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International emission regulation in sea transport: Economic feasibility and impact

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ABSTRACT

Emissions from shipping due to the burning of the sulphur content of marine fuels conduce to air pollution in the form of sulphur dioxide and particulate matter. Various international organisations and institutions impose environmental standards on their member states to limit the emission of greenhouse gases. This paper examines both the potential effects of the emerging international maritime emission regulations on the competition between seaports and the potential underlying economic motivations fostering the discussion of introducing Emission Control Areas. It focuses on deepsea shipping. Another novelty is that the environmental issues are addressed from a policy, an economic and a legislative viewpoint. For the policy-related part, it is found that the political theory of public choice suggests that not the green lobby but rather the petrochemical lobby is the major driving factor behind the very strict emission caps. A potential port shift from Northern Europe to Mediterranean ports seems unlikely due to logistics disadvantages and service problems in Southern European ports. Finally, no convincing proof was found that the main liner companies would be unprepared for this legislation and should be persuaded to change their routes in favour of Mediterranean ports solely on account of the various emission regulations. The legal analysis, however, showed that the current enforcement regime of MARPOL Annex VI should be improved in order to rule out the possibility of a low degree of compliance and to protect the competiveness of complying ships.

Introduction

By developing an extensive legislative playing field, the International Maritime Organisation (IMO) and national governments[2] have accelerated their environmental efforts in international shipping. The strong correlation between the sulphur degree of maritime exhausts and acid rain on the one hand, and public health on the other, is undoubtedly one of the driving forces behind this. In 2008, the IMO directed the first revision of the International Convention for the Prevention of Pollution

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[2] European Commission (2013) for instance states that "*The Commission's 2011 White Paper on transport suggests that the EU's CO_2 emissions from maritime transport should be cut by at least 40% of 2005 levels by 2050, and if feasible by 50%. However, international shipping is not covered by the EU's current emissions reduction target*".

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From Ships (MARPOL Annex VI) which resulted in substantial measures for a gradual worldwide reduction in SOx and NOx (IMO, 2008). After the revision of MARPOL Annex VI, the focus moved to the issue of CO_2 reduction and the optimisation of shipping efficiency (see e.g. Aronietis et al., 2014a,b; Stevens et al., 2014). The requirements of SOx and NOx reduction also triggered the development of other guidelines such as the code for gas-fuelled ships, the International Code for Ships Using Gases or Other Low-Flashpoint Fuels or IGF code and guidelines for scrubbers. The entire package requires the shipping industry to look at new business models and aims at providing environmental benefit and health gains. Each measure involves costs as well as benefits, with potential negative effects for the maritime economy. The bunker fuels presently used by international maritime transport will have to be replaced by alternative, less polluting fuel. Alternatively, the combustion process used will have to be adjusted by new techniques to reduce their hazardous emissions, called vessel retrofitting (Aronietis et al., 2014a,b; Brynolf et al., 2014; Cullinane and Bergqvist, 2014; Fathom Shipping, 2014; Stevens et al., 2014; Frouws et al., 2012; Endresen et al., 2005). It is presumed that this implies extra costs: the petrochemical process of refining is prolonged while more intensive and new investments on the ship have to be made (Seaat, 2011).

A substantial amount of research exists on the link between emission legislation and maritime economics, mainly focusing on shortsea shipping. An overview of some of this research is provided by Entec Consulting Ltd. (2010). The main conclusions relate to three topics: which method is best suited to achieve this transition successfully (Miola, 2010), what are the additional costs faced by sailing to/from an Emission Control Area (hereafter ECA) zone, and what is the possibility of a so-called reverse modal shift (i.e. road transport winning again from a competitive and cost perspective compared to maritime transport, mainly shortsea shipping) (Jiang et al., 2014; Aronietis et al., 2014a,b; Johansson et al., 2013; Odgaard et al., 2013; Entec Consulting Ltd., 2010; Turku, 2009). The latter studies expect a reverse modal shift from sea-based transportation to currently more competitive land-based transportation, ranging from 3% to 50% on some trade lanes. Such a substantial shift could eradicate the environmental gains through rising congestion and pollution caused by transportation of this cargo by land. Nevertheless, such a shift is possible since shortsea shipping, which will have to be completely sulphur-free due to its geographical location within the sECA-zones of the Baltic and North Sea, has always been in stiff competition with land-based transportation on relatively short distances. In contrast, Holmgren et al. (2014) concludes that a modal backshift to road transport is unlikely to occur for the shipments of relatively high-valued containerised goods from Lithuania to the British Midlands.

Clearly, focusing on the impact upon deepsea shipping from an transversal viewpoint fills a gap in the literature. Concentrating on deepsea means taking into account that the vessel passes different zones with several different emission legislations (for instance, US coast guard). This could provoke shifts in routes: certain zones with very severe emission caps could become less attractive for maritime transport in comparison to less strict, alternative regions. An example of this dichotomy can be found in Europe, which features two ECA's: the Baltic sulphur-ECA and the North Sea sulphur-ECA. In contrast, the Mediterranean area currently remains free from such legislation, and is only required to follow European legislation and IMO's global rules (Maarsen, 2011). As a result, the Mediterranean ports could use their advantageous position to raise their market shares and attract new trades (Garcia-Milà, 2010).

This paper examines both the potential effects of the emerging international maritime emission regulations on the competition between seaports and the potential underlying motivations fostering the discussion of introducing ECA's (Emission Control Areas) and their efficiency. The scope of the paper is limited to the main container liners and the Northern European and Mediterranean ports of call. The main question of the present paper is whether enhanced sulphur emission legislation provides the Mediterranean ports with a competitive advantage, and provokes a potential port shift and growing hinterland due to changed cost balances. The research question will be addressed from a policy, an economic and a legislative viewpoint. This transversal approach is rather novel. The policy part to the answer addresses the current state and the likely future of ECA regulation regimes, which will determine the need for and likelihood of a potential port shift. The economic part to the answer gives quantitative and qualitative insights in operator impacts and strategies. The legislative part to the answer finally contributes by showing the side-conditions for making the ECA implementation successful and therefore showing the real potential of a port shift.

The paper is structured as follows. Firstly, the scope and the methodology is described in detail. Then, the paper continues with a policy, an economic and a legal analysis. The policy part, in Section 'The policy perspective on ECA'S', consists of a brief overview of IMO and EU legislation and an analysis of interviews conducted with the legislative bodies (i.e. IMO and EU representatives) and interest groups (see Appendix A). Given that port competition can also contribute to reducing emissions, the economic part in Section 'Economic analysis: ports and port competition' focuses on the ports, port competition and hinterland. This is clearly the core part of the analysis. Finally, in order to provide some legal insights in the discussion about ECAs, in Section 'Legal analysis: enforcement and effectiveness of regulation' the attention will be turned to those legal and regulatory aspects that can affect a potential port shift. Major findings and conclusions will be found in Section 'Conclusion'.

Scope and methodology

The international span of deepsea shipping is different from the more regional character of shortsea carriers, given that vessels navigate through different zones or regulations. Shippers might take this into account while opting for these routes. This paper concentrates on the European situation, with a focus on four ports out of the sECA adjacent to the Hamburg-Le