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The Port and its Environment

METHODOLOGICAL APPROACH FOR ECONOMIC APPRAISAL

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JEL Classification: H41, Q51, Q58, R14

The Port and its Environment:

Methodological approach for economic appraisal

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ABSTRACT

In times of increasing environmental awareness, the port-city relationship has gained a new meaning since ports have been seen as the origin of both negative and positive externalities affecting the public wellbeing. While the former are the result of port expansion, the latter are the result of transforming obsolete port areas into recreational facilities. Therefore, in order to support effective policy-making, in this research is emphasized the need of measuring these environmental externalities. Considering their non-market nature, the contingent valuation method is introduced as an economic tool capable of overcoming this obstacle. Thus, the cases of two ports in Spain, namely Valencia and Castellón, are reviewed. The policy implications of this are discussed with the aim to improve the understanding of the changing relationship between ports and cities.

Keywords: port expansion; waterfront redevelopment; environmental externalities; contingent valuation; economic appraisal; port-city relationship**.**

JEL Classification: H41, Q51, Q58, R14

FOREWORD

This working paper is one in a series of *OECD Working Papers on Regional Development* published by the OECD Public Governance and Territorial Development Directorate. It forms part of the *OECD Port Cities Programme*. This paper was written by Salvador del Saz-Salazar, Leandro García-Menéndez (Departamento de Economía Aplicada II, Universitat de València, Spain) and Olaf Merk, (Administrator, OECD Port-Cities Programme, Paris, France).

The paper can be downloaded on the OECD website: www.oecd.org/regional/portcities

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1. INTRODUCTION

Over the last thirty years, fuelled by the current globalization process, the maritime transport industry has experienced technological breakthroughs giving rise to containerization and other major changes in cargo handling facilities (Olivier and Slack, 2006). These changes have brought about two different but related phenomena. On the one hand, the expansion of ports relocating terminals to more peripheral sites in order to meet the current standards of ship size and hinterland connection (Asteris and Collins, 2007); and, on the other hand, the urban renewal of waterfront sites that have become obsolete and vacant following the introduction of modern cargo-handling facilities (Hoyle, 1994; Olivier and Slack, 2006) and the demand for inner-city revitalization (Hoyle, 2000). Both phenomena have an important impact on the surrounding environment and can be referred to as environmental externalities. However, while the first one can be considered as a negative externality (or external cost) since it has a negative impact on the environment; the second one can be considered as a positive externality (or external benefit) since usually results in and increase of the quality of the environment. In both cases, there is no monetary compensation for the damage caused, or for the benefit produced, to a third party. More specifically, land reclamation, air and water pollution, noise, odours and visual impact are among the main environmental effects stemming from port expansion (Saz-Salazar et al., 2012), hence public opposition to port expansion is a growing concern in many port cities as people are becoming more aware of its negative environmental impact (Morris and Gibson, 2007). At the same time, the urban waterfront renewal aimed to transform vacant port sites into open-access recreational areas with promenades and sea views can unequivocally increase the environmental quality having a positive effect on public welfare (Saz-Salazar and García-Menéndez, 2003). Such positive effects are sometimes referred to as "soft values" of seaports that have been traditionally ignored in port policies (Van Hooydonk, 2007).

In presence of externalities, market prices do not reflect the full costs or benefits resulting from producing a good or a service (in this case port services), thus leading to a non-desirable outcome, i.e. as the producer does not take into account the external costs of its activity, the level of pollution will be excessive from a social perspective. In the same way, if there are external benefits, too little of the good (or service) will be produced since the producer does not take into account the external benefit of its activity to others. In order to accurately inform decision-making, it is necessary to estimate the value of these external costs and benefits and to incorporate them in a cost-benefit framework. However, considering their non-market nature this is not an easy task.

Therefore, to overcome this difficulty economists have developed different approaches (Freeman, 2003). For a start, there is a growing literature on the external costs of hinterland traffic. These external costs include costs related to congestion, accidents, air pollution, noise and other external costs. Haezendonck and Coeck (2006) calculated the external costs of hinterland traffic related to the port of Rotterdam to be around € 240 million in 2000. Even if these calculations are dependent on the data quality and underlying assumptions, there is a growing academic literature underpinning such results (Maibach et al., 2008).

Another approach to quantify external effects of ports is the hedonic price analysis. Hedonic prices are the implicit prices of attributes, which are revealed to economic agents from observed prices of differentiated products and the specific characteristics associated with them. This helps to explain house prices in terms of the house's characteristics, such as the type of dwelling, age, floor area, neighbourhood and job accessibility. It can also explain the impact of undesirable facilities on house values due to perceived disamenities. Such concerns (for example, worries about air pollution, health risks and public

image) can manifest themselves in property markets, as buyers are likely to pay more to reside in locations farther from perceived disamenities.

Hedonic price analysis studies have found negative price effects for industrial zones, but not necessarily for port areas. Proximity to an industrial site exhibits a statistically significant negative effect on the value of residential properties in the Randstad region (Netherlands), but the effect of closeness to a port area was found to be insignificant (De Vor and De Groot, 2010). Hedonic price analysis conducted on St. Nazaire showed no linear and univocal relation between proximity to the port industrial zone and housing prices, possibly explained by a positive effect of proximity to place of work or easy access to the transport network, which can offset air pollution or environmental risks (Maslianskaia-Pautrel, 2009). Similarly, close proximity of housing to a seaport was found to have an insignificant effect on individual well-being in Ireland (Brereton et al., 2008). There is some evidence of negative effects on house prices due to proximity to the port-industrial complex of Port Jérôme, which is part of the Rouen port cluster. Hedonic price analysis, taking into account a house's intrinsic characteristics, shows that close proximity to this port-industrial complex leads to a price discount of approximately 12% of the average price for a similar house. Proximity to the Seine River leads to an even larger reduction, namely 38%; the Seine is thus not considered an asset in this area (Travers et al., 2009). The lack of a broad base of quantitative assessments makes it difficult to generalise about the extent of the port-city mismatch of benefits and negative impacts; much is unknown and much depends on local circumstances.

