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An Analysis of the Factors Influencing Transaction Costs in Transferable Development Rights Programmes

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Abstract

Transferable Development Rights (TDR) programmes have been introduced as an alternative to traditional regulatory instruments with proponents arguing that the implementation of these alternative programmes leads to similarly effective land-use outcomes with greater efficiency and equity. The evaluation of land-use policies is key to improving policy design and implementation processes, and particularly important when considering whether alternative policy instruments such as TDR deliver preferable outcomes. While some researchers have tried to identify the factors affecting TDR success, there has been little research about institutional aspects and the related transaction costs of TDR programmes, and their potential effect on policy outcomes. The presence of significant transaction costs decreases the efficiency, and can have a negative effect on the success of TDR programmes. This paper explores the transaction costs that may arise in TDR programmes with the specific objective of gaining a better understanding of which factors influence transaction costs in these programmes and why such costs arise. These factors are examined under three categories; 1) the characteristics of the transaction; 2) the characteristics of the transactor; and, 3) the characteristics of the policy. The paper also examines the different effects of these factors on different parties involved in the TDR programmes.

Keywords: Transferable Development Rights (TDR), Policy Instruments, Policy Analysis, Transaction Costs, Institutional Design and Arrangements.

1. Introduction

Traditionally, direct government interventions, using regulatory instruments in the form of zoning, development control, acquisition and eminent domain, and purchase of development rights (PDR) programmes, have been the predominant view in planning practice (Wang et al., 2010, Rydin, 1993, Heimlich and Anderson, 2001). However, the efficacy of these instruments has remained a critical concern among planners and economists. The principal criticisms allege relatively low efficiency and effectiveness, inequitable outcomes, and significant transaction costs (Fischel, 2000, Rydin, 1998, Pogodzinski and Sass, 1990, Mills, 1989, Heikkila, 2000, Nelson, 1977). There is also an increasing scepticism about the ability of the regulatory authorities to manage land use and development in an efficient and equitable manner. Due to a lack of sufficient knowledge and information, it is likely that regulatory authorities underestimate the real costs of losing development potential or adapting inappropriate restrictions on valuable lands for preservation (Wang et al., 2010). On the other hand, some planners argue that these instruments are associated with high transaction and social costs. These costs include both administrative and information costs, as well as opportunity costs of not developing or improving the more beneficial areas of society (Mills, 1989, Pogodzinski and Sass, 1990). Given these costs and problems, it has been argued that these instruments fail to

achieve their objectives and, in particular, they fail to result in optimal land-use patterns (Clinch and O'Neill, 2010, Nelson, 1977, Fischel, 2000).

Having recognised the inefficiency of the traditional regulatory instruments and their shortcomings, increasing numbers of land-use planners and economists have been proposing the implementation of alternative market-based instruments to implement and manage urban plans (Janssen-Jansen et al., 2008, Micelli, 2002, Clinch and O'Neill, 2010). Moreover, successful implementation of market-based instruments in environmental policy has generated greater optimism and enthusiasm for their application in land-use planning. The principal reason for the proposition is that such instruments are more likely to promote efficient (least cost) outcomes in terms of, for example, compliance with an environmental objective, and more capable of providing an equitable distribution of the marginal costs of preservation through a transfer of funds between parties. In addition, the market mechanism addresses the information failures that make it difficult for planners using traditional instruments to achieve the same results.

The Transferable Development Rights (TDR) approach is one of the market-based land-use policy instruments, which has been introduced as an alternative to the traditional regulatory instruments, such as zoning. TDR programmes have been used in the USA and a number of other European and Asian countries for preserving farmlands and ecologically sensitive areas, as well as directing future development (Janssen-Jansen et al., 2008, Chan and Hou, 2015, Shahab and Azizi, 2013, Wang et al., 2010). The Coase theorem is usually considered as the 'intellectual foundation' of TDR programmes (Wang et al., 2010). According to Coase (1960), market interventions are not always desirable, and net social benefits can potentially be maximized, without state regulations, through clarifying property rights and also minimizing transaction costs. In other words, the Coase Theorem affirms that, in dealing with externalities, where transaction costs are negligible, if property rights of any resource can be clearly attributed, market transactions would lead to more efficient outcomes than state interventions, through negotiation between parties, regardless of the initial allocation of resources (Clinch et al., 2008). TDR programmes commodify development rights and (re)establish markets for these rights in a way that they become the currency of development. In essence, TDR programmes are designed to assist in defining property rights and establishing a property rights market, which can replace direct forms of government intervention in order to internalise externalities and cope with market failures (Shahab et al., 2018b). Using the terminology of TDR, planners determine 'sending areas' that are undesirable or less desirable for development and 'receiving areas' which are designated areas for development (Pruetz and Pruetz, 2007, Nelson et al., 2011). Under traditional zoning, those in the 'sending areas' suffer a welfare loss as they are not entitled to develop and those in 'receiving areas' gather significant rents from being conferred with the right to develop. However, in a TDR programme, those in 'receiving areas' must purchase development rights from those in the 'sending areas'. Thus, the approach is consistent with the 'polluter pays principle' whereby there is, effectively, a charge imposed on the developers and compensation to those who are denied the development right. In this way, the approach is considered to be more equitable than traditional instruments.

