6	Salerno-Valencia	Shippax Grimaldi	16,121	16,938	20,114	24,457	25,332	18,959	21,289	20,267	17,238	18,771	25,392

Sources: Civitavecchia Port Authority, Livorno Port Authority, Shippax, Grimaldi

## 1.2. Available and elaborated traffic volumes data for the Genova-Barcelona route (trailers/year)

Data provided by Grandi Navi Veloci S.p.a. (GNV), available in trailers per year, has been estimated by the shipping line by converting the number of line meters that have been recorded as transported on the Genova-Barcelona route into trailers/year figures. This has been done by dividing the number of transported line meters by a conversion coefficient set at 11.5 meters. In other words, it has been assumed the average trailer length to lie around that value.

Such a procedure has led to a significant discrepancy between the data provided by WestMos for 2005/06 and the one provided by GNV for the subsequent years. Computing growth rates, the combination of such data as a reference, would have resulted in an overall trend not reflecting the real evolution of RoRo traffic on the route in question. Especially given that the time series provided by GNV starts in 2007, the first year of the incentive deployment. Traffic volumes provided by GNV are consistently understated compared to those made available by both the Genova port authority and WestMos. As a result, combining higher traffic volumes for 2005/06 with lower traffic data provided for 2007 onwards, generates statistics displaying a traffic decline over the whole Ecobonus implementation period when compared with 2006 traffic volumes.

**Table 7 – Traffic volumes data and elaborations for the Genova-Barcelona route, measured in trailers/year**

Nr.	Route	Source	Nr. Of trailers/year*									
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Genova-Barcelona	GNV			71,000	60,000	25,000	18,000	23,000	9,500	3,500	1,500
		Traffic growth rates				-15%	-58%	-28%	28%	-59%	-63%	-57%
2	Genova-Barcelona	Genova PA WestMos data	56,944	72,500	90,897	78,663	33,941					
		Traffic growth rates		27%	25%	-13%	-57%					
3	Genova-Barcelona	GNV PwC Elaborations (2016)	44,480	56,630	71,000	60,000	25,000	18,000	23,000	9,500	3,500	1,500
		Traffic growth rates		27%	25%	-15%	-58%	-28%	28%	-59%	-63%	-57%
			*GNV data is estimated based on transported linear meters (conversion rate = mt. 11.5)									

Sources: GNV, WestMos data, Genova Port Authority, PwC elaborations

However, if growth rates for both time series (i.e. nr.1 and nr.2) are compared, a nearly identical growth/decline pattern can be observed for 2007 and 2009, i.e., the years for which both GNV and Genova Port Authority data is available. This implies that data provided by both entities is very likely to be reliable and that the employment of too high a conversion rate by GNV has produced an understated time series that, nevertheless, describes a real trend.

Therefore, traffic data provided by WestMos for 2006/07 has been deflated to GNV data levels by employing the traffic growth rates observed for the Genova PA/WestMos data over the same period as a conversion rate. This has considered the best viable and most prudent procedure, since it implied the elaboration of data for two years (2005/06) only. The result is a coherent and robust traffic volumes time series (nr.3) that is now possible

to employ for analysis. In a recent interview conducted with GNV, the shipping line validated our approach and confirmed the accuracy of our estimate.

### ***1.3. Weekly sailings***

The table below presented the number of sailings operated per week on the different routes under analysis.

**Table 7 – Traffic volumes data and elaborations for the Genova-Barcelona route, measured in trailers/year**

Nr.	Route	Source	Nr. of sailings/week										
			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Civitavecchia-Barcelona	Grimaldi	6	12	12	12	12	12	12	12	12	12	12
2	Livorno-Barcelona	Grimaldi				3	6	6	6	6	6	6	6
3	Livorno-Tarragona	Shippax		n.a.	3	3	2						
4	Livorno-Valencia	Grimaldi	3	3	3	3	3	4	6	6	6	6	6
5	Palermo-Valencia	Grimaldi		n.a.	2	2	2	2	2	2	2	2	2
6	Salerno-Valencia	Grimaldi	n.a.	n.a.	2	2	3	3	3	3	3	3	3
7	Genova-Barcellona	Shippax	n.a.	n.a.	7	14	6	5	4	n.a.	3	3	n.a.
<b>Total</b>			<b>9</b>	<b>15</b>	<b>29</b>	<b>39</b>	<b>34</b>	<b>32</b>	<b>33</b>	<b>29</b>	<b>32</b>	<b>32</b>	<b>29</b>

In 2006, last year before the deployment of Ecobonus, 29 sailings per week were operated between Italy and Spain. In the period between 2007 and 2010, when the Ecobonus has been assumed having generated modal shift from road, the average number of sailing per week were 33. The Livorno Barcellona was started up in 2007 with 3 weekly sailing and upgraded in 2008 and following years with 6 weekly sailings. Hence, if the Livorno Valencia is excluded from the aggregate supply assessment, the overall weekly sailings drops from 29 in 2006 to 26 in 2013.

# ***Annex II. Survey questionnaire***

## **Survey on the evaluation of the Italian Ecobonus Scheme on Italian-Spanish routes**

### **I. Introduction**

PwC is conducting the present survey on behalf of R.A.M. SpA. The survey will focus on the Italian Ecobonus scheme implemented over the 2007-2010 period. The collected information will be used to develop a new European Ecobonus for road haulage companies using short sea shipping services.

### **II. Addressees**

This survey is addressed to all those road haulage companies and lorry drivers that have benefitted from the Italian Ecobonus scheme.

### **III. Instructions**

Please note that the present survey will expire on Sunday the 8th of May 2016. You are kindly asked to complete and submit the questionnaire within that date. The questionnaire's estimated completion time is of approximately 15 minutes. Please be aware that the progress made in this survey is saved automatically each time respondents move from one page to another. Therefore, you can interrupt the survey and go back to it anytime.