One of the most popular approaches to measure external costs are the stated preference methods that rely upon survey responses in order to obtain the value of these external costs and benefits. Among this class of methods, the contingent valuation method (CVM) (Mitchell and Carson, 1989) is the most widely used technique. The purpose of this method is to elicit respondent's preferences in monetary terms for changes in the quality or quantity of environmental goods. Respondents are asked about their willingness to pay (WTP) for a hypothetical increase in the level or quantity of the environmental quality or, in the case that there is a decrease in the environmental quality, they are asked about their willingness to accept compensation (WTA). The values obtained should be aggregated in a cost-benefit framework to obtain the social benefits (or social costs) of the proposed policy that have a positive (or negative) effect on public welfare.

While there is a considerable literature that have addressed the issue of non-market valuation with regard to the protection of ocean and coastal resources, as are beaches, marine protected areas and wildlife (see Pendleton et al., 2007 and Grafton, et al., 20011 for a survey of this literature), this is not the case of the environmental externalities stemming from port expansion despite the importance of this issue in many port cities around the world. Therefore, the purpose of this article is to provide a methodological framework to value environmental externalities in this particular context, thus allowing policymakers to implement more efficiently environmental policies. With this intention, two cases, showing the two sides of port expansion, are reviewed. The first one relates to the negative externalities resulting from port expansion in the city of Valencia (Spain) (Saz-Salazar et al., 2012), and the second one to the social benefits stemming from the renewal of vacant port areas for recreation purposes in the city of Castellón, also in Spain (Saz-Salazar and García-Menéndez, 2003).

The remainder of the paper is organized as follows. The next section presents the cost-benefit analysis (CBA), a technique for measuring the social costs and benefits of any policy. The theoretical foundations of the CVM are analysed in section 3, discussing the difference between WTP and WTA measures. The above-mentioned cases are reviewed in section 4 and 5. Section 6 provides a conclusion.

2. COST-BENEFIT ANALYSIS AND EXTERNALITIES: A CONCEPTUAL FRAMEWORK

Cost-benefit analysis (CBA) is a practical way of assessing the desirability of a project or policy enumerating and comparing all the relevant costs and benefits, where it is important to take a long view in the sense of looking at repercussions in the nearer, as well as, in the further future (Prest and Turkey, 1965). If the benefits exceed costs, then the project or policy is desirable since supposedly society is better off as a whole. While some benefits and costs can be measured in a straightforward way because there exist a market for them, there are other costs and benefits that are or non-market nature, usually referred to as 'intangibles', that for a long time were omitted in CBA for two reasons. First, it was widely believed that it was difficult, if not impossible, to measure them (Johansson, 1993), and second, environmental awareness was still in its infancy, so few people thought that these omissions were major deficiencies (Pearce, 1998). Although in presence of externalities, it is precisely the absence of a market what makes valuation more complicated, in the 1980s the emergence and generalization of questionnaire-based approaches, as the CVM, and other techniques (revealed preference approaches), resulted in a dramatic increase in the possibility of undertaking CBA of projects that affect the environment. Although monetization is controversial since it is argued that the use of a money metric degrades the environment reducing it to a commodity, CBA would be seriously defective without monetary values for such environmental externalities (Carson, 2000).

When conducting a CBA, a logical sequence of steps should be followed (Hanley and Barbier, 2009). The first stage involves setting out what is analysed, what welfare effects are considered and the time period in question, i.e. determining the nature of the problem being addressed and the alternative options for dealing with it. The second stage is aimed to identify the physical and biological changes that should be measured. These impacts should be relevant in the sense that these have an effect on the quantity or quality of resources, thus any impact that affects individuals' well-being is a proper impact for including in CBA. Once all the impacts have been identified, in the next stage these are expressed in monetary values. When markets work well, then markets prices are a good first approximation to their value. However, quite often the effects of a policy are not directly registered in the market, as is the case of the environmental externalities (e.g. port expansion can cause erosion in nearby beaches). In this latter case, markets prices are no longer a good guide to social costs and benefits, in which case use could be made of the CVM, or other non-market valuation techniques, to measure such non-market values. In the fourth stage, all relevant costs and benefits should be converted into present value terms using a discount factor, a subject addressed below. Finally, in the last stage benefits and costs are compared using the net present value (NPV) criterion. The present value of benefits minus the present value of costs should be positive for accepting the project. An alternative to the NPV criterion is the cost-benefit ratio (discounted benefits over discounted costs) that should exceed unity to go ahead with the project.

In CBA all relevant effects are expressed in monetary values, although the conceptual basis is utility. Therefore, gains and losses are measured in terms of increment and decrements of human wellbeing (or utility), which, in turn, are approximated by the most an individual is willing to pay for a gain or for avoiding a loss; and by the least an individual is willing to accept in compensation to tolerate a loss or to

forgo a benefit (Pearce, 1998). Thus, these money metric measures, willingness to pay (WTP) and willingness to accept (WTA), form the basic building blocks of individual valuation of gains and losses within CBA (Hanley and Barbier, 2009) corresponding to the measures of consumer surplus formalized by Hicks (1943). To illustrate these measures in a more formal way, we will refer to the case of study in the next lines.