In spite of growing implementation of TDR programmes, there has been little evaluation of their design, process, and outcomes (Chan and Hou, 2015, Clinch and O'Neill, 2010, Machemer and Kaplowitz, 2002). The main focus of TDR evaluation studies thus far has been identifying the factors affecting TDR success through the study of established TDR programmes (Chan and Hou, 2015, Kaplowitz et al., 2008, Pruetz and Pruetz, 2007, Machemer and Kaplowitz, 2002, Aken et al., 2008). Some studies, however, show that many TDR programmes have not met planners' expectations (Pruetz and Standridge, 2008) and some researchers believe that the relative cost-effectiveness of market-based instruments, in general, has been exaggerated and requires assessment with a more appropriate and realistic approach (Stavins, 1995). The issues surrounding transaction costs, and other institutional aspects of designing and implementing TDR programmes, are argued by some authors to

be of importance in determining and evaluating the success of these programmes (Shahab et al., 2017b). The size, type and distribution of transaction costs can affect the efficiency, effectiveness, and equity of TDR programmes (Bruening, 2008, Janssen-Jansen, 2008, Shahab et al., 2017a, Messer, 2007) and can hinder people from participating in the programmes (Tripp and Dudek, 1989, Nelson et al., 2011).

Despite these debates, there has been a lack of empirical studies and analyses of transaction costs in TDR programmes, and their potential effects on the success of these programmes. The objective of this paper is to address this gap by exploring the factors which influence transaction costs in TDR programmes, as well as seeking to understand why they occur and, thereby, to highlight where account needs to be taken of such costs when designing and analysing these programmes so as to enhance their efficiency and equity. Transaction costs arise in both policy design and policy implementation stages, nonetheless, this paper mainly focuses on the costs involved in operating and participating in existing TDR programmes. This paper aims to enhance understanding of what determines the level of transaction costs in TDR programmes by analysing how some specific factors influence it. The paper goes on to discuss the effects of these influencing factors on different stakeholders and parties involved in TDR programmes and seeks ways to reduce such costs.

2. What Are Transaction Costs?

Coase (1937), in his seminal paper ‘The Nature of the Firm’, introduces the concept of transaction costs to the study of firm and market organisation. Transaction costs are often defined as costs that are involved in exchanges or transactions, other than the sale price, in other words, all the costs that are not directly related to the production of that product (Nilsson and Sundqvist, 2007, Webster and Lai, 2003). Although many authors have discussed this concept, consensus about the definition of transaction costs has not been achieved and, moreover, there are many inconsistencies amongst them. The concept has been used in different meanings and scopes, from, being simply, the fee charged by middlemen, to a much broader concept which can be applied in comparing efficiency of different alternatives of resource allocation (Klaes, 2008). Transaction costs are also defined as ‘the cost of exchanging ownership titles’ (Demsetz, 1969) or ‘the costs of effecting exchange’ (Barzel, 1985). In another definition, Gordon (1994) determines the expenses of organising and participating in a market or implementing a government policy as transaction costs.

McCann et al. (2005, p.530) review a range of transaction costs definitions and present a definition to be used in environmental management: “transaction costs are the resources used to define, establish, maintain, and transfer property rights.” However, Marshall (2013) argues that this definition is not sufficiently comprehensive. He points out that McCann et al.’s (2005) definition considers the costs of defining the problem (to be solved institutionally) as negligible costs. On the other hand, property rights do not cover all the institutions which are involved in transaction costs of environmental policy and management. In addition, there is no clear distinction between the creation or change of an institution or organisation and the use of them (Furubotn and Richter, 1991). Similarly, North (1990) explains that institutions are created to reduce uncertainties, or are changed to facilitate a socially preferable outcome, after which they are used. Therefore, this study will use more comprehensive definition of transaction costs, presented by Marshall (2013, p.188) :

“Transaction costs are the costs of the resources used: to define, establish, maintain, use and change institutions and organisations; and to define the problems that these institutions and organisations are intended to solve.”

3. Factors Influencing Transaction Costs in Land-Use Policy Instruments

Many factors have been shown to influence transaction costs in different policy areas, such as environmental, agricultural, and natural resource policies. In the land-use planning literature, Shahab et al. (2018a) advances a transaction costs framework for evaluating land-use policy instruments building on prior works of *inter alia* Coggan et al. (2013), McCann (2013), Ducos and Dupraz (2007), Ducos et al. (2009), Mettepenningen et al. (2011), Nilsson (2009), Knowler and Bradshaw (2007), Rørstad et al. (2007). This framework employs the terminology commonly used in transaction costs economics, particularly the works of Nobel Laureate Oliver Williamson (1975, 1981, 1985, 1996, 1998, 2000), for example asset specificity, uncertainty and frequency. As outlined in Table 1, they propose that the factors that influence transaction costs in the design and implementation of land-use planning policy instruments can be classified in three categories; 1) characteristics of the transaction; 2) characteristics of the transactors; and 3) characteristics of the policy. The main contribution of this framework, compared to the previous ones, is that it includes a policy-characteristics category to highlight the importance of characteristics of the policy itself in the design and implementation of any policy. This framework is used in this paper to examine the factors which influence transaction costs in TDR programmes. While these transaction costs influencing factors are presented separately, it should be noted that they might be interrelated.

Table 1: Factors influencing transaction costs in a land use policy instrument

Categories	Factors	Description
Transaction characteristics	Interdependence (asset specificity)	The degree to which the investments are specific to a particular transaction and re-deployable to other transactions.
	Uncertainty surrounding transactions	A situation which involves limited information and/or asymmetric information.
	Timing (duration and frequency)	The number of transactions that occurs in a period of time, as well as the length of time each transaction takes.
	Number of agents	The number of stakeholders and people that are involved in a transaction.
	Involvement of intermediaries	Intermediaries might be involved in transactions and they may play an important role by providing information and other services.
Transactor characteristics	Past experience	Concerns previous experiences of agents with transactions or policies, and it may have a 'learning by doing' effect.
	Opportunism	When the agents involved in transactions show rent-seeking behaviour and adapt their actions to take advantage of opportunities for their own self-interests.
	Trust between parties	The extent to which agents have confidence in the information provided by other agents and their actions.
	Common preferences	Common ideology as well as a good understanding among people about the objectives and approaches of a policy.
	Social connectedness	The membership of a community of practice which is a group of people who share a domain of interest.
Policy characteristics	Simplicity	The extent to which a policy is easy to participate and understand, and how simple the policy administration is designed.
	Age of the policy	The number of years that a policy is in place.
	Precision of the policy	Concerns how precisely a policy is designed and structured.
	Policy approach	Different policy approaches (i.e. regulatory and market-based) within different types of governance (i.e. market and hierarchy).
	Public involvement and participation	The extent to which the public has been involved, and participated in, the policy choice, design and implementation stages.
	Policy credibility and consistency	The quality that people are confident that rules, regulations, and policies will be carried out and are not going to change easily.

Source: Shahab et al. (2018a)

4. Methodology

This research has utilised a case-study approach in order to examine the factors influencing transaction costs in TDR programmes. The case study, as a research method, is a well-established technique in the field of land-use planning. The ability of the case study methodology to be utilised, in learning about, obtaining data, understanding phenomena and processes in local contexts, and integrating multiple methods, makes it a powerful research method in land-use planning (Thomas and Bertolini, 2014, Machemer and Kaplowitz, 2002, Yin, 2013, Marshall and Rossman, 2006). The case studies in this research have been selected from the TDR programmes of Maryland, USA. Maryland is one of the pioneer states in operationalising these programmes (McConnell et al., 2007, Dehart and Etgen, 2007). Some of the TDR programmes in Maryland are among the most successful, well-established, and well-institutionalised programmes in the USA. According to a national study, conducted by American Farmland Trust (2008), TDR programmes in Maryland had preserved over 80,000 acres, or 61% of all agricultural lands protected by TDR transfers in the nation. Four TDR programmes in Maryland have been selected as the case studies of this research, including Calvert, Montgomery, St. Mary's, and Charles Counties. Table 2 outlines the characteristics of these four TDR programmes. Montgomery County is the most populous county among the case studies, and as it is located relatively closer to Washington D.C., its housing market is more active, facing higher demand for development. Despite similarities, the design and implementation of these TDR programmes are different in many respects. They vary in terms of: their approaches to the designation of sending and receiving areas; what the eligibility criteria for TDR creation/retirement are; whether the use of purchased TDRs in the receiving areas is by-right; and what mechanisms are used to stabilise TDR prices. Moreover, these four TDR programmes vary in terms of the perceived degree of success and the year of initiation. Calvert and Montgomery Counties, which initiated in 1978 and 1980 respectively, have been quite successful in preserving farmlands and open spaces in the regions they have identified for protection. On the other hand, St. Mary's and Charles Counties, which were initiated in 1990s, have not been very (or relatively) successful and have preserved limited amount of lands (McConnell et al., 2007).

Table 2: Characteristics of the TDR case studies

TDR Programmes	Year Initiated	County Pop. (2010)	County Area (Sq. Miles)	Acres Preserved (2016)	Type of protection	Acres needed for one TDR	No. of TDRs needed to build one unit	Main Goal of the TDR Program
Calvert County	1978	88,737	213.15	14,700	Easement	1	5	Preserving the rural character and farmlands
Montgomery County	1980	971,777	491.25	52,052	Easement	5	1	Agricultural preservation & compensation
St. Mary's County	1990	105,151	357.18	4,107	Easement	3	1	Preserving natural resources & farmlands
Charles County	1992	146,551	457.75	5,274	Covenant	3	1	Agricultural preservation

Data sources: Pruetz (2016); Maryland Department of Planning (2016); Dehart and Etgen (2007); The Maryland State Data Center (2015)

As presented in Table 3, representatives from different parties involved in the TDR transactions in each TDR case study were interviewed. Four different parties were identified to be involved in

most of the TDR transactions, including landowners/farmers (TDR sellers – supply side), developers (TDR buyers – demand side), local authorities (planners, programme administrators and/or people who work for the county government), and intermediaries (land-use attorneys and brokers). Interviews are considered as one of the major data collection methods in transaction costs economics studies (McCann et al., 2005, Falconer and Saunders, 2002, Fang et al., 2005, Kuperan et al., 2008, McCann and Easter, 2000, Ofei-Mensah and Bennett, 2013, Coggan et al., 2013, Mettepenningen et al., 2011). Using open-ended questions, semi-structured interviews were conducted with key participants of four TDR programmes in Maryland from March to July 2016. The semi-structured interviews provided the researchers with the flexibility to tailor the questions to the interview context and interviewees’ experiences and positions (May, 2011, Galletta, 2013). Open-ended questions were designed based on the transaction costs economics literature in order to address the theory-based factors (as presented in Table 1) influencing transaction costs in TDR programmes. A total of 46 participants have been interviewed in order to reach data saturation, whereby no further insights were being generated from data collection (Guest et al., 2006). This research aimed at achieving data saturation concerning each factor influencing transaction costs across TDR case studies, but not necessarily in each case study.

The interviews were conducted face-to-face and at a location and time that was convenient for the interviewees, however, two interviews were conducted by telephone, as this was the preference of the interviewees. All of the interviews, lasting from 45 to 90 minutes each, were digitally recorded and anonymously transcribed by the researchers. In order to choose the potential interviewees, in the first instance, key interviewees who were involved in the respective TDR programme were identified, contacted and interviewed. Then, based on snowball sampling, they were asked to recommend other potential interviewees and/or to provide information helpful for contacting other members of the target population. Snowball sampling allowed us to identify people who were information-rich yet not easy to identify and contact (Sarantakos, 2012, Thompson, 2012). To examine whether, and how, the theory-based factors, presented in Table 1, influence transaction costs, each interview question was designed to theoretically relate to one or more factors. For example, to address an aspect of interdependence (asset specificity) from the perspective of local authorities, they were asked: Are there standardised processes and documents for those requiring or selling the development rights? If they were involved in the implementation/administration of another TDR scheme they were asked whether they think it would be easier and why? Such interview design enabled the researchers not only to manage the collected data case-by-case, but also to organise the empirical data according to the variables of interest (i.e. the theory-based factors) (Miles and Huberman, 1994). Using NVivo 11, interviews were analysed and coded based on the theory-based factors. Policy documents were also reviewed for required data, including original reports of the policy instruments, official statistics, administrative records, and other accounts kept routinely by the county authorities which enhanced our framing of the questions and the discussion.

Table 3: Number of different stakeholders interviewed in each TDR case study

Participants	Montgomery County	Calvert County	St. Mary’s County	Charles County	Total
Landowners	3	2	2	2	9
Developers	3	2	2	2	9
Local Authorities	5	5	4	2	16
Intermediaries	4	2	4	2	12
Total	46				

5. Results: Factors Influencing Transaction Costs in TDR Programmes

Using the analytical framework of Table 1, this section presents an analysis of the factors influencing transaction costs in TDR programmes, based on the interviews with key interviewees from across the four TDR case studies. Each factor is examined to find out whether, and how, it influences transaction costs in these TDR programmes. This section also highlights the different effects of these transaction costs' factors among the parties involved and across the TDR case studies.

5.1. Factors concerning the characteristics of the transaction

5.1.1. *Interdependence (Asset Specificity)*

TDR is not an 'idiosyncratic' good, but a nonspecific one. Regardless of its origin, once created, it equals to any other TDR in the market. In other words, the price of TDR is not dependent on the attributes of the land in which the TDR is originated, such as the land use, the soil quality, the location, etc. Every single TDR available in the market at one time should theoretically have the same price. Thus, concerning a TDR as a commodity, a TDR transaction is of low interdependence. This attribute of TDR reduces transaction costs through decreasing information collection costs as well as making negotiation and finalising a price for the TDR a relatively straightforward effort. Likewise, it reduces the time and effort that local authorities need to put into reviewing and assessing a TDR application. While it makes the bargaining power of the sellers of TDRs limited, the buyers see that as one of the major strengths of the TDR programme. For example, one of the developers in St. Mary's County pointed out:

"A TDR is a TDR, why would I pay any more. The negotiation over price was very straightforward and the reason was because a TDR is a TDR. There's no other criteria. It's not like a Chevrolet versus a Ford or an uptown location versus a downtown location. That's not even like a bottle of water. You and I could have different brands of water, then I could say my water is better and we can have a conversation about it. On the TDR, there's no conversation. You either have it or you don't."

In order to create or certify TDRs, the landowners have to do a property title search, and sometimes a land survey, as part of the counties' rules and requirements. Although in most cases these goods and services have been only purchased for the TDR transaction, they could be re-deployed to other transactions and purposes, and are not fully specific to a particular TDR transaction. Thus, while the landowners are required to invest in preparing title reports, and sometimes land surveys, these goods and services should not be considered as investment in completely 'dedicated assets' from their perspective. However, if based on the agreement between seller and buyer, the buyer has to pay for the costs of title search and land survey and they will be considered as dedicated assets for the buyer, since he or she will not be able to use them in any other transaction.

In terms of site specificity, there is a difference between the supply and demand sides of the TDR market. TDRs are lifted from lands located in preservation districts (i.e. sending areas), and are landed in areas designated and specific for development (i.e. receiving areas). Due to designating large areas in each county as sending areas, TDRs are quite a widespread good and are not site specific from a TDR supply point of view. However, since in some counties, the TDR supply capacity is greater than the TDR demand capacity, using TDRs in receiving areas is site specific to some extent. This situation has been pointed out particularly by interviewees in Montgomery County, where the use of TDRs in receiving areas is not 'by-right' and might require further processes. Developers in Montgomery County were required to negotiate with the County planners as well as conducting public hearings in order to use bonus densities derived from purchased TDR credits. Moreover, transferring extra densities to the receiving areas might face with reluctance among citizens of those

areas. Additional rules and regulations concerning the use of TDRs in receiving areas have also been mentioned as another obstacle. For example, one of the county administrators in Montgomery County stated that:

“One of the problems with the programme is having this quotient of supply and demand that's imbalanced. In theory, you should have one place to land, for each TDR that you intend to create. However, the problem with a lot of these TDR receiving areas is that they have a theoretical capacity, which is different with their practical capacity. Due to the environmental regulations, topography, environmental law, and competing uses for TDRs, what ends up happening is most of these receiving areas only get to be at the maximum about 60% of what they are planned for.”

All of the counties have established standardised documents, routines and processes, which are tailored to be used for TDR transactions. There are four main documents involved in any TDR transaction, including TDR certificate, easement or covenant, deed of transfer, and TDR sale contract. The first three documents are designed as ‘boilerplate’ documents which are public and usually can be found on the counties’ websites, but the last document, TDR sale contract, is a private document only between transactors. Nonetheless, land-use attorneys involved in TDR transactions have developed sample documents to be used for different TDR sale contracts. Thus, TDR transactions have very low level of procedural asset specificity which means routines and template documents can be easily transferred to another transaction. The interviewees also noted that the institutional knowledge of carrying out one TDR transaction is transferable to the next transactions which shows they are of low knowledge specificity. This attribute of TDR transactions will be further discussed with regard to the transactors’ past experiences factor later in this section.

5.1.2. Uncertainty

The TDR prices are set by the private market. Depending on changes in the development market, the TDR prices have fluctuated in all four case-study programmes during the last few decades. For example, the Montgomery County TDR programme has experienced a TDR price as low as \$6,500 per TDR in 2001, while five years later, in 2006, the price was as high as \$42,000 per TDR. Similarly, in Charles County, although the TDR price has had a peak of \$20,000 in 2006, in recent months it has been as low as \$5,500 per TDR. These dramatic changes in the TDR prices have had major effects on the uncertainties over the TDR transactions. The counties use different mechanisms to try to stabilise TDR prices and reduce their related uncertainties by making them more predictable. Montgomery and Calvert Counties established PDR programmes, respectively, in 1990 and 1993, more than 10 years after their TDR programmes began. Recently, Charles County has also started introducing a PDR programme, accepting PDR applications in 2016 for the first time. On the other hand, since 2002, St. Mary’s County has used a fee-in-lieu programme as an alternative to purchasing a TDR. Through the use of PDR, which uses public-fund sources, the counties buy development rights directly from the landowners. PDR provides landowners with another alternative to preserve their lands. Nonetheless, this option is not necessarily available when landowners are willing to sell their development rights. While the purchase price of PDR is dependent on past TDR market prices, it also influences future TDR transactions. According to McConnell et al. (2007), using PDR, as a complementary programme, in Calvert County has made the TDR prices very stable, whereby it has created a predictable environment for TDR sellers and buyers. In addition, Calvert County was the only county which had been publishing a quarterly newsletter, including TDR price information that contributed to the predictability of the TDR market in this county. However, arising from changes in management and administration, this newsletter is no longer published. The Fee-in-Lieu Programme in St. Mary’s County, on the other hand, has been established as a complementary mechanism for TDR to ensure that, should there not be enough TDRs available in the market, a developer would be able to pay a fee to the County to buy the required density. The Fee-in-lieu for each TDR must be at

least 120% of the average market value of TDRs purchased in arms-length intermediate transactions in the previous fiscal year.

For the TDR sellers, uncertainties concern when and how to participate in the TDR programme, what the current TDR sale price is, the results of past TDR transactions, and how to find a TDR buyer. One of the farmers interviewed in Calvert County stated that *“the TDR market is very fickle. Sometimes there is a real market for it and sometimes years will go by and there is no market for it.”* The landowners who decide to participate in the TDR programme are highly uncertain regarding when is the best time to sell the TDRs. This links to the volatility aspect of uncertainty. Moreover, the sellers of TDRs do not have enough information about the prices at which TDRs are being bought and sold, which links to the ambiguity aspect of uncertainty. None of the counties collect and release information on sale prices or about potential buyers of TDRs, with landowners indicating that they rely on ‘word of mouth’ from their personal connections. These uncertainties have a considerable effect on the transaction costs of TDR sellers in all TDR case studies. For the buyers of TDRs, uncertainty associated with a TDR transaction is lower, compared to those of TDR sellers. The developers, interested in purchasing TDRs, are usually provided with a list of potential sellers, whom they can contact with and negotiate a price. Moreover, they normally have more information regarding TDR transactions, prices, and processes, due to their personal experiences and connections.

For local authorities, uncertainty over the TDR programmes concerns two main issues; information about TDR prices and the outcomes of the programme. Being aware of TDR prices in the market enables the local authorities to provide more precise information to the sellers and buyers, to assess the condition of the programme, and to set a reasonable price/fee for the PDR/fee-in-lieu programme. The sale price of a TDR transaction is set privately between a buyer and a seller and the local authorities are not necessarily informed about that. In Charles County, for example, the administrators often see a \$1 price on the deed of transfer document, instead of the real sale price, since some of the transactors are not willing to disclose the prices. For the programme administrators, this situation increases uncertainty about TDR prices in the market. On the other hand, the outcomes of TDR programmes are uncertain to the planners, since they have no control on targeting the number and quality of the lands that enter into the programme. Participating in the programmes is voluntary, and the planners cannot easily estimate the acreage of land that may become preserved each year. Also, there is a concern regarding the ability of the programme in preserving the high-quality farmlands. Unlike PDR programmes, using TDR programmes planners cannot prioritise purchasing the development rights of prime farmlands or any other selected environmentally sensitive lands within sending areas. As one of the representatives of a local authority in Calvert County said, *“You might end up preserving low quality farms.”* In summary, it is clear that uncertainty is one of the major factors influencing transaction costs in the TDR programmes for all the parties involved.

5.1.3. Timing

Timing consists of two aspects of frequency and duration. In terms of the former, frequent TDR transactions reduce transaction costs by reducing uncertainty over TDR prices and decreasing information collection time. On the contrary, few and infrequent TDR transactions result in instability of TDR prices and increased levels of uncertainty associated with them. With frequent TDR transactions, transaction costs of the local authorities would tend to be reduced, since it enables them to develop standardised routines and processes and template documents. It also helps them to re-deploy the knowledge to limit the time required for each TDR transaction. Sellers and buyers, on the other hand, would benefit from increased predictability and stability of market prices arising from frequent TDR transactions. It also increases the availability and accessibility of the information for all parties. The markets for TDRs in the case study programmes are generally thin. These thin markets, which are characterized by a small number of participants and few buying or selling offers for TDRs,

contribute to the low transaction frequency, high price volatility, and relative illiquidity of TDRs. The frequency of TDR transactions depends on different factors, including the market conditions, policy design, and the development approaches and priorities of the counties. The more developments take place in an area, the more TDR transactions occur. For example, all counties were experiencing a greater number of transactions before 2008/09, when the recession started in the USA. Furthermore, counties have different approaches and priorities regarding development. St. Mary's, Calvert, and Charles counties use the TDR programme, as their primary preservation scheme, to encourage development in their receiving areas. Montgomery County, on the other hand, provides the developers with a few other options to increase density without purchasing TDRs.

The duration of a TDR transaction can be defined as the time required to complete a transaction. This duration varies across transactions, depending on the market conditions and past experiences of the transactors. From the TDR sellers' standpoint, TDR transactions are single and independent transactions, concerning a stand-alone product, called a TDR. Therefore, they are not involved in any other follow-up activities or long-standing consequences. When a landowner sells his certified TDRs, upon its sale no more action is required. This attribute of TDR reduces the time required for a transaction to be completed. Moreover, the whole process of participating in the TDR programmes is normally shorter than for other preservation schemes. For example, one of the programme administrators in Montgomery County pointed out that *"for the TDR programme, from the time that you apply to get the TDR created to the time you record your easement, you are talking about one to two months. But for other programmes, like PDR, it's going to be from six to 18 months. They are lengthier processes."* Likewise, a farmer in St. Mary's County stated that *"you could have TDRs lifted off of a property in a month or maybe 45 days"*. However, given the TDR markets are thin and rather illiquid, finding a buyer for TDRs can be the challenging part of the process for the TDR sellers. Depending on the market conditions and expecting sale price, it might take few days, months, or even years.

For TDR buyers, on the other hand, the process is usually more straightforward than for sellers. After finding a seller and finalising a contract, developers have to record a deed of transfer in the land records and submit it to the county to be used in their development projects. The whole process can take from only a few days to a number of weeks. All interviewed developers stated that finding a TDR seller was not a time-consuming process. Besides using their own personal connections and contacts, the county authorities provided them with a list of potential TDR sellers. In addition, as discussed before, negotiation over a price for TDR is a more or less straightforward effort, since TDR is a nonspecific good. For instance, one of the developers in Charles County mentioned that:

"If they [TDRs] have already been lifted off the property, I could buy them tomorrow. That would be very quick. I've been doing this business for many years so I know a lot of folks and I know who's got TDRs and who doesn't. The County also keeps a list of people who have notified them that they have TDRs for sale. I can call any one of these guys. If I'm willing to pay their price, I can have them tomorrow".

5.1.4. Number of Agents and Involvement of Intermediaries

Along with sellers and buyers of TDRs, a number of other people might be involved in a TDR transaction, including programme administrators, county attorneys, land-use attorneys, and brokers. Counties typically assign TDR administration responsibilities to two people; one person is responsible for initial consultation with landowners, reviewing TDR applications, and creating TDRs; another person is at the receiving side of it and is responsible for approving extra densities to be used in receiving areas. With the exception of Charles County, county attorneys are also involved in the TDR programmes. County attorneys legally review and approve documents in order to create or certify

TDRs. In the case of Charles County, instead of the county attorney, the programme administrator carries out this task. Having fewer people involved in the process has decreased the administration time and costs required for TDR programme in Charles County. However, this effect has not been substantial.

There are land-use attorneys in all counties who have been involved in several TDR transactions. Involvement of land-use attorneys in TDR transactions is necessary, as preparing a title report for a property is required by counties and it has to be completed by a licenced attorney. Along with the title report, land-use attorneys provide their clients with advice regarding TDR transactions, such as legal requirements, processes, documentations, and sometimes TDR prices and potential sellers/buyers. Through capitalising on economies of scale, these land-use attorneys have developed institutional knowledge that is transferable between TDR transactions, given the fact that these transactions are of low knowledge specificity. Due to land-use attorneys' experiences across many TDR transactions over time, the costs associated with information collection for both sellers and buyers of TDRs are reduced. Therefore, while entailing professional fee costs for the parties, the involvement of these land-use attorneys, who specialise in working with TDR programmes, reduces other transaction costs of the trading parties.

The involvement of brokers in TDR transactions mainly depends on the market conditions and availability of information regarding TDR sellers/buyers. Uncertainty about finding a TDR buyer has been the key reason for the use of brokers by TDR sellers. For instance, among the landowners interviewed in Montgomery County, one person, who completed his TDR transaction in 2003 when the housing market was active, could find the buyer and complete the transaction without the need to involve a broker. On the other hand, two interviewees, who completed their TDR transactions after 2012, had to pay 3-5% of the total TDR sales as the brokerage commission for finding the TDR buyers. Due to the lower demand for TDRs after the recession, they could not reach potential buyers by themselves. While involvement of the brokers in TDR transactions might shorten the time required to complete a transaction, it notably increases the overall transaction costs of the TDR sellers.

5.2. Factors concerning the characteristics of the transactor

5.2.1. *Past experience*

All developers who were interviewed stated that they have been involved in a number of TDR transactions since the programmes were initiated. Therefore, they had previous experiences with TDR transactions before undertaking their most recent transaction. They noted that these past experiences reduce the time and effort they had to invest in each transaction. On the other hand, only three landowner interviewees had previous experiences with TDR programmes. These landowners highlighted that their past experiences limit information collection requirements for the TDR transaction, and consequently reduce transaction costs. All interviewed landowners noted that their current experience with TDR transactions would have a downward influence on time and effort of their future TDR transactions. Many of their TDR transactions have been undertaken with the involvement of intermediaries, who specialised in these programmes. These intermediaries provide buyers and sellers with advice on the TDR processes, based on their past experiences. Similarly, local authorities in all counties acknowledged that, through a 'learning by doing' effect, their past experiences help them to accomplish their tasks in a more efficient way. This attribute of TDR transaction can also be justified according to its low degree of knowledge specificity and transferability of institutional knowledge from one transaction to another, which we discussed earlier.

5.2.2. *Opportunism*

Uncertainty is the primary factor that facilitates opportunism in TDR transactions. Some interviewed landowners stated that because of the uncertainties over finding a buyer, developers and brokers sometimes show secretive and opportunistic behaviours. Reluctance by buyers to disclose TDR agreed sale prices is also mentioned by local authority respondents in Charles County. These opportunistic behaviours are mainly associated with withholding important market information from other parties involved. Some landowners also believe that some people in the counties have a better access to information and this information asymmetry increases the risk of opportunism. For instance, one of the landowners in Montgomery County pointed out that:

“The TDR market is very opaque... There are only really a pretty small number of developers and builders in the marketplace. So they almost function as an oligopolist. It's not a free market at all. Those are the people with the money. I would have a feeling that they do talk. But on the farm end of it, you're pretty much in the dark about it.”

This attribute of TDR transactions increases transaction costs for TDR sellers and local authorities through increasing their information collection time. On the other hand, TDR sellers could potentially be opportunistic in their transactions, by providing incomplete information to the parties involved. However, this opportunism has been overcome through administrative design requirements (i.e. property title report and land survey) for certifying TDRs. This potential for opportunism has increased the transaction costs of local authorities due to the administration costs and time needed to review and verify TDR applications. Moreover, there is a potential for speculators to purchase and hold TDRs, at their own financial risk, with the hope that they will become more valuable in future. However, it was not mentioned as big issue in any of the TDR case studies.

5.2.3. Trust between parties

Landowners in all counties acknowledged that they had confidence in the information and advice that the programme administrators and land-use attorneys provided to them. Social connectedness and past experiences of working with county officials have been identified as two major factors to have positive influences on trust building between the landowners and administrators. This confidence has decreased the transaction costs of landowners through decreasing the information collection time and effort. On the other hand, some developers expressed a general pessimism regarding the government and public policies. Nevertheless, since TDR transactions and negotiations have been completed between private parties, with minimal involvement of the county governments, this lack of confidence does not seem to have a considerable effect on transaction costs of developers. In other words, due to the market-based nature of the TDR transactions, developers' interactions with programme administrators have been minimal and limited to verifying and including purchased TDRs into the development projects and subdivisions. Moreover