INSTITUTIONAL PERFORMANCE AND SHIP REGISTRATION

1. Introduction

Ship registration has retained for at least six decades now its central role as a vital element of modern maritime business strategy and policy. Initially a requirement under international law and the focus of a strong debate in international intergovernmental shipping quarters, ship registration has through the years been transformed into a complex business decision rather than a mere legal prerequisite. Ship registration is not only a ship's prerogative and duty; its impact extends to a much wider system of constituents in the shipping industry, including national governments, port authorities, trade unions, international policy and law making bodies, competing shipping companies. Contemporary changes and developments in international shipping but also oversights in previous investigations highlight the need for further research into the issue of ship registration along a number of parameters, exogenous and endogenous to the industry, which this paper seeks to address.

The significance of ship registration has been reflected in both the theory and practice of the shipping sector. A growing mixture of diverse ship registration alternatives for ship owners has arisen; multiple national and supranational policies have been developed around ship registration aspects, and; flagging behavior has constituted the focal area of investigation for academic research along a number of parameters. The main flag distinction has of course traditionally been between national flags and open registries. Although other types of registries, such as second or international registers, have gained prominence at certain times, the major issue has been the proliferation of the open registers regime as a competitive alternative of ships' registration in national flags. With shipping being the truly global business that it is, ship owners have always sought an international level playing field for their activities. Therefore, the decision to 'flag-out' – i.e. to change a vessel's registry from a national flag to a foreign flag, namely a flag of convenience (FoC) – would have to be affected by not strictly the status and requirements of the national flag but by its comparative status in relation to existing flag alternatives. Open registries have been designed and established to provide mainly a cost reduction and commercially simple service to ship operators and have been successful in doing that, given that since 1989 the ratio of foreign

registered vessels in total vessels has generally been on the increase reaching the 71.5% in 2012 (UNCTAD, 2012). Safety concerns have arisen, though, in the process.

Yet, this sort of dualism in the international maritime transport sector, splitting the industry into two segments distinguished by operating characteristics peculiar to the two different scenarios and by lower break-even points, may have been surpassed by recent developments. Literature denotes an observed convergence between the two main types of registry along a number of parameters (Mitroussi and Marlow, 2010). Such convergence is seen to stem both from the inclination of national flags to incorporate open registries' features, as well as from the open registries' efforts to upgrade their game in the maritime safety standards arena. However, ship registers are not separate from the nation from which they originate and they should not be examined irrespective of them or of their administrative and institutional performance.

There have been numerous attempts to try to explain flagging behavior and especially flagging-out behavior. Shipping literature has focused too heavily – and therefore perhaps too restrictively – on shipping-related aspects of ship registration. Further research on the impact of controlling parameters exogenous to the industry is needed. Previous research has also not taken into account, concurrently with other factors, latest changes in the ship registration regime. These include the apparent convergence along certain parameters between previously distinct types of registry, but also, an increased volume of flagging-out from traditional national flags not to open registries but to other traditional flags.

This paper revisits the issue of flagging-out in the light of factors both internal and external to the shipping industry. Its contribution is two-fold. First, it proposes a new measure of flag-out behavior, defined as net flag-out ratio, which, in contrast to the standard flag-out definition, accounts not only for the nationally owned ships which flag-out to other flags but also for foreign-owned ships flagging-in the national flag. By definition, the net flag-out ratio is a wider concept than the traditional one and, as we argue later in the paper, more suitable to study flag-out behavior within an environment of an increased volume of flag-out within traditional flag countries. Second, it uses, for the first time, quantitative measures relating to the areas of corruption/transparency and institutional performance/friendliness-to-business to capture the potentially impact of these factors to ship registration, while controlling for context-related factors. The remainder of the paper is structured as follows: Section 2 gives an overview of ship registration and flagging-out, as reflected in extant literature. Section 3

reviews the new emerging trends in flagging behavior and presents the net flag-out ratio proposed by the paper. Section 4 presents the empirical findings relating to the standard and net flag-out ratios obtained by applying correlation analysis and cross-sectional, multiple regression econometric approach to capture the effect of a country's institutional performance and/or environment on ship registration and flagging-out. Finally, section 5 summarizes and draws the paper's research conclusions.

2. Flagging-out traditional overview

Ship registration found a prominent position in shipping literature with the advent of open registries or FOCs especially after the 1950s. This new breed of ship registry challenged the legal requirement for a 'genuine link' between the flag and the vessel and had a number of repercussions at multiple levels - company, industry, national and international level. It attracted the attention of academics in the same way that it attracted the attention of business people. Today, however, many of the definitions of FoC provided in the early literature may seem rather surpassed by the current state of affairs. For example, Boczek (1962) defined a FoC as: the flag of any country allowing the registration of foreign-owned and foreign controlled vessels under conditions which, for whatever reasons, are convenient and opportune for the persons who are registering the vessels. Metaxas and Doganis (1976) identified as a FoC: the national flags of those states with whom ship owners register their vessels in order to avoid the fiscal obligations and the conditions and the terms of employment of factors of production, that would have been applicable if their ships were registered in their own countries. Today's reality sees foreign-owned vessels being registered not just in open registers but also in traditional national flags, whereas the relaxation of fiscal regimes and employment related requirements, like manning, have acquired a more or less universal character (Haider, 2013, Marlow and Mitroussi, 2008).

Other definitions of FoC's may appear to be more in tune with today's changing environment. Bergstrand (1983, p.4) definition may be one of them: "A FoC is a flag of a state whose government sees registration not as a procedure necessary in order to impose sovereignty and hence control over its shipping but as a service which can be sold to foreign ship owners wishing to escape the fiscal or other consequences of registration under their own flags". The definition distinguishes FoCs on the basis of varying incentives and attitudes between exercising true sovereignty and offering a commercial service and does not

necessarily preclude traditional flags from accepting foreign-owned vessels on their registries.

Flagging-out, which essentially denotes the shrinkage of the registered fleets of the traditional maritime countries, has in fact always been associated with the surge and proliferation of open registries. The fleeing fleets of traditional maritime nations were almost wholly attracted by open registers, hence their staggering expansion, especially in the 1980s and 1990s. The share of world deadweight tonnage registered in the major open registries was about 4% in 1950, it then had a sharp increase in the 1970s, going from 21.6% of the world total fleet to 31.1% during that decade, and in 1988 the open registries' fleet surpassed for the first time the traditional maritime countries' fleet (UNCTAD, 2008). Today that share is not diminishing. The fleets of the 10 most important open registries – Panama, Liberia, Bahamas, the Marshall Islands, Malta, Cyprus, the Isle of Man, Antigua and Barbuda, Bermuda, and Saint Vincent and the Grenadines – have continued expanding their market share, amounting to 56.6% of the total world fleet (UNCTAD, 2012).

This created a distinct dichotomy in the shipping business, whereby control and ownership of world fleet was to be found, largely, in the hands of traditional maritime countries but open registries dominated the registration of ships. Research focused on the factors affecting ship registration in an attempt to explain this dyadic character of the shipping business and map ship owners' strategic decision making. Many lessons learned were subsequently translated into national ship registration policies.

Reasons for flag choice have centered around the advantageous regimes open registries have offered to ship owners. Open registries have primarily offered an alternative production input combination that has allowed shipping companies to minimize costs. In fact, the representation of FoC as a solution in search of the absolute cost advantage by shipping firms (Sletmo, 1986) has made them be strongly associated with relevant traditional economic theories (see for example Vernon, 1966). Flagging-out has gained a prominent position in maritime history by it being regarded as the third wave of maritime transport (Sletmo, 1989). Typical of the traditional investigation approach to ship registration is an esoteric – to the industry – approach with a focus on the firm.

Although flag selection is a high-level decision usually made, on a vessel-by-vessel basis and different companies perceive different factors as being important to their decision on flag (Bergantino and Marlow, 1998), flagging-out is thought to be caused primarily by the desire

of the firm to minimize costs under a relatively lower cost regime. Two main cost items appear as most important in the literature: operating costs and tax obligations. Tax considerations were the primary initial reason for the creation of open registries both at the beginning of the century as well as later[1]. There is some ambivalence in the fact that, for many years, shipping companies considered the need to enjoy fiscal advantages to be a substantial factor in their flag choice decision. Avoiding taxes and other fiscal obligations in ship owners' own countries were regarded as main factors behind the decision to flag-out (Asteris, 1993, Gardner et al 1984, Metaxas 1985, Metaxas and Doganis, 1976, Vogel 1993, UNCTAD, 1981). More recently, however, fiscal regimes have become so similar in their impact that there is little to choose between them, making potentially shipping taxation no longer a major issue for the industry (Goss and Marlow, 1997, Marlow and Mitroussi, 2012). Yet, still absolute tax savings are possible for a shipping company when comparing registration options at a global basis (Marlow and Mitroussi, 2008).

Regarding operating costs, it is in the manning costs area where flagging-out policies allow attainment of varying degrees of freedom from the constraints of union agreements and national manning regulations. Therefore, crew costs have appeared as the main financial reason behind the ship owner's decision to flag-out in studies by several authors (Asteris, 1993, Bergantino and Marlow, 1998, Dorey, 1988, Metaxas, 1985, Metaxas and Doganis, 1976, Policy Research Corporation, 1994, Tolofari et al 1986). Manning cost concerns seem to continue to be prevalent as national flags adjust their nationality requirements to attract more tonnage. For instance, in 2007 the Greek government relaxed requirements to employ Greek seafarers under the national flag and noticed an increase in tonnage under Greek flag (Marlow and Mitroussi, 2008).

[1] For example, in the 1920s the use of the Panamanian flag helped US ship owners to avoid high tax rates in the US, while after the Second World War a more systematic and formally organised approach by US tax lawyers resulted in the setting up of the Liberian flag.

3. Revisiting the flagging-out behavior

3.1. New areas of investigation

Contemporary developments create a business environment that differs from the shipping industry of the 1970s, 1980s or even the 1990s (where most of the related literature is placed). This calls for a reassessment of the range of factors affecting flagging and flagging-out behavior and effect. Although cost cutting remains a vital concern of ship operation, interest has arisen with regard to an array of other factors that may play an increasing role in ship owners' flag decisions. For example, Goulielmos (1998) discusses the relevance of labor quality and degree of government control in addition to fiscal factors with regard to ship registration. Bergantino and Marlow (1998) underline crew costs as the most common reason for flagging-out but also bring to the fore other factors, like the wish to escape bureaucratic control, high costs of compliance with standards of the national flag, the unavailability of skilled labor (and the need to ensure a supply of same), and fiscal reasons. More recently, Chung, Hwang and Wong (2007) found that the major factors causing containership flagging out in Taiwan are insufficient local crews, requirement of dual class, insufficient incentives, trading limits and privatization. Hoffmann, Sanchez and Talley (2005) stress vessels' characteristics and their importance in the decision to flag-out. They examined in particular the vessel type age and size, its country of build and its classification society, while consideration was given also to characteristics of the country where the operator is domiciled. Kavussanos and Tsekrekos (2011) show that the likelihood and timing of registry switching decisions can be affected by uncertainties over the level of savings in tax and labor costs that accrue from flagging-out, and the level of correlation of a vessel's operation with the market portfolio. Marlow and Mitroussi (2012) suggest that taxation is only one of the parameters which will determine flag choice as other factors gaining prominence might include the attitude of trade unions towards certain flags depending on which IMO list they appear, inspection procedures by national authorities, or manning regulations (Marlow and Mitroussi, 2012).

The issue of application of appropriate safety standards by flags is not new in the ship registration debate. The upsurge in open registers was accompanied with serious concerns about maintaining safety, as the industry watched the 'genuine link' between the vessel and the traditional and responsible maritime administrations disappear. A number of studies

examined the role of open registries to maritime safety resulting in some alarming results. Li and Wonham (1999) in their investigation concluded that the worst group, in terms of total loss rate, is open registries (except Liberia and Bahamas). Li (1999) confirmed that loss rate, detention rate and age of ships are highly correlated with each other and showed that the loss rates and detention rates of open registers are above the world average, but with the exception of Liberia, Marshall Islands and Barbados. Alderton and Winchester (2002) found the FoC to have the worst casualty record. They, however, underlined that distinct differences exist among different open register countries with the newer, faster growing FoCs (e.g. Bolivia, Cambodia, Sri Lanka, etc.) being more likely to have inferior records to other flags mostly due to non-observance of international standards.

Enhanced regulatory initiatives followed such concerns aiming to target, monitor and penalize flag state performance. First, the port state control regime was established with various Memoranda of Understanding (MOU) around the world, e.g. the Paris MOU, the Tokyo MOU, and with an always acute in its investigations US Coast Guard. Then, more emphasis was placed on improving the flag state control (FSC) by introducing auditing mechanisms of the flag states themselves, rather than only the vessels carrying their flags. What started at the International Maritime Organisation (IMO) as a voluntary Member State Audit Scheme has now evolved into a mandatory scheme due to take full effect at an international level in 2016. Stricter rules and standards in port state control, as well as expansion of its area of investigation to include performance of recognized organizations, like classification societies, rather than just performance of individual ships and flags have tightened control. In the light of the above, variables relating to particular aspects of safety standards, like the PSC, or the FSC, should not be left out of a discussion of ship registration factors. Cariou and Wolff (2011) show that PSC inspections influence ship owners' interest in changing the flag of registry. Luo et al. (2011) found that the parameter of the safety record as translated by both the port state control and the flag state control has a marked significance as flag choice factor. They found that for ship operators from closed registry countries, if the country of origin has a lower PSC inspection rate, stricter FSC and worse safety record, they will prefer a full-open group. In contrast, those from open registry countries prefer a full-open group if the country of origin has a higher PSC inspection rate, loose FSC and better safety record.

The bulk of the extant literature on flagging-out has concentrated on factors directly related to the shipping business, i.e. operating costs, shipping company, vessels' features, the shipping

business environment, and have only peripherally touched upon more macroeconomic dimensions which may affect the flag choice. Very recently, Haider (2013) provided a macroeconomic perspective in the study of flagging-out, showing that the foreign-flag share is higher in countries with higher crew cost and lower labor rate and that developed countries, especially in European region, have higher shares of foreign flag than developing countries. This paper advocates the need to expand on a macro-investigation into the factors that affect flagging-out. The ship registry provided by a nation cannot be seen in isolation of that nation itself. The ship registration framework that it provides, for example, reflects also the administrative and institutional regime of that country. The macro features of a nation may be reflected in the ship registry regime and may affect either the perception or the experience of the ship owner doing business with this country. For instance, previous research has hinted to the importance of avoiding bureaucratic control when flagging out (Bergantino and Marlow, 1998). It is important to examine relevant macro factors that have been neglected so far, such as the ease of doing business parameters. Recently, the Greek ship owners raised particular concerns about the bureaucratic constraints experienced in the actual registration process of their vessels with the national flag, which required 32 signatures from different entities in order to be completed (Karageorgos, 2013). In a global market, as is the flag registration market, where other flags advertize completion of the ship registration procedure in 24 hours, this could be a detrimental factor for flag choice.

3.2. Towards a new flagging-out regime?

In the extant literature the main assumption is that flagging-out is synonymous to registering with a FoC. This has accurately reflected reality so far but nowadays due regard should be given to recent developments which may moderate such assumptions. What the literature has failed to underline is that in recent years the 'beneficiaries' of the flagging-out of vessels of national registries, are not anymore only the open registries, as has been the presumption for decades. Over only the last five-years, striking increases in the percentage of vessels owned by foreigners are observed for national-type of ship registries. The most noticeable of them, as presented in Table 1, include the case of the UK, China, Italy, Indonesia, the US, Russia, the Philippines and the Netherlands. In contrast, the share of some respective international registers (e.g. NIS, DIS) diminished. In the last 13 years (1999-2012) the total world fleet has expanded by almost 100% –i.e. it was less than 800 million deadweight in 1999 going up

to 1.5 billion deadweight tons in 2012 –, and the share of the deadweight tonnage of major open registries increased by 8.6% - i.e. from 48% in 1999, to 56.6% in 2012 (UNCTAD, 2000, 2012). Given that the share of world fleet under foreign registration (i.e. other than its owned interests) has continued to be on the increase, reaching 71.5%, it is obvious that a considerable portion of the expansion of the world fleet has been absorbed by national flags, not, however, of the same national origin as its controlling interests.

[INSERT TABLE 1 HERE]

The current registration system appears quite differentiated from the traditional dichotomy between national flags and FoC. Both types of registry have taken steps towards meeting each other somewhere in the middle along certain parameters. National flags have benchmarked their policies against their main 'competitors', i.e. the open registries, and have aligned their registration incentives with those offered by FoCs. For example, the overwhelming majority of the ocean-going fleet is under some form of tonnage tax system, while nationality restrictions for crew complements become more and more lax for traditional flags. Haider (2013) observes that at some point equilibrium may be established whereby the ratio of flagging-out would reach a stable plateau within each nation. On the other hand, some open registries today exhibit a similar safety and quality profile to major traditional national flags. Liberia, the Bahamas and the Marshall Islands are on the white list of both the Paris and the Tokyo MOU and enjoy a listing on the United States Coast Guard (USCG) Qualiship21. Malta, Cyprus and Panama are also on the white lists of the Paris and Tokyo MOUs.

Despite similarities nowadays between national flags and open registries regarding several dimensions of ship registration, differences are still significant. The two tend to have, for example, a distinctive philosophy regarding shipping: traditional flags consider shipping an important industry for their nation, one in which governments should invest and to which private investment should be attracted and regard ship registration as a necessary procedure to impose sovereignty. They also tend to use open registers as a benchmark in order to increase the competitiveness of their own national shipping industry and extended maritime cluster rather than in order to sell a service to foreign ship owners wishing to escape the fiscal

or other consequences of registration under their own flags (Mitroussi and Marlow, 2010). Is that perhaps less and less the case nowadays? Traditional flags become increasingly open to other nationalities making their services available to foreign ship-owners. One recent study examined the particular case of the UK flag regarding this issue considering potential repercussions (Marlow and Mitroussi, 2011). "If the aspect of national affiliation, with all its implications, is not present in the choice factors that make a national flag appealing, then it will tend to compete with the rest of the flags, open registries or not, on an equal footing. In this case, the mere introduction of favorable tax regimes will not be enough to effect 'flagging in' (Marlow and Mitroussi, 2011, p.362). Even more, for some national flags the flagging-in does not refer anymore solely to the 'repatriation' of nationally owned vessels, but increasingly more to the pouring in of vessels of foreign interests. An infusion of elements from the shipping experience and standing of both national and foreign ship-owning interests should then be reflected on the flag. Literature has already noted the need for new assumptions and new generation of quasi definitions in respect of types of registries. Luo et al (2011) for example, distinguish between 'full-open registries' and 'quasi-open registries', denoting a difference in safety attitude between the two.

3.3. A new measure of flagging-out

The traditional measure of flagging-out used by the existing literature (and also considered in the analysis which follows) is given by equation (1) below as the ratio of tonnage owned by a country's nationals registered under a foreign flag to the total tonnage owned by the country's nationals (see, for example, UNCTAD, 2012, p.41):

$$Standard\ flagout\ ratio = \frac{Tonnage\ owned\ by\ country's\ nationals\ registered\ under\ foreign\ flags}{Total\ tonnage\ owned\ by\ country's\ nationals} \quad (1)$$

In light of the evidence of increased flagging-out into traditional flags discussed in section 3.2, it is plausible to develop measures of flag-out behavior that do not only account for the traditional type of flag-out (i.e. the exodus of ships from traditional flags to ORs) captured by equation (1) but, also, for the emerging trend of ships registering under traditional flags other

than their owned interests. For this purpose we propose a new ratio defined as net flag-out ratio, given by equation (2) below:

$$Net\ flagout\ ratio = \frac{Tonnage\ owned\ by\ country's\ nationals}{Global\ tonnage} - \frac{Tonnage\ under\ country's\ flag}{Global\ tonnage} \quad (2)$$

Equation (2) defines the net flag-out ratio as the difference between a country's ownership share in total global tonnage minus the share of global tonnage under the country's flag. If the net flag-out ratio takes a positive value then tonnage under a country's ownership exceeds tonnage registered under the country's flag, in which case the country presents net flag-out. If the net flag-out ratio takes a negative value then tonnage under a country's ownership is lower than tonnage under the country's flag, in which case the country presents net flag-in.

Compared to the standard flag-out ratio in equation (1), the net flag-out ratio in equation (2) captures not only the ability of a country to maintain its nationally-owned ships in its national flag but also its ability to attract foreign-owned ships. The net flag-out ratio is a wider concept than the standard flag-out ratio and is more appropriate to measure ship registration performance within the new flagging-out regime described in section 3.2 characterized by an increasing volume of flag-out within traditional maritime countries. Note that it is possible for a country to record an increased standard flag-out ratio and, at the same time, net flag-in. This can happen if the country attracts to its flag a higher volume of foreign-owned tonnage than the volume of nationally-owned tonnage choosing to register under a foreign flag. Under such a scenario, the standard flag-out ratio would falsely indicate that the country's ship registration performance is deteriorating when, in reality, it has improved.

4. Data and methodology

Our empirical analysis investigates the determinants of both measures of flagging-out behavior discussed in section 3.4 above, i.e. the standard flag-out and the net flag-out. As both ratios are mostly relevant to those countries from which flag-out occurs, our analysis considers the 33 nations with the largest owned fleets listed in Table 2 and representing 95% of total world deadweight capacity. In line with our discussion in section 3.3, Table 2 suggests that the standard and net flag-out ratios are by no means perfectly collinear: although the correlation coefficient is positive, it is well below unity taking the value of 0.35.

[INSERT TABLE 2 HERE]

In line with previous studies we model our flag-out measures on the log of per capita GDP measured in US Dollars in year 2012 (Data source: CIA Factbook, 2013), a variable used in the literature as a proxy for crew salaries due to the lack of wage data specific to the shipping sector. Hoffmann, Sanchez and Talley (2005), for example, recognize that GDP per capita is main indicator for the level of a country's general development and that this coincides with high wage levels (p.188). Haider (2013) uses the Gross National Income (GNI) per capita (US$), to represent the seaman's salary level of a country, which in the study is indicative of crew costs / employment cost. There are good empirical and theoretical reasons to consider the approximation of crew costs by per capita GDP valid. First, the correlation between per capita income and aggregate wage levels at the international level is very strong.[2] Second, mainstream economic theories, such as the Balassa-Samuelson model, predict a high correlation between national aggregate wages and wages in the economy's constituent sectors (the shipping sector being one of the latter), a hypothesis validated by a large volume of empirical literature (see chapter 3 in Sarno and Taylor, 2003). Finally, and specifically for the purpose of our own analysis using per capita GDP has an extra advantage: A high level of economic development (reflected in high per capita GDP) tends to coincide not only with high wage levels but also with stricter security standards and corresponding labour regimes (Hoffman et al., 2005).[3] This renders per capita GDP a more comprehensive control variable for the purposes of our econometric analysis, because by controlling for the effects of more variables additional to wage levels it reduces the scope for any omitted variables' bias affecting the coefficients and statistical significance of the variables measuring institutional performance included in our econometric specifications on whose role in shipping registration our analysis focuses (see below). From that point of view, the comprehensive nature of per capita GDP as a control variable improves the reliability of our statistical inference in relation to our main research hypothesis.

[2] For example, for year 2012 to which our cross-section regression models below refer, in a sample of 31 OECD countries the Pearson correlation coefficient between per capita income and average wage level (both measured in constant USD dollars) is 0.87, raising to 0.93 if Luxembourg is excluded from the analysis (data available upon request),

[3] We would like to thank an anonymous referee for raising these points.

Additionally to per capita GDP our empirical analysis offers an institutional perspective of investigation into flagging-out which has never been used before. Specifically, we undertake correlation and multiple regression analysis investigating the effects of quantitative measures of corruption and institutional performance/ friendliness towards business on our two flag-out ratios.[4] More specifically, we model the standard and net-flag out ratios on:

(a) The corruption perception index published by Transparency International for year 2012 (TICPI). This index takes values from 0 to 100, with higher values indicating a higher level of transparency and hence a lower level of corruption; and

(b) The Ease of Doing Business Index (EODB) published by the World Bank in June 2012 and the ten sub-indices used to calculate it. These business indices rank countries in terms of their relative performance among the full set of UN countries, with lower rankings indicating good performance and higher rankings indicating bad performance. The ten sub-indices used to construct the aggregate EODB and considered by our analysis include: Starting a Business (START); Dealing with Construction Permits (PERMITS); Getting Electricity (ELECTRIC); Registering Property (REGPROP); Getting Credit (CREDIT); Protecting Investors (PROTINV); Paying Taxes (TAXES); Trading Across Borders (TAB); Enforcing Contracts (CONTRACTS); and Resolving Insolvency (INSOLV).

Previous literature reviewed in sections 2 and 3 above has suggested that ship registration is influenced by the administrative and institutional regime of a country. However, such inference in previous studies is drawn using qualitative analysis, e.g. interviews (see e.g. Bergantino and Marlow, 1998); and/or it is restricted in data from a single country, e.g. the UK or Greece (see e.g. Bergantino and Marlow, 1998, Goulielmos, 1998); and/or it has a different emphasis, e.g. the level of a country's economic development and trading patterns (Haider, 2013) or the country's past national casualty rate, and literacy level, population etc (Hoffmann, Sanchez and Talley, 2005). What is more, in all previous studies the examination of the different factors focused on the standard flag-out ratio only. The present research has a different approach using quantitative metrics of a country's corruption level and institutional performance, with relevant data allowing for international comparisons to be made, while

[4] We also experimented with measures of implementation of safety standards or evidence of quality taking as a measure the participation of flags on the Paris and Tokyo MoUs' White lists and on the US Qualship 21 Initiative. These, however, were not statistically significant in explaining the standard and net flag-out ratios for our sample of the 33 nations with the largest owned fleet (results available upon request) and hence are excluded from the empirical findings reported below.

accounting also for a new concept and measure, the net flag-out ratio. The indices mentioned above offer quantitative metrics for these variables, extensively used in the economics and politics literature either to study the determinants of corruption or to use corruption to explain variables such as economic growth, foreign direct investment and total factor productivity (see e.g. Coe et al, 2009, Corcoran and Gillanders, 2014, Lambsdorff, 2006, Treisman, 2007). With shipping being a truly global industry, we conjecture that ship registration may be significantly impacted upon by institutional characteristics. We use, for the first time, in the shipping literature the metrics of institutional performance described above to investigate whether institutional characteristics determine flag-out behavior.

We test this hypothesis using two methodologies. First, we calculate Pearson correlation coefficients. Second, we estimate cross-section least squares regression models where the two independent variables, the flag-out and net flag-out ratios are regressed on a constant, per capita GDP, the TICPI, the EODB and each of the latter's sub-indices. Due to the limited number of available degrees of freedom our regression analysis is performed in three stages. In the first round of estimations the standard flag-out and net flag-out ratios are modelled on three independent variables, namely per capita GDP, the TICPI and one business index. In this estimation round we estimate one regression model for each business index, i.e. no more than one business index is included in the regression. In the second estimation stage we estimate models in which the standard and net flag-out ratios are modelled on real GDP and the interaction of TI-CPI with each of the business indices considered by our analysis. This round of estimations aims to account for possible colinearity between TICPI and the business indices and also to capture the possibility of misspecification in the first-stage regressions. Again, for these models too, no more than one business index is included in each regression. Finally, we estimate models in which the flag-out ratios are regressed simultaneously on all variables (linear and interactive) that turned out to be statistically significant in the first and second round of regressions. In this third stage, we allow for more than one business indices to enter our regression model.

5. Empirical findings

5.1. Correlation analysis

We start our empirical analysis with correlation analysis. Table 3 reports the correlation coefficient of the standard flag-out and the net flag-out ratios with each of the explanatory variables used in our analysis. Our a priori expectation is that the standard flag-out ratio will be positively correlated with our proxy for crew salaries, i.e. per capita GDP. Indeed, this positive correlation is obtained (see column (a) in Table 3). We also expect a positive correlation between the net flag-out ratio and crew salaries: given a certain value for a country's owned tonnage, higher crew salaries are expected to cause national tonnage to fly out to foreign flags and prevent foreign-owned tonnage from flying in the national flag. Both effects result in a reduction in the ratio of tonnage under the national flag to global tonnage, which according to equation (2) increases the net flag-out ratio. Table 3 column (b) suggests that this expected positive correlation is also obtained in the data. The size of this coefficient, however, is much lower than the figure obtained for the standard flag-out ratio in column (a) (0.16 versus 0.61). Therefore, the prima facie evidence is that the net flag-out ratio is less sensitive to crew salaries than the standard flag-out ratio. A possible explanation for this difference is that the standard flag-out ratio primarily captures flag-out from national flags to open registries mainly motivated by the difference in crew wages (e.g. Metaxas, 1985, Bergantino and Marlow 1998). By contrast, the net flag-out ratio also accounts for flag-in of foreign-owned vessels into traditional flags (as per our sample of traditional ship owning countries). Therefore, and given the higher degree of similarity among crew salaries within this group, the decision to leave one national flag for another may be mostly determined by factors other than crew salaries, such as the measures of institutional performance considered by our analysis.

[INSERT TABLE 3 HERE]

With regard to corruption, we expect the standard flag-out ratio to be negatively correlated with the TICPI index, as a higher degree of transparency is expected to encourage nationally owned flags to maintain their national registration, thus reducing the standard flag-out ratio. Column (a) in Table 3 however, suggests that the correlation coefficient between the TICPI and the standard flag-out ratio is negative. This counter-intuitive finding is reversed when we consider the net flag-out ratio. We expect a negative correlation between the net flag-out ratio and the TICPI as given a certain value for a country's owned tonnage higher transparency is

expected to cause nationally-owned tonnage to maintain the national flag and encourage foreign-owned tonnage to fly-in the national flag. Both effects result in an increase in the ratio of tonnage under the national flag to global tonnage, which according to equation (2) reduces the net flag-out ratio. The expected negative correlation between net flag-out and TICPI is indeed obtained (see Table 3, column (b)).

Finally, we expect positive correlation between each of the business indices and the standard flag-out ratio: as higher values of the business indices imply lower institutional performance leading to a less business-friendly environment, we expect a higher score for the business index (indicating deteriorating institutional performance) to be accompanied by higher values for the standard flag-out ratio. In the data, however, we obtain negative correlation between the standard flag-out ratio and the EOBD index, as well as nine out of ten of its individual sub-indices (see Table 3, column (a)). Once again, these counter-intuitive findings are reversed when we consider the net flag-out ratio. For this ratio, too, we expect a positive correlation with business indices: given a certain value for a country's owned tonnage, higher business indices scores implying deteriorating institutional performance are expected to cause nationally-owned tonnage to fly-out from the national flag and discourage foreign-owned tonnage from flying in. Both effects result in a reduction in the ratio of tonnage under the national flag to global tonnage, which according to equation (2) increases the net flag-out ratio. Consistent with these expectations, the net flag-out ratio is positively correlated with the EOBD index and seven out of ten of its individual sub-indices. The sizes of the reported correlation coefficients suggest that the correlation of net flag-out is stronger in the case of two indices traditionally important for ship registration, namely with Starting a Business and Paying Taxes.

Overall, our correlation analysis indicates that the performance of national flag countries in the areas of transparency/corruption and good-quality institutions do not determine the standard flag-out ratio in a way consistent with our prior expectations. The standard flag-out ratio seems to be much more strongly correlated with crew salaries, approximated by per capita GDP. On the other hand, transparency and institutional performance are correlated to the net flag-out ratio in the way we would expect them to be. As the standard flag-out measure mainly captures flag-out from national flag countries to open registries, whereas the net flag-out ratio also accounts for flag-in from other maritime countries, our findings in this section indicate that the decision to flag out to an open registry is primarily determined by crew costs considerations. On the other hand, given the decision to register a ship under a

national flag, the importance of crew costs diminishes and the institutional performance of a country becomes relevant. The following sub-section presents regression analysis exploring these hypotheses further.

5.2. Regression analysis

The first stage of our regression analysis involves estimating eleven equations for each flag-out ratio, modelling the standard and net flag-out ratios on three explanatory variables namely per capita GDP, the TICPI and each individual business index, with each index entering its respective regression model separately from the others. Specifically, we estimate by OLS the cross-section regression model given by equation (3) below: [5]

$$Flag-out\ ratio_i^j = \alpha + \beta_1 LOGDP_i + \beta_2 TICPI_i + \beta_3 Business\ index_i^k + u_i \quad (3)$$

where j denotes the modelled flag-out ratio (standard or net), i the cross-section units (countries) included in our sample, k the business index used to estimate the model and u_i a random error term.

Table 4, Panel A presents the equations modelling the standard flag-out ratio. In all models the only significant variable is per capita GDP. On the other hand, the TICPI has the wrong sign and it is statistically insignificant. The same holds true for the EODB index and its individual business indices. The reported tests for heteroscedasticity and functional form/general misspecification (RESET) suggest lack of misspecification problems at the 5 per cent level. To confirm that the insignificance of the TICPI and the business indices is not due to colinearity problems we present the p-values of the F-scores testing the joint

[5] In view of the relatively small sample size available for our analysis, we have tested the robustness of the findings of all reported regression models reported below in relation to the size and the standard error of the reported coefficients by undertaking two bootstrapping exercise. The first is a standard normal-distribution bootstrapping exercise involving randomising each model's estimated residuals and re-running the regression model a thousand times. The second is a wild bootstrap exercise (see Rapach et al, 2013), again involving a thousand repetitions of the bootstrapping experiment for each regression model. The results of both exercises (not reported here but available upon request) are consistent with the OLS estimates reported in Tables 4, 5 and 6 below.

significance of these variables' coefficients. In all cases the null hypothesis of joint insignificance ($H_0: \beta_2 = \beta_3 = 0$) is comfortably maintained, which suggests that the individual insignificance of the two variables is not due to colinearity between them. This is also confirmed by the values of the reported centered variance inflation factors (VIF) for parameters β_2 and β_3, all of which are well below the threshold values of 10 and 4, commonly used in the literature to denote the presence of significant collinearity (see O'Brien, 2007). Finally, we undertake another round of estimations to confirm that the insignificance of the TICPI and the business indices is not due to collinearity problems. Specifically we test whether TICPI and business indices impact upon the standard flag-out ratio not in a linear fashion, as suggested by the specifications reported in Table 4, Panel A, but in a multiplicative fashion captured by an interaction term. We do so by estimating the regression model given by equation (4) below setting *j* = standard flag-out ratio.

$$Flag-out\ ratio_i^j = \alpha + \beta_1 LOGDP_i + \beta_2 TICPI_i * Business\ index_i^k + u_i \quad (4)$$

The results are reported in Table 4, Panel B. All interaction terms are statistically insignificant and the misspecification tests pass at the 5 per cent level. Overall, our regression analysis in Table 4, Panels A and B suggests that the only explanatory variable significant in explaining the standard flag-out ratio is per capita GDP. The quantitative measures of transparency and institutional performance do not have explanatory power upon the standard flag-out ratio.

[INSERT TABLE 4, PANELS A AND B HERE]

We now move to the equations modelling the net flag-out ratio. We start with the specifications including linear terms given by equation (3), presented in Table 5, Panel A. Per capita GDP maintains its expected positive sign in all estimated models, but it is statistically significant at the 10 and 1 per cent level only in five and one out of eleven equations respectively. This is consistent with the findings presented in our correlation

analysis indicating that the role of crew salaries in determining the net flag-out ratio, which mainly captures flag-out among national flag countries, is of lesser importance than for the standard flag-out ratio which has traditionally captured flag-out from national flag countries to open registries. Furthermore, the TICPI is statistically significant in three equations at the 10 per cent level or lower. This stands in contrast to the equations modelling the standard flag-out ratio presented in Table 4 in which the TICPI was insignificant in all twenty two models.

Finally, we identify two models in which the business indices are highly statistically significant with the expected negative sign. These are the models reported in columns (i) and (k) of Table 5, Panel A, estimated using the business indicators referring to Paying Taxes (TAXES) and Starting a Business (START) respectively. For these two models, per capita GDP is significant at the 10 and 1 per cent level respectively, but the TICPI is insignificant. This may be the result of colinearity between TICPI and each of the two business indices included in the models and/or equation misspecification. As far as collinearity is concerned, the reported F-tests and VIF values do not suggest the presence of significant collinearity; for the equation estimated using the START business index, however, the heteroscedasticity and RESET functional form tests suggest misspecification at the 6 per cent level. To investigate further the misspecification hypothesis we estimate equation (4) setting j = net flag-out ratio. The results are reported in Table 5, Panel B. All interaction terms are statistically insignificant, with the exceptions of the models estimated using the START and TAXES business indices, reported in columns (i) and (k) respectively, which are highly significant. Furthermore, the models reported in columns (i) and (k) in Table 5, Panel B yield a superior model fit compared to their counterparts in Table 5, Panel A, as suggested by the increased Adjusted-R^2 and lower AIC. This improvement is particularly pronounced for the model considering the interaction term between TICPI and TAXES reported in column (k). Indeed, given its superior Adjusted-R^2 and minimum AIC scores, this model is the best among those reported in Table 5, Panels A and B in terms of explaining the net flag-out ratio. However, despite its superior explanatory power this model fails the RESET functional form at the 5 per cent level, indicating that further improvement is possible (see below).

[INSERT TABLE 5, PANELS A AND B HERE]

Overall, the findings reported in Table 5, Panels A and B suggest that the net-flag-out is significantly determined by a country's tax regime and the ease of starting a business. Previous studies, reviewed in sections 2 and 3, have documented the importance of high taxation in determining flag-out from national flags to open registries. Our findings relating to the Paying Taxes business indicator is consistent with those earlier findings. However, they go one step ahead, as the Paying Taxes business index considered by our analysis accounts not only for the direct cost of taxes, which has been considered by previous literature, but also the administrative burden, measured in terms of cost and time in complying with them.[6] Therefore, our TAXES variable does not only capture the cost of taxation, as previous studies have done; rather, it is a composite quantitative indicator capturing both taxation costs and the institutional quality associated with national tax systems. Its statistical significance implies that both aspects are important for flagging-out behavior among national flag countries. Given the convergence of shipping tax rates that has taken place in recent years among the fleet-owning countries covered by our sample (see Marlow and Mitroussi, 2011) it is very likely that the statistical significance of TAX captures the effect of differences in the institutional performance of our sample countries' tax systems.[7] On the other hand, starting a business, measures "the number of procedures, time and cost for a small and medium-size limited liability company to start up and formally operate".[8] Therefore, it is also a composite quantitative indicator capturing direct start-up costs and the non-monetary burden associated with setting up a new business both of which, according to our findings, determine the net flag-out ratio. Finally, we note that while the

[6] Specifically, "the Paying Taxes sub-index records the taxes and mandatory contributions that a medium-size company must pay in a given year and also measures the administrative burden of paying taxes and contributions. It does this with these indicators: payments, time and the total tax rate borne by a case study firm in a given year. The number of payments indicates the frequency with which the company has to file and pay different types of taxes and contributions, adjusted for the way in which those payments are made. The time indicator captures the number of hours it takes to prepare, file and pay three major types of taxes: profit taxes, consumption taxes, and labor taxes and mandatory contributions. The total tax rate measures the tax cost borne by the standard firm" (Doing Business 2013, Data, Paying Taxes, What is Measured).

[7] The convergence in shipping taxation rates among ship registers and thus, also, among traditional fleet-owning countries may also explain the lack of statistical significance of the Paying Taxes indicator in the equations modeling the standard flag-out ratio in Table 4, Panels A and B. As mentioned in sections 2 and 3, lower taxation has traditionally been one of the main determinants of flag-out from national flags to open registries. To capture this effect in cross-section regression analysis, the cross-section sample units must include enough variation in the TAX variable, i.e. the sample must include both traditional flag and open registries for the effect to be identified. As our sample consists of traditional flag countries only, the intra-sample variation of the TAX variable may not be relevant in explaining the standard flag-out ratio, which mainly occurs to open-registries not covered by our sample.

[8] Definition cited in Doing Business 2013, Data, Starting a Business, What is Measured.

TICPI is not statistically significant on its own in columns (i) and (k) in Table 5, Panel A, when it is interacted with the two significant business indices TAX and START included in those models, it improves the model's fit (columns (i) and (k) in Table 5, Panel B). This indicates that a country's corruption/transparency level affects net flag-out indirectly, through reinforcing the effects of these two variables. In other words, a tax regime that is not friendly to business and obstacles in starting a business will encourage stronger net flag-out under higher levels of corruption rather than lower ones.

We now look to improve further upon our model's fit and specification. To that end, we first add to the model reported in Table 5, Panel B, column (k) the second interaction term that was found to be statistically significant in Table 5, Panel B, column (i), namely TICPI*START. The results are reported in Table 6, column (a). All coefficients are statistically significant at 10 per cent or better and we obtain a better data fit, as suggested by a noticeable increase in the Adjusted-R^2 score and a reduction in the AIC value. However, this model too fails the RESET misspecification test at the 5 per cent level, suggesting that further improvement is possible. To that end, we replace the two individual interaction terms TICPI*TAX and TICPI*START with a single interaction term defined as the product of all three variables, TICPI*TAX*START. The results are presented in Table 6, column (b). Both independent variables are highly significant at the 1 per percent. The reported Adjusted-R^2 and AIC values suggest that this model fits the data even better than the model reported in column (a) of Table 6. The intuition is that the effects of taxation and obstacles to starting a business on flag-out are not only reinforced by higher levels of corruption but also reinforce each other. This time the model passes comfortably passes the RESET test, as well as the heteroscedasticity test.

Finally, we estimate a model in which the interaction term is expanded to include per capita GDP (TICPI*TAX*STAR*LOGGDP). The results are reported in Table 6, column (c). All coefficients are significant at the 1 per cent level and the model yields an even better data fit, as suggested by its increased Adjustsed-R^2 and reduced AIC scores. Furthermore, the model comfortably passes the misspecification tests. This model represents our overall preferred specification for modelling the net flag-out ratio. The intuition behind its findings is that crew salaries, approximated by per capita GDP, affects net flag-out not only directly but also indirectly by reinforcing the effects of taxes, obstacles to starting a business and corruption. At the same time, all three variables may reinforce the effects of higher crew salaries as well as each other's. The policy implication is that a slight deterioration of a country's

performance in any of the areas determining net flag-out may cause a much larger impact than its size would suggest. This is because each determinant may not only have a direct effect on the net-flag-out ratio; it may also have an indirect one through reinforcing the effect of the rest of the determinants.

[INSERT TABLE 6 HERE]

6. Summary and conclusions

Extant literature and fundamental assumptions about the flagging-out fail to capture the effect of today's changing environment in shipping in general and in ship registration in particular. Contemporary developments have created a level playing field along a number of ship registration dimensions. These dimensions include the fiscal regime and manning requirements; the observed convergence between the conventionally distinct two types of registry, i.e. national flags and open registries and; the increasing attention to assessed and verifiable safety by external entities, like the port state control authorities. The existence of such a level playing field has resulted in increasing flagging-out behavior not only from traditional flags to open registries, but also among traditional national flags. The traditional line of thought about factors affecting choice of flag and flagging-out may no longer be adequate to explain flagging behavior. The emerging new trends in ship registration call for new approach of investigation.

This paper builds on existing theories in the area, by expanding and advancing the pertinent literature and tools of research. Its contribution is two-fold. First, it proposes a new measure of flagging-out behavior, the net flag-out ratio, which accounts not only for the nationally owned ships leaving the national flag to register under a foreign flag (as the traditional flag-out measure does), but also takes into account the foreign-owned ships which flag-in the traditional ship register. This measure is particularly relevant to the 33 traditional flag countries considered by our analysis, which are also those with the largest owned fleets and from which most of flagging-out occurs. Second, it engages in the examination of variables not investigated before. More specifically, we model the traditional flag-out and the net flag-out ratio on quantitative metrics of a country's corruption/transparency and institutional performance/friendliness to business while controlling for more traditional factors of

flagging-out, i.e. crew salaries. Quantitative measures of transparency and institutional performance are well established tools of empirical research in other academic fields such as economics and politics. This is the first paper which uses these metrics in the area of shipping.

Our empirical findings suggest that within our sample of traditional shipowning countries the standard flag-out ratio (which accounts for only the flagging-out of tonnage and depicts flagging-out mainly from traditional flags to open registries) is highly responsive to crew salaries but it is not explained by any measure of a country's institutional performance. This indicates that institutional characteristics do not exercise a major influence on the choice between a traditional flag and an open registry. On the other hand, the net flag-out ratio (which captures the increasing flag-out behavior among national flag countries) is responsive to such measures. In particular, in addition to crew salaries we find the net flag-out ratio to be determined by the characteristics of a country's tax system, the ease of staring new business and the country's corruption/transparency level. Furthermore, these determinants may not only have a direct effect on the net flag-out ratio; they may also have an indirect one through reinforcing the effect of the rest of the determinants. Our findings indicate that given the decision to register under a traditional flag, institutional characteristics determine the flag to be chosen.

Overall, our analysis implies that it is no longer appropriate to regard flagging-out as only relevant to open registers. Traditional flags have also entered the arena of attracting foreign shipping investment rather than only seeking to address the exodus of national ships from their register. Ship owners are looking into foreign traditional flags for alternative but efficient and investor-friendly ship registration. In an era of measurable, tightly assessed and externally controlled safety, ship owners may look for management savings in efficiency gains through the necessary support mechanisms of the chosen ship register. This means that traditional maritime countries wishing to appeal to foreign ship owners must align accordingly not only their targeted maritime policies but also their wider institutional performance. They must be able to demonstrate a high level of transparency and low corruption as well as develop or sustain a regime of favorable and investor-friendly conditions for doing business. Taxation parameters are by no means obsolete; they still have an important role to play. Yet, today's comparable tax practices in shipping in all flag types (i.e. tonnage tax) have altered the nature of tax considerations in the choice of ship registers. Flags must not only have in place an investor-friendly tax system but they must exhibit

competence in running it smoothly and efficiently providing a well-organized and accommodating tax environment for ship owners. Policy makers, national governments, ship owners and other stakeholders formulate but also adjust to the changing face of contemporary ship registration.

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Table 1: Share of foreign-owned vessels on major national flags

	Percent of tonnage owned by foreign owners (in dwt)	
	(a)	**(b)**
National Flags	**2007**	**2012**
Belgium	7	4.9
China	1	10.3
Denmark (DIS)	3	2.7
France (FIS)	70	62.5
Germany	1	0.7
Greece	8	10.4
Hong Kong, China SAR	61	75.3
India	2	4.1
Indonesia	6	25.8
Italy	8	16.2
Japan	0	1.7
Korea, Republic of	4	7.6
Kuwait	unavailable	0
Malaysia	24	9.1
Netherlands	33	40.3
Norway (NIS)	39	18.2
Philippines	61	87.2
Russian Federation	6	22
Singapore	70	73
Taiwan, Province of China	7	3.4
Thailand	34	9.4
Turkey	1	7.5
UK	56	89
USA	17	38.2
Vietnam	unavailable	13.9
*Average**	*22.6*	*26.9*

*Excluding Kuwait and Viet Nam. *Source:* UNCTAD, 2007, 2012

Table 2: Flag-out ratios in the 33 largest owned-fleet countries for year 2012

	(a)	(b)
	Standard flag-out	**Net flag-out**
Belgium	56.5	0.60
Brazil	83.4	1.77
Canada	88.6	1.34
China	58.3	5.09
Hong Kong, China SAR	36.5	-4.41
Taiwan, China, Province of	89.6	2.53
Cyprus	71.4	-1.66
Denmark	66.3	-1.94
France	69.3	0.22
Germany	86.2	7.88
Greece	71.0	11.33
India	28.5	0.47
Indonesia	19.8	-0.06
Iran	92.8	0.74
Italy	27.5	0.37
Japan	90.6	14.09
Korea, South	69.6	2.78
Kuwait	40.9	0.22
Malaysia	32.8	0.32
Netherlands	58.1	0.30
Norway	63.4	1.80
Qatar	90.0	0.25
Russian Federation	73.4	0.97
Saudi Arabia	85.5	0.77
Singapore	42.7	-2.63
Sweden	83.3	0.35
Switzerland	75.7	0.27
Thailand	29.9	0.09

Turkey	63.6	1.06
United Arab Emirates	93.1	0.55
United Kingdom	89.0	-1.56
United States	86.9	3.13
Viet Nam	29.7	0.08

Source: Authors' calculations based on data taken from UNCTAD, 2012

Table 3: Pearson correlation coefficients

	(a)	(b)
	Standard flag-out ratio	**Net flag-out ratio**
Per capita GDP	0.61	0.16
TI Corruption Perception Index	0.45	-0.12
Ease of Doing Business Index	-0.35	0.10
Enforcing contracts	-0.23	-0.07
Getting credit	-0.14	0.04
Getting electricity	-0.28	-0.05
Resolving Insolvency	-0.31	-0.08
Dealing with construction permits	-0.23	0.09
Protecting investors	0.12	0.18
Registering property	-0.08	0.23
Starting a business	-0.28	0.41
Trading across borders	-0.13	0.07
Paying taxes	-0.34	0.35
Flag-out ratio	1.00	0.35
Net flag-out ratio	0.35	1.00

Note: All reported coefficients have been calculated using data referring to year 2012. The sources of the data have as follows: Standard and net log-out ratios: Authors' calculations based on data taken from the statistics section of the United Nations Conference on Trade and Development (UNCTAD) for year 2012. Per capita GDP: CIA Factbook 2013. TI Corruption Perception Index: Transparency International, CPI 2012. Easy of Doing Business Index and individual sub-indices: The Ease of Doing Business Index, The World Bank, June 2012

Table 4, Panel A: Regression analysis. Dependent variable: Standard flag-out ratio

Estimated regression model: $Standard\ flag-out\ ratio_i = \alpha + \beta_1 LOGDP_i + \beta_2 TICPI_i + \beta_3 Business\ index_i^k + u_i$

	Business index *k* used for the model's estimation										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
	EODB	CONTRACTS	CREDIT	ELECTRIC	INSOLV	PERMITS	PROTINV	REGPROP	START	TAB	TAXES
LOGGDP	15.8 (5.52)***	15.3 (5.46)***	16.0 (5.89)***	15.3 (5.52)***	17.9 (5.62)***	15.4 (5.48)***	14.6 (5.33)**	15.4 (5.49)***	15.3 (5.46)***	14.6 (5.33)**	15.9 (5.81)**
TICPI	0.21 (0.28)	0.12 (0.23)	0.06 (0.27)	0.12 (0.23)	0.31 (0.25)	0.11 (0.25)	0.18 (0.22)	0.13 (0.22)	0.12 (0.27)	0.32 (0.27)	0.14 (0.23)
Business Index *k*	0.07 (0.13)	0.00 (0.07)	-0.04 (0.12)	0.01 (0.08)	0.15 (0.11)	-0.01 (0.08)	0.09 (0.07)	0.02 (0.08)	0.00 (0.09)	0.14 (0.11)	0.03 (0.09)
Adjusted R^2	0.32	0.32	0.32	0.32	0.35	0.32	0.35	0.32	0.32	0.35	0.32
AIC	8.84	8.84	8.84	8.84	8.78	8.84	8.79	8.84	8.84	8.79	8.84
F-test: β_2=β_3=0	0.76	0.86	0.82	0.86	0.36	0.86	0.39	0.82	0.86	0.39	0.82
VIF β_2	2.84	1.95	2.66	1.92	2.41	2.22	1.77	1.62	2.52	2.63	1.87
VIF β_3	2.56	1.31	1.61	1.42	2.48	1.45	1.07	1.05	1.78	1.62	1.71
Hetero F-test	0.38	0.22	0.52	0.49	0.27	0.49	0.22	0.47	0.43	0.33	0.36
RESET	0.16	0.70	0.92	0.66	0.17	0.71	0.14	0.57	0.62	0.06*	0.40

Notes: All models have been estimated including a constant term. Standard errors in parentheses. *,**,*** respectively denote statistical significance at the 10, 5 and 1 per cent level. AIC: Akaike Information Criterion. VIF: centered Variance Inflation Factor value. HeteroF-test: Breusch-Pagan-Godfrey heteroscedasticity test (p-values). RESET functional form/general misspecification test (p-values). p-values reported for F-test β_2=β_3=0: Variables abbreviations: Per capita GDP in logs (LOGGDP); Transparency International Corruption Perception Index (TICPI). Ease of Doing Business (EODB) Starting a Business (START); Dealing with Construction Permits (PERMITS); Getting Electricity (ELECTRIC); Registering Property (REGPROP); Getting Credit (CREDIT); Protecting Investors (PROTINV); Paying Taxes (TAXES); Trading Across Borders (TAB); Enforcing Contracts (CONTRACTS); and Resolving Insolvency (INSOLV).

Table 4, Panel B: Regression analysis. Dependent variable: Standard Flag-out ratio

Estimated regression model:

$$Standard\ flag-out\ ratio_i\ =\ \alpha+\beta_1 LOGDP_i+\beta_2 TICPI_i * Business\ index_i^k+u_i$$

	Business index *k* used for the model's estimation										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Independent variable	EODB	CONTRACTS	CREDIT	ELECTRIC	INSOLV	PERMITS	PROTINV	REGPROP	START	TAB	TAXES
LOGGDP	17.79 (4.50)***	17.27 (4.17)***	17.75 (4.36)***	17.30 (4.19)***	19.54 (4.44)***	17.16 (4.18)***	16.21 (4.22)***	17.04 (4.19)***	17.14 (4.17)***	17.68 (4.15)***	18.09 (4.29)***
TICPI* Business Index *k*	0.0008 (0.0025)	0.0006 (0.0014)	-0.0008 (0.0019)	0.0003 (0.0012)	0.0024 (0.0019)	-0.0002 (0.0015)	0.0010 (0.0010)	0.0004 (0.0012)	0.0005 (0.0014)	0.0020 (0.0022)	0.0011 (0.0015)
Adjusted R^2	0.34	0.34	0.34	0.33	0.37	0.33	0.36	0.34	0.33	0.35	0.35
AIC	8.79	8.78	8.78	8.79	8.73	8.79	8.76	8.79	8.79	8.76	8.77
Hetero F-test	0.40	0.31	0.84	0.80	0.66	0.72	0.15	0.70	0.73	0.37	0.74
RESET	0.17	0.30	0.87	0.40	0.13	0.48	0.18	0.37	0.33	0.09*	0.20

Notes: All models have been estimated including a constant term. Standard errors in parentheses. *,**,*** respectively denote statistical significance at the 10, 5 and 1 per cent level. AIC = Akaike Information Criterion. HeteroF-test: Breusch-Pagan-Godfrey heteroscedasticity test (p-values). RESET functional form/general misspecification test. p-values reported for F-test $\beta_2=\beta_3=0$: Variables abbreviations: Per capita GDP in logs (LOGGDP); Transparency International Corruption Perception Index (TICPI). Ease of Doing Business (EODB) Starting a Business (START); Dealing with Construction Permits (PERMITS); Getting Electricity (ELECTRIC); Registering Property (REGPROP); Getting Credit (CREDIT); Protecting Investors (PROTINV); Paying Taxes (TAXES); Trading Across Borders (TAB); Enforcing Contracts (CONTRACTS); and Resolving Insolvency (INSOLV).

Table 5, Panel A. Regression analysis. Dependent variable: Net flag-out ratio

Estimated regression model:

$$Net\ flag-out\ ratio_i\ =\ \alpha+\beta_1 LOGDP_i+\beta_2 TICPI_i+\beta_3 Business\ index_i^k+u_i$$

	Business index *k* used for the model's estimation										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Independent variable	EODB	CONTRACTS	CREDIT	ELECTRIC	INSOLV	PERMITS	PROTINV	REGPROP	START	TAB	TAXES
LOGGDP	1.84 (1.09)*	1.74 (1.06)	2.16 (1.14)*	1.70 (1.08)	1.44 (1.12)	1.78 (1.07)	1.69 (1.06)	1.89 (1.04)*	1.65 (0.95)*	1.80 (1.07)	2.80 (0.99)***
TICPI	-0.05 (0.06)	-0.08 (0.05)*	-0.10 (0.05)*	-0.07 (0.05)	-0.09 (0.05)*	-0.07 (0.05)	-0.06 (0.04)	-0.06 (0.04)	0.01 (0.05)	-0.07 (0.05)	-0.03 (0.04)
Business Index *k*	0.01 (0.03)	-0.01 (0.01)	-0.02 (0.02)	-0.01 (0.02)	-0.02 (0.02)	0.00 (0.01)	0.01 (0.01)	0.02 (0.02)	0.04 (0.02)**	-0.01 (0.02)	0.04 (0.02)***
Adjusted R^2	0.01	0.03	0.04	0.01	0.03	0.01	0.03	0.07	0.21	0.01	0.25
AIC	5.58	5.57	5.56	5.58	5.56	5.59	5.57	5.52	5.35	5.58	5.30
F-test β_2=β_3=0	0.29	0.24	0.21	0.28	0.22	0.31	0.24	0.13	0.01**	0.30	0.01**
VIF β_2	2.84	1.95	2.67	1.92	2.41	2.22	1.77	1.68	2.52	2.63	1.87
VIF β_3	2.56	1.31	1.61	1.42	2.48	1.45	1.06	1.05	1.78	1.82	1.71
Hetero F-test	0.93	0.96	0.78	0.82	0.44	0.92	0.93	0.59	0.06*	0.90	0.24
RESET	0.65	0.95	0.82	0.81	0.74	0.78	0.81	0.09*	0.06*	0.79	0.76

Notes: All models have been estimated including a constant term. Standard errors in parentheses. *,**,*** respectively denote statistical significance at the 10, 5 and 1 per cent level. AIC: Akaike Information Criterion. VIF: centered Variance Inflation Factor value. HeteroF-test: Breusch-Pagan-Godfrey heteroscedasticity test (p-values). RESET functional form/general misspecification test (p-values). p-values reported for F-test β_2=β_3=0: Variables

abbreviations: Per capita GDP in logs (LOGGDP); Transparency International Corruption Perception Index (TICPI). Ease of Doing Business (EODB) Starting a Business (START); Dealing with Construction Permits (PERMITS); Getting Electricity (ELECTRIC); Registering Property (REGPROP); Getting Credit (CREDIT); Protecting Investors (PROTINV); Paying Taxes (TAXES); Trading Across Borders (TAB); Enforcing Contracts (CONTRACTS); and Resolving Insolvency (INSOLV).

Table 5, Panel B. Regression analysis. Dependent variable: Net flag-out ratio

Estimated Regression model:

$$Net\ flag-out\ ratio_i\ =\ \alpha+\beta_1 LOGDP_i+\beta_2 TICPI_i * Business\ index_i^k+u_i$$

	Business index *k* used for the model's estimation										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Independent variable	EODB	CONTRACTS	CREDIT	ELECTRIC	INSOLV	PERMITS	PROTINV	REGPROP	START	TAB	TAXES
LOGGDP	1.10 (0.90)	0.69 (0.85)	0.81 (0.89)	0.68 (0.82)	0.58 (0.93)	0.75 (0.84)	0.64 (0.87)	0.67 (0.85)	0.63 (0.73)	0.78 (0.85)	1.47 (0.70)**
TICPI* Business Index *k*	0.0006 (0.0005)	-0.0002 (0.0003)	-0.0002 (0.0004)	0.00 (0.0003)	-0.0001 (0.0004)	0.0002 (0.0003)	0.00 (0.0002)	0.0001 (0.0002)	0.0008 (0.0002)***	0.0003 (0.0004)	0.0010 (0.0002)***
Adjusted R^2	0.00	-0.03	-0.04	-0.04	-0.04	-0.02	-0.04	-0.03	0.23	-0.03	0.34
AIC	5.56	5.59	5.60	5.60	5.60	5.59	5.60	5.60	5.30	5.60	5.14
Hetero F-test	0.81	0.81	0.41	0.62	0.24	0.85	0.82	0.49	0.03**	0.71	0.75
RESET	0.49	0.94	0.56	0.53	0.45	0.92	0.30	0.48	0.89	0.55	0.05**

Notes: All models have been estimated including a constant term. Standard errors in parentheses. *,**,*** respectively denote statistical significance at the 10, 5 and 1 per cent level. AIC = Akaike Information Criterion. HeteroF-test: Breusch-Pagan-Godfrey heteroscedasticity test (p-values). RESET functional form/general misspecification test (p-values). p-values reported for F-test $\beta_2=\beta_3=0$: Variables abbreviations: Per capita GDP in logs (LOGGDP); Transparency International Corruption Perception Index (TICPI). Ease of Doing Business (EODB) Starting a Business (START); Dealing with Construction Permits (PERMITS); Getting Electricity (ELECTRIC); Registering Property (REGPROP); Getting Credit (CREDIT); Protecting Investors (PROTINV); Paying Taxes (TAXES); Trading Across Borders (TAB); Enforcing Contracts (CONTRACTS); and Resolving Insolvency (INSOLV).

Table 6: Regression analysis. Dependent variable: Net flag-out ratio

	(a)	(b)	(c)
Independent variable			
LOGGDP	1.25* (0.68)	2.27*** (0.69)	1.91*** (0.64)
TICPI			
START			
TAXES			
TICPI*TAXES	0.0008*** (0.0003)		
TICPI*START	0.0005* (0.0002)		
TICPI*TAXES*START		9.23E-06*** (1.84E-06)	
TICPI*TAXES*START*LOGGDP			9.43E-07*** (1.77E-07)
Adjusted R^2	0.40	0.45	0.48
AIC	5.08	4.97	4.91
Hetero F-test	0.76	0.61	0.39
RESET	0.04**	0.17	0.28

Notes: All models have been estimated including a constant term. Standard errors in parentheses. *,**,*** respectively denote statistical significance at the 10, 5 and 1 per cent level. AIC = Akaike Information Criterion. HeteroF-test: Breusch-Pagan-Godfrey heteroscedasticity test (p-values). RESET functional form/general misspecification test (p-values). p-values reported for F-test $\beta_2=\beta_3=0$: Variables abbreviations: Per capita GDP in logs (LOGGDP); Transparency International Corruption Perception Index (TICPI). Starting a Business (START); Paying Taxes (TAXES).