### **IV. Respondent's information**

**Q1 Please, enter below your contact details.**

Name (1)  
Surname (2)  
Company/Organisation (3)  
Nationality (4)  
E-mail address (5)  
Telephone number (6)

## V. Ecobonus evaluation

**Q2 On which of the following routes were you boarding before, during and after the implementation of the Ecobonus?**

	Before (2003-2006) (1)	During (2007-2010) (2)	After (2011-2104) (3)
Civitavecchia - Barcelona (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Genoa - Barcelona (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leghorn (Livorno) - Barcelona* (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Barcelona - Savona (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leghorn (Livorno) - Valencia (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leghorn (Livorno) - Tarragona (6)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Palermo - Valencia (7)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salerno - Valencia (8)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Marina di Carrara - Castellon de la Plana** (9)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\*this route was first introduced in 2007. \*\*this route was not active in the period before and after the implementation of the Ecobonus.

**Q3 Approximately, which percentage of total freight transported between Italy and Spain were you boarding before the introduction of the Ecobonus, i.e., in the 2003-2006 period?**

- ☐ 0% (1)
- ☐ 10% (2)
- ☐ 20% (3)
- ☐ 30% (4)
- ☐ 40% (5)
- ☐ 50% (6)
- ☐ 60% (7)
- ☐ 70% (8)
- ☐ 80% (9)
- ☐ 90% (10)
- ☐ 100% (11)

**Q4 Approximately, which percentage of the total freight transported between Italy and Spain were you boarding during the implementation of the Ecobonus, i.e., in the 2007-2010 period?**

- ☐ 0% (1)
- ☐ 10% (2)
- ☐ 20% (3)
- ☐ 30% (4)
- ☐ 40% (5)
- ☐ 50% (6)
- ☐ 60% (7)
- ☐ 70% (8)
- ☐ 80% (9)
- ☐ 90% (10)
- ☐ 100% (11)

**Q5 Approximately, which percentage of the total freight transported between Italy and Spain were you boarding after the end of the Ecobonus initiative, i.e., in the 2011-2014 period?**

- ☐ 0% (1)
- ☐ 10% (2)
- ☐ 20% (3)
- ☐ 30% (4)
- ☐ 40% (5)
- ☐ 50% (6)
- ☐ 60% (7)
- ☐ 70% (8)
- ☐ 80% (9)
- ☐ 90% (10)
- ☐ 100% (11)

**Q6 Did you start using short sea shipping services as a direct consequence of the introduction of the Ecobonus?**

- ☐ Yes (1)
- ☐ No (2)
- ☐ N/A (3)

**Q7 Did the introduction of the Ecobonus boost your company's transport volumes between Italy and Spain?**

- ☐ Yes (1)
- ☐ No (2)



**Q8 If yes, by how much:**

- ☐ 10% (1)
- ☐ 20% (2)
- ☐ 30% (3)
- ☐ 40% (4)
- ☐ 50% (5)
- ☐ 60% (6)
- ☐ 70% (7)
- ☐ 80% (8)
- ☐ 90% (9)
- ☐ 100% (10)

**Q9 Have you experienced increases in the level of net sea prices on the aforementioned routes during the implementation period of the Ecobonus?**

- ☐ Yes, however price increases were negligible and not directly related to the implementation of the Ecobonus (1)
- ☐ Yes, prices increased significantly over the 2007-2010 period (2)
- ☐ No, prices stayed constant over the given time period (3)

**Q10 Which are the main reasons for you to choose maritime/RoRo transport over other alternative transport modes?**

- ☐ It was more cost-efficient (1)
- ☐ It was more time-efficient (2)
- ☐ It allowed drivers to rest (3)
- ☐ It allowed my company to avoid traffic bans (e.g. weekend/holiday bans) (4)
- ☐ It allowed to avoid road congestion (5)
- ☐ Enhanced cargo security (7)
- ☐ Others, please specify: (8) \_\_\_\_\_

**Q11 Which are the main reasons for you not to choose maritime/RoRo transport over other alternative transport modes?**

- ☐ Unsatisfactory service schedule/frequency (1)
- ☐ Poorer time-efficiency (increased trip duration) (2)
- ☐ Port congestion (5)
- ☐ Need to operate intermediate stops to load/unload cargo (3)
- ☐ Others, please specify: (4) \_\_\_\_\_

**Q12 Did the recent economic crisis affect your decision to use short sea shipping services in any way?**

- ☐ Yes, I reduced the share of trailers boarded with respect to total freight transported as a consequence of the economic crisis (1)
- ☐ Yes, I increased the share of trailers boarded with respect to total freight transported as a consequence of the economic crisis (2)
- ☐ It did not affect my decision to use short sea shipping services (3)

**Q13 Have you formed or did you participate to a consortium to benefit from the Ecobonus?**

- ☐ Yes (1)
- ☐ No (2)
- ☐ N/A (3)

**Q14 Is it still in place today? Besides from the Ecobonus-related benefits, which do you believe to be the main advantages brought about by consortia membership? Please, elaborate in the text-box below.**

**Q15 Approximately, how many men-hours were required, on a yearly basis, to prepare the file for requesting and being granted the subsidy? (e.g. if you had 2 employees working on it for one day, the resulting men-hours will be 16)**

- ☐ 4 men-hours (1)
- ☐ 8 men-hours (2)
- ☐ 16 men-hours (3)
- ☐ 24 men-hours (4)
- ☐ 32 men-hours (5)
- ☐ 40 men-hours (6)
- ☐ More, please specify: (7) \_\_\_\_\_