2.1 Negative externalities and utility change

In presence of negative externalities (land reclamation, noise, odours, etc.) resulting from port expansion, nearby residents experience a decrease in the environmental quality enjoyed from z^0 to z^1. Without this expansion process, the average household is assumed to enjoy a quality level z^0 while with the referred process the enjoyable quality level is only z^1. Following Johansson (1993), we consider an individual that maximizes his utility subject to the budget constraint. Then, the individual's indirect utility function can thus be written as:

$$V = U[x(p, y, z), z] = V(p, y, z) \qquad (1)$$

where *x* is a 1·n vector of private goods and *z* is a 1·m vector of public or environmental goods. The quantity demanded of private goods is a function of prices (*p*), income (*y*) and the provision or quality of environmental commodities (*z*). The indirect utility function is decreasing in prices, and increasing in income and the quality of the environment, i.e. the higher the prices, the lower the utility, and the higher the income and the environmental quality, the higher the utility. Let us now introduce a change in the environmental quality. For simplicity prices and income are kept constant. Then the change in utility is:

$$\Delta V = V(p, y, z^1) - V(p, y, z^0) \qquad (2)$$

where a superscript 0 (1) denotes initial (final) levels values for the environmental good. Since the utility function is not observable, we need a money measure to evaluate the change in utility. Then let us consider the compensating variation (CV) in short. If environmental quality deteriorates, then CV is the minimum amount of money that must be given to the individual to compensate her for the loss of environmental quality leaving her just as well off as prior to the change. Thus CV measures the WTA compensation for allowing a decrease in environmental quality:

$$V(p, y + CV, z^1) = V(p, y, z^0) \qquad (3)$$

In this case, the level of utility held constant is the initial level of utility, i.e. the level prior to the change. Hence the level of utility resulting from the change in the environmental quality, plus the monetary compensation or WTA, is the same as the level enjoyed in the original situation prior to the change. An alternative measure to the compensation variation is the equivalent variation, but now the utility level fixed is the level after the change in the environmental quality. Therefore, in this case the equivalent variation is the individual's maximum willingness to pay to avoid the change in the quality of the environment.

2.2 Positive externalities and utility change

The redevelopment of vacant port areas into recreational sites clearly results in an increase in the environmental quality enjoyed from z^0 to z^1, but now, contrary to the previous case, $z^0 < z^1$, i.e. the environmental quality after the change is higher than prior to the change. So in this case the compensating variation (CV) is the maximum amount of money that an individual is willing to pay to secure the utility gain resulting from improving the quality of the environment, since by taking away money we leave him as well off as prior to the change. The welfare measure involved is given by the following equation:

$$V(p, y - CV, z^1) = V(p, y, z^0) \qquad (4)$$

As in the previous case, the level of utility that is held constant is the utility prior to the change in the environmental quality, hence the level of utility enjoyed with this new level of environmental quality, minus the monetary payment or WTP, is the same as the level enjoyed in the initial situation prior to the change. Taking again the post-change level of utility as the reference level results in the equivalent variation, i.e. the individual's minimum willingness to accept to forgo the change in the quality of the environment.

3. THE CONTINGENT VALUATION METHOD

3.1 A brief description

The contingent valuation method (CVM) is a survey-based technique widely used for placing monetary values on environmental goods that are not sold or bought in the marketplace. The absence of a market is due to their public good nature, what makes market prices inappropriate measures of value in these cases. Thus, surveys offer a way to trace the demand curve for public goods that could not otherwise be gleaned from market data (Hanemann, 1994). The potential of contingent valuation estimates of value is unmistakable since they can support both CBA and litigation much more strongly than values based on public attitudes or other qualitative measures (Bjornstand and Khan, 1996).

This technique consists of directly asking individuals about their WTP (or WTA) for an improvement (or deterioration) in the quality or quantity of a resource. The economic value of the proposed change is inferred from the choices made by a random sample of respondents drawn from the population affected. The method is called "contingent" because it uses information on how people say they would behave given certain hypothetical situations (Whitehead and Blomquist, 2006), so the values obtained are dependent or contingent on the characteristics of hypothetical market created with the survey instrument. Overall, a well-designed CVM survey must convey to respondents that the government is considering implementing a policy and that their responses will be used to help inform that decision (Carson 2012). Thus, consequential settings motivate responses that are quite different from those obtained when respondents perceive their decisions to be inconsequential (Poe and Vossler, 2011).

Respondents can be asked to state their WTP or WTA in different ways or elicitation formats. The dichotomous-choice format, also known as the take-it-or-leave-it format, is the most popular one due to its advantages over other elicitation formats more prone to bias and other sources of error. Under this question format, initially introduced by Bishop and Heberlein (1979), respondents are offered a binary choice between two alternatives: one being the *status quo* policy, and the other the proposed change in the environmental quality having a cost higher than maintaining the *status quo* (Carson, 2000). By randomly varying the cost figures (or bids) to the respondents, the researcher can trace out the WTP distribution and can estimate the mean or median WTP (Hanemann, 1984). Whether WTP or WTA is the correct measure, depends on how property rights on the environment are allocated (Mitchell and Carson, 1989). If the individual does not have any right on the environment, or any legal entitlement on it, then the correct measure is WTP. For example, if as consequence of port expansion some port areas are left vacant and local authorities decide to develop them for recreation purposes, then the correct procedure would be asking to the population affected by this policy how much they are WTP for enjoying the resulting gain in their wellbeing. On the other hand, if the individual has a legal entitlement to the environment and is asked to forgo it, then the correct measure is WTA. For example, as a result of port expansion nearby residents may suffer a decrease in their wellbeing due to its negative impact on the environment (land reclamation, noise, odours, etc.). Therefore, in this case WTA is the appropriate measure since WTP would contradict

the perceived property rights of people that have been living there for a long time before the expansion process took place.

3.2 Stages of a CVM exercise

In order to accurately inform decision-making, a typical CVM exercise can be split into five stages (Hanley and Barbier, 2009). The first stage is to set up the hypothetical market for the environmental good in a survey instrument that must contain all necessary elements. These latter include a detailed description of the proposed change in environmental quality, how funds are going to be raised (payment vehicle), a policy implementation rule, and which elicitation format is going to be used (closed-ended, open-ended, bidding game or payment card). Therefore, the design of the survey instrument or questionnaire is a crucial stage when implementing the CVM exercise since the values obtained (WTP or WTA) are contingent on the information provided to the respondents. Accordingly, the task of translating technical information into a form understood by the generic public, whatever their education, is often a difficult one (Carson, 2000). This implies that for complex policies the process of developing a reliable survey can be lengthy since it frequently requires considerable work and expense. To this respect, Whittington (2002) points out that we are still a long way from the point where it is possible to do high-quality CVM surveys with minimal effort or expense. This effort typically includes focus groups, drawn from the relevant population, in-depth interviews, pre-tests and pilot studies that can be extremely valuable in determining the background information needed, how to effectively communicate this information to the respondents, and even in identifying the appropriate payment vehicle for the change in environmental quality (Chilton and Hutchinson, 1999). In this way, focus groups are considered as a device for developing more valid and refined surveys helping to determine the plausibility and comprehensibility of the valuation scenario being presented to the respondents.

In the second stage, once the questionnaire has been designed and pretested, it should be administered to a representative sample of the entire population. Again, this process is costly since as Randall (1997) points out, learning about WTP is fairly cheap, but documenting it with personal interviews, probability samples, and high response rates is very expensive. The survey may be administered in different ways: face-to-face interviews, telephone interviews, mail interviews, and Internet surveys that are growing in popularity since they may be helpful for giving visual stimuli when explaining to respondents complex valuation scenarios (Hoyos and Mariel, 2010). Each delivery mode has its advantages and disadvantages, so depending of the nature and goals of the survey, as well of practical issues such as the available amount of funding, one mode or another will be used. A typical CVM questionnaire will have an introductory section that includes questions about environmental attitudes and respondent knowledge of the good in question. These questions are referred to as “warm up” questions since they are easy of answer and at the same time get the respondent ready to answer some tougher and more thought-provoking questions later (Whitehead, 2006). The valuation section contains the primary valuation questions aimed at collecting WTP or WTA and some follow-up questions that can be very useful to distinguish between genuine zero responses and protest responses. If the question format used is the “open-ended”, then respondents are asked for their maximum WTP with no prior value suggested to them. On the other hand, in a “single bounded dichotomous choice” question format respondents are asked to agree (yes) or disagree (no) to the single payment suggested to them. Finally, a demographic section asks for socio-economic data of the respondents that may be used later when trying to validate the results obtained from a theoretical point of view (WTP determinants).

In the third stage, a measure of value is estimated that can be either the mean or median WTP (or WTA). Mean WTP is the traditional measure used in cost-benefit analysis, while median WTP, which corresponds to the flat amount that would receive majority approval, is a standard public choice criterion (Carson, 2000), thus being more meaningful from a political consensus view point. For both measures, confidence intervals should be reported. For open-ended responses, calculating mean or median WTP is quite simple and immediate, however this is not the case for the dichotomous choice question format. In this latter case, the researcher does not know the respondent's maximum WTP, but rather her affirmative or negative response to the offered amount. Therefore, mean WTP must be estimated using different approaches, being the most popular one the Random Utility Model developed by Hanemann (1989) that provides the basic framework for analysing single bounded dichotomous choice responses. In a later piece of work, Hanemann and Kanninen (2001) provide a more comprehensive explanation of these models that use discrete-response contingent valuation data.

In the fourth stage it is necessary to investigate the determinants of WTP (or WTA) estimating a bid curve in which the dependent variable is the response given by the respondent to the offered bid and the explanatory variables include income, bid offered, education, age, environmental quality and other socio-economic variables. Regressing WTP values against standard economic variables is the way of validating theoretically the results obtained since they must conform to the underlying principles of economic theory, e.g. when explaining WTP the variable income should be significant and with the correct sign (the higher the respondent's income, the higher the probability of accepting the proposed payment).

Finally, in the fifth stage the mean or median WTP is aggregated over the relevant population in order to obtain an economic value of the benefits derived from the environmental policy proposed. Considering that CVM is based on the analysis of individual behaviour, there is a problem in knowing how changes in the quality of the environment can affect aggregate values. This will depend on both the benefits per person and the population of beneficiaries or extent of the market (Bateman, et al., 2006). Finally, it is necessary to choose the time period over which benefits should be aggregated and a discount rate. Regarding this latter variable, the choice of the "correct" discount rate is still the subject of a contentious debate in the cost-benefit analysis literature (see, for example, Almansa-Sáez and Calatrava-Requena, 2007). Nevertheless, it seems that for short and mid-term projects (around 25 years) the appropriate discount rate would be around 5% (European Commission, 2008), while for long-term projects, exhibiting environmental externalities and affecting intergenerational equity, lower discount rates, in the 1–3% range, should be used as it is suggested by Weitzman (1999), and Pearce et al. (2003).

3.3 The disparity between WTP and WTA

Despite its popularity and strength, illustrated by the fact that thousands of contingent valuation studies have been done in over 130 countries covering different areas of research (Carson, 2011), the CVM is not a perfect technique. Critics argue that this method does not provide a good basis for informed policymaking or accurate damage assessment in judicial proceedings (Hausman, 2012), or that money appears to be a poor scale for summarizing environmental values since evaluating how people perceive environmental changes involve more that can be obtained from a stated-preference monetary scale (Ryan and Spash, 2011).

One of the major criticisms of the method, affecting its validity, revolves around the disparity between WTP and WTA. A debate that is far from settled and that raises important research questions about the use of cost CBA in which CVM will undoubtedly play a part (Haab et al., 2013). Basic economic theory

suggests that both approaches can be used interchangeably to elicit individual's preference for a change in the level of environmental goods since they should give the same answer, provided that that income and welfare effects are small (Freeman, 2003). However, both practitioners and critics of the CVM recognize not only that these disparities exist, but also that these are large and persistent (Horowitz and McConnell, 2002). The extent to which people demand more to accept a loss than they are willing to give up to obtain an otherwise commensurate gain, is a subject of growing interest (Knetsch, 2010). Several explanations have been suggested for the large difference between both measures.

A first explanation can be found in the existence of an income effect (Willig, 1976), so that the WTP for an environmental good is constringed by the respondent's income, while the WTA compensation for forgo it is not constringed by her income. Hanemann (1991) demonstrated that both an income effect and a substitution effect determine the sign and magnitude of this disparity. Nevertheless, even if there is a small income effect, the disparity can still be large if the elasticity of substituting the environmental good and the rest of goods is sufficiently low (Hanemann, 1991).

A second explanation, beyond the standard microeconomic theory, is based on the theoretical developments in economics and psychology, as it is the case of the "prospect theory" (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991). In this theory consumers are subject to "loss aversion", and thus they weight losses (reflected by WTA) more heavily than the equivalent gains (reflected by WTP) because they are attached to goods for a variety of reasons. Consequently, people ask for more compensation when losing a good than what they are willing to pay to keep it. In this case the disparity between these measures hinges entirely on the substitution effect as is shown in Hanemann (1991).

A third explanation lies in the idea of asymmetrical assignment of moral responsibility suggested by Boyce et al. (1992). This explanation arises from the field of environmental economics stressing the idea that environmental commodities might have intrinsic value beyond their monetary value, thus individuals may want to preserve them for moral motives. Finally, a fourth explanation in line with the third explanation looks at differences in emotions and moral perceptions especially for those public goods with a perceived moral character, such as contributions to a good cause (Biel et al., 2011). In this latter case, public-good choices are perceived to have a more evident ethical dimension since the choices made by an individual can have an effect on the wellbeing of others.

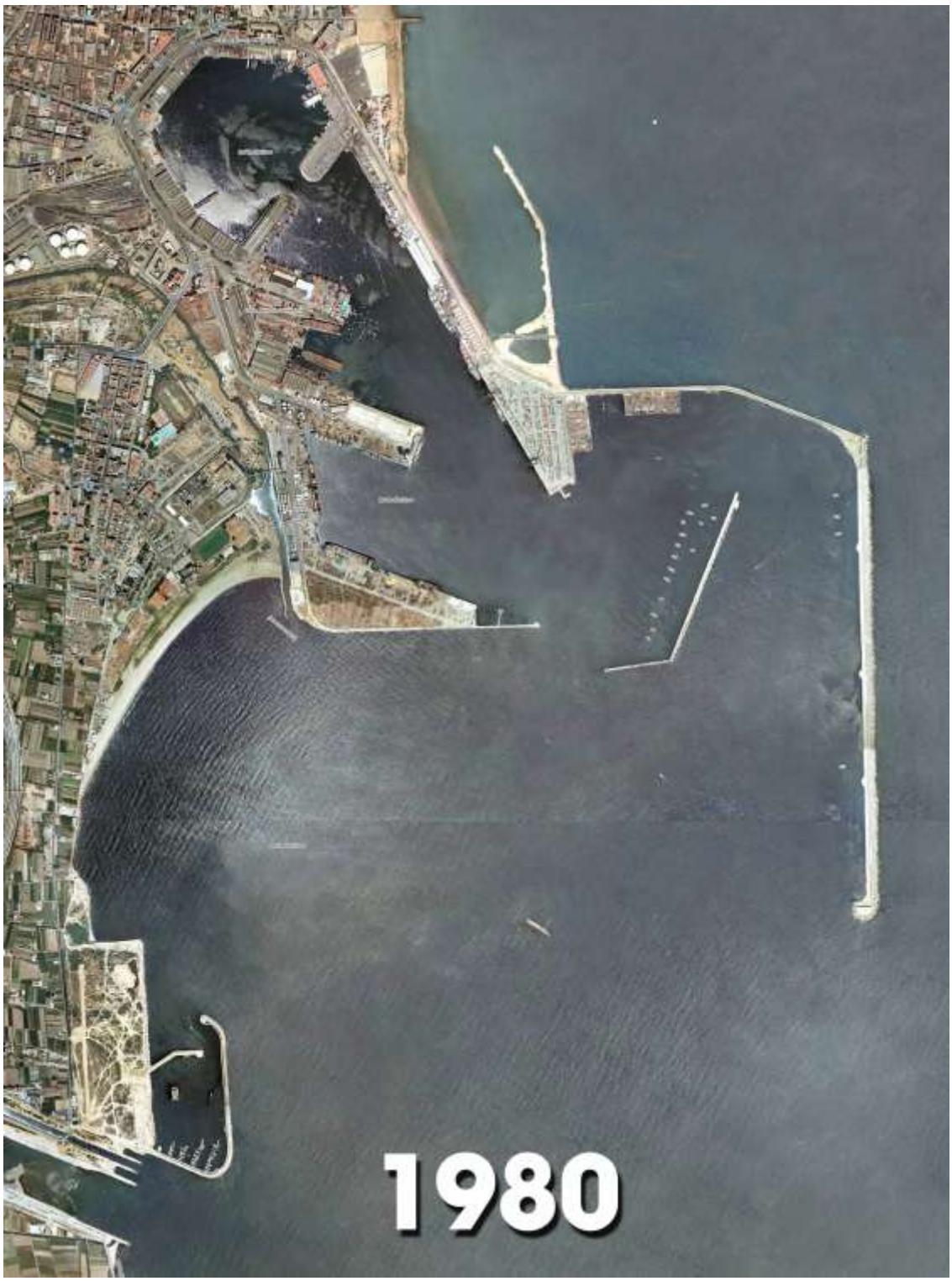
In general, studies addressing this disparity conclude that a good and realistic survey design could reduce the difference between both measures (Venkatachalam, 2004). Nevertheless, Hausman (2012) points out that the gap between WTP and WTA is likely due to the reality that answers to contingent valuation surveys do not actually reflect well-defined preferences but instead opinions invented on the fly.

4. PORT EXPANSION AND NEGATIVE EXTERNALITIES

In the past, ports have been mostly concerned with their own activity and economic efficiency, rather than the impact of port operation on the surrounding environment (Wooldridge and Stojanovic, 2004).In line with this, port areas have been regularly expanded to accommodate the increase of cargo volume handled. However, as noted by Wiegmans and Louw (2011), expanding port areas is becoming more difficult than before due to a growing environmental awareness and the subsequent community opposition. Therefore, it seems that the era of easy and free-of-controversy port expansion has come to an end.

Nevertheless, despite this growing opposition to port expansion, some ports, as is the case of the Port of Valencia (PV), are still expanding in order to accommodate future traffic increases. In fact, as a consequence of the expansion process experienced in the last thirty years, now the Port of Valencia is the leading port in the Western Mediterranean and the fifth largest port in Europe in terms of containerized cargo according to data provided by the European Seaports Organization (ESPO, 2012a). However, from an environmental point of view, this expansion process is not neutral since we cannot overlook its impact on the surrounding environment. The main environmental problem of the Port of Valencia related to its expansion process was by far the reclamation of land from the sea, and from the adjacent areas, in order to construct new port facilities. The construction of new quays, protruding into the sea, has affected the coastal hydrography causing erosion in the nearby beaches due to reduced sediment availability. Coastal erosion takes place when there is a land-connected structure protruding into the sea that changes the depositional-hydrodynamic regime as a result of altering littoral currents (Kamphuis, 2000; Frihy, 2001). As a result of this expansion process, the surface area of the Port of Valencia increased fourfold since 1980, when it had an area of 1.5 million square meters compared to its current 5.5 million square meters. Figures 1 to 3, illustrate the extent of this process over the last thirty years.

Figure 1. Aerial view of the port of Valencia (1980)



Source: Saz-Salazar and García-Menéndez (2012)

Figure 2. Aerial view of the port of Valencia (1992)

Source: Saz-Salazar and García-Menéndez (2012)

Figure 3. Aerial view of the port of Valencia (2012)

Source: Valencian Institute of Cartography

In order to accurately inform decision making, it is necessary to incorporate the economic appraisal of these negative externalities in CBA. Considering that in this context CBA has traditional ignored these external costs a contingent valuation study was conducted aimed to estimate the external costs resulting from the expansion process experienced by the Port of Valencia, thus filling the void in port environmental policies (Saz-Salazar et al., 2012). In conducting this study, the first problem we faced was to decide which measure (WTP or WTA) we were going to ask the respondents. As it has been explained in the previous lines, whether WTP or WTA is the correct measure is a question on property rights on the environment. In this particular case, although respondents did not have any legal entitlement to the environment, we considered more appropriate to use a WTA format considering that most people would regard the existence of the previous area close to the port as the reference state for their feelings of loss since they have been living there many years before the expansion of the Port of Valencia took place, hence that the use of a WTP measure would have contradicted the perceived entitlement structures that may not coincide with the legal situation (Lienhoop and MacMillan, 2007).

As it is shown in table 1, in constructing the hypothetical market, 400 face-to-face interviews were carried in the six neighbourhoods closer to the port area since they were the most potentially affected by this expansion process. The payment vehicle chosen was a reduction in the urban property tax currently paid by each family owning a house since it was a WTA scenario. This payment vehicle was considered the most appropriate with regard to the credibility of the hypothetical market created, besides of having the advantage of being very familiar to the respondents.

The question format used was the dichotomous choice with a five-bid vector (10€, 30€, 60€, 120€, and 270€) given its advantages over other question formats (open-ended question) that demand a higher cognitive effort from the respondents while being more prone to strategic behaviour. More specifically, the wording of the valuation question used was:

The expansion process of the Port of Valencia, as previously explained, may have negative consequences on the surrounding environment affecting the wellbeing of nearby residents. In the case that you would feel negatively affected by this expansion process, would you willingness to accept an annual reduction of € ... in the real estate tax currently paid as a monetary compensation for the damage caused to you? Before you decide your response, we would like you to keep in mind that if approved this compensation policy, it would reduce the amount of money for funding other public policies and services from which you can benefit.

Table 1.Overview of the WTA study on Valencia

Valuation scenario	Valuing negative externalities from port expansion
Survey mode	Personal interviews
Payment vehicle	A reduction in the property tax
Elicitation format	Dichotomous-choice
Bid vector	€10, €30, €60, €120 and €270
Mean WTA	€97.5 - €116.3
Population affected	24,145 families
Aggregated costs (lower - upper bound)	**€**40,989,328 (**€**37,423,396 - €44,533,045)
Sample	400
Year of data	2010

In this study, using different logit models with socio-demographic variables, the estimated mean WTA ranged from a minimum value of €97.5 to a maximum value of €116.3, depending on whether a mechanism for correcting hypothetical bias was applied or not. Comparing these values with a reference figure as it is the average amount paid in real estate taxes by a house owner in Valencia, it was found that the median WTA values obtained would mean a hypothetical reduction in this tax of between 36% and 43% for those families negatively affected by the port expansion process. Nevertheless, these figures would be meaningless if they are not underpinned by the construction of an equation that predicts the response given by the respondent to the offered bid as a function of several variables as household income and other attitudinal and knowledge variables concerning the good in question. In this respect, Carson (2000) points out that the construction of an equation that predicts WTA for the good with a reasonable explanatory power and coefficients with the expected sign provides evidence in support of the proposition that the survey has measured the intended construct. If this is not the case, the researcher may have failed to collect the relevant variables in the survey instrument or, what is even worse, the WTA responses obtained are random and completely useless. Therefore, as we used a dichotomous choice question, the probability of a yes response to the offer amount *A* was given by the next equation:

$$\Pr(Yes) = \frac{1}{(1 + \exp(-\alpha Z - \beta A))} \qquad (5)$$

where *Z* is a set of socio-economic characteristics of the respondents as household income, family size and environmental concern, among others. To estimate this equation the "yes" responses are coded as "1" while the "no" responses are coded as "0", then these responses are regressed, using packages as LIMDEP or STATA, on the socio-economic variables collected in the survey. In this case, other things equal, we obtained that the probability of a "yes" response was positively related with the offered bid (*A*). Therefore, as expected, the higher the offered bid the higher the probability of accepting it, since it was a WTA scenario and not a WTP one. In the same way, we obtained that the higher the household income the lower the probability of acceptance. We also found that respondents more concerned about the environment had a higher probability of accepting the proposed compensation. Finally, another interesting result was that those respondents that earned their living from the port of Valencia were less likely to accept the compensation offered to them. In this respect, Grobar (2008) notes that port district residents will have less incentive to oppose to port expansion the better they able to take advantage of the economic opportunities arising from ports. .

As this study was aimed at estimating the social costs borne by local residents as a consequence of the negative externalities stemming from port expansion, a final step was to aggregate the monetary values over the population affected by this process (24,145 families). Therefore, assuming a 25-year period, a 3% discount rate, and a mean WTA of €97.5, it was obtained that these social costs amounted to **€**40,989,328 with a lower bound of **€**37,423,396 and an upper bound of €44,533,045.

5. WATERFRONT REDEVELOPMENT AND POSITIVE EXTERNALITIES

The literature on waterfront has dealt with the changing nature of the relationship between port and cities. Hence chronological port-city models have been used to explain the migration of port terminals to more peripheral sites and the resulting process of urban waterfront renewal (Olivier and Slack, 2006). Moreover, the increasing environmental awareness has acted as a catalyst for the port-city separation process. Hoyle (2000), in his port-city evolution model, adopts a six-stage chronological approach to explain the port-city interrelationship. In the fifth stage, following a retreat of maritime industrial facilities from the traditional waterfront, the redevelopment of original port areas into other uses takes place that reflects the move to bring people back to the water's edge while creating new and more attractive urban environments in response to the public demand for access to the waterfront. Finally, the last stage is characterized by a renewed collaboration between port and city as waterfront zones are revitalized, thus urban redevelopment enhances the port-city integration process.

Huang et al. (2011), on the basis of previous models by Toffler (1990) and Vallega (2001), develop a three-stage-six-type framework of port-city development. In the "third stage waterfront" the emphasis of the relation between people and ports is the ecology and the concept of sustainable life. Therefore, its primary functional activities are recreation, tourism, cultural heritage, and the enjoyment of the environment, thus consumption and leisure activities replace former industries (Norcliffe et al., 1996).

While these models have been very informative in understanding the port-city relationship, they fall short of explaining all the effects, especially those ones of nonmarket or environmental nature, stemming from these processes of waterfront redevelopment. Thus, we cannot overlook that, from an economic perspective, waterfront redevelopment projects usually result in urban and environmental improvements (positive externalities) increasing the wellbeing of citizens. However, these improvements share, to some extent, the non-excludable and non-rival nature of public goods, hence that estimating these non-market benefits is a difficult task requiring the use of non-market valuation techniques as the CVM. Considering this difficulty, along with the apparent lack of interest of this phenomenon by economists, so far there is only one single study, published a decade ago, addressing this topic (Saz-Salazar and García-Menéndez, 2003). The primary objective of this ex-ante valuation study was to estimate in monetary terms the increase in citizens' wellbeing resulting from recovering some old vacant port areas for recreational and leisure purposes in the city of Castellón (Spain), thus increasing the offer of these services in an area where such services were practically non-existent. The idea behind this redevelopment project was not just only to improve the physical environment, but also to change the image of the waterfront from a derelict wasteland to an interesting and inviting place in line with renewal experiences based on a mix used of space as a key factor for success (Tunbridge and Asworth, 1992). In particular, the project envisaged the construction of green areas, promenades, two museums, an outdoor concert facility, a shopping mall and a multi-theatre complex (see figure 4). Finally, the presence of historically and architecturally important buildings was also contemplated, thus contributing to the creation of an improved image of the site through the symbiosis of these heritage assets and new recreation facilities planned.

Figure 4. Partial aerial view of the port of Castellón

Source: Valencian Institute of Cartography

Figure 5. Aerial view of part of Castellón's waterfront development project

Source: Google Maps

Table 2 summarizes the features of this case. In this study, 700 interviews were carried out in three different areas (Castellón city, the port district, and the metropolitan area); each area received a different weight in the final survey considering based on two factors: population and their proximity to the new recreational facilities to be provided. Thus, the port district, the area closest to the port and most affected by the public works, was assigned a greater weight than would have been given had only its population been considered. The survey used discrete response framing (take-it-or-leave-it, voting-based) for the valuation question as well as in-person interviews as recommended by the NOAA panel of experts (Arrow et al., 1993). However, the respondents were first asked a binary question with the purpose to determine whether or not they were in the market. This allowed a Spike model (Kriström, 1997) to be applied in order to explain the two decisions made by the respondent: (i) whether or not to participate in the market and (ii) the response to the offered payment once they had decided to enter the market. For the dichotomous-choice question, six different bids were used (€6, €18, €30, €45, €60 and €90) based on the results obtained in the pilot study, where an open-ended question was used. The payment vehicle chosen for the survey was a voluntary and individual contribution to a special trust fund responsible for carrying out the works during the schedule execution period of three years (1999-2001). The specific wording of the WTP scenario read to respondents was:

The restoration of these vacant port areas for leisure and recreational purposes, as previously explained, costs a great deal of money. Given limited government resources, in order to fund this action all the citizens would be asked to pay an annual and voluntary contribution to a special trust over the next three years. If the majority of households vote in favour, this project will be carried out, while if a majority votes against the proposal, then these areas will remain as they are today. Considering all the benefits that stem from this project, would you willing to contribute financially to such a project for the next four years? Yes, No, Don't Know.

Before you decide your vote regarding this proposal, we would like you to keep in mind that if approved this redevelopment policy, it would reduce the amount of money you would have to spend on supporting other environmental and public policies, and on the everyday products you buy as well.

Respondents who answered affirmatively to this previous question were asked the following WTP question:

This redevelopment program would cost your household € . . . a year. Would you vote in favour of this program, against or do not know?

The mean WTP obtained ranged from a minimum value of €45 to a maximum value of €62 depending of the model applied in analysing the dichotomous choice question. As it is customary and necessary in CVM studies, an equation that predicts WTP for the good as a function of other several variables in the survey was constructed to validate the results from a theoretical point of view. To estimate this equation, as it has been explained in the previous lines, the "yes" responses were coded as "1" while the "no" responses were coded as "0", and then were regressed on the socio-economic variables collected in the survey. In this case, unlike the WTA study, the results showed, other things equal, that the probability of a "yes" response was negatively related with the offered bid (*A*). Therefore, as expected, the higher the offered bid the lower the probability of accepting it. In the same way, it was obtained that the higher the household income the higher the probability of acceptance. In the same way, respondents that expected to use the new recreation

facilities more often, had higher probability of accepting the proposed bid, while older respondents, as a consequence of having a different scale of values with regard to the environment, had a lower probability of acceptance.

Finally, aggregating the mean WTP obtained (€45) by the population affected by this restoration policy (54,50 families), and assuming that these new recreation facilities have a 25-year useful life and using a discount rate of 5%, it is obtained that the social benefits resulting from these environmental improvements amount to € 7,308,307.

Table 2.Overview of the WTP study on Castellón

Valuation scenario	Valuing positive externalities from waterfront redevelopment
Survey mode	Personal interviews
Payment vehicle	A voluntary contribution to a special trust
Elicitation format	Dichotomous-choice
Bid vector	€6, €18, €30, €45, €60 and €90.
Mean WTP	€44.9 – 62.6€
Population affected	54,250 families
Aggregated benefits	€ 7,308,307
Sample	700
Year of data	1999

6. CONCLUSIONS

The current globalization process has served as a catalyst for major technological changes in the shipping industry. Thus, the relationship between port and cities has gained a new meaning since the effects that these changes have on the surrounding environment should be considered. Both negative and positive environmental externalities have been detected. While the former are the result of port expansion in order to accommodate current and future increases in maritime traffic, the latter are the result of transforming obsolete port areas into recreational facilities as a consequence of the growing environmental awareness. It is essential to take these externalities into account into decision-making on port expansion and transformation of port areas. This paper aims to provide a building block towards sound policy making in this respect, by estimating monetary value of these externalities, and incorporating them in the framework of cost-benefit analysis.

With this purpose, the contingent valuation method has been applied to two ports in Spain. While we are aware that CVM is not a flawless methodology, this paper illustrates that the contingent valuation method can be an important tool at the disposal of policy decision makers in contexts, as those analysed in these two cases, where substantial costs and benefits of a proposed public policy are not incorporated. We agree with Barr and Mourato (2009) that, irrespective of how one thinks of the contingent valuation method, policy decisions that ignore non-market values are at least incomplete and at worst misleading. In addition to chronological models from the field of economic geography that have explained the changing nature of the relationship between port and cities, quantification of environmental effects from an economic perspective is necessary, which is what we have attempted in this paper. In a context of growing environmental concern over port expansion, environmental issues arise as key factor shaping the current success of ports and their "licence to operate" in the future with sustainable local support. Wider application of the contingent valuation method on port expansions and waterfront development could provide valuable guidance to policy-makers.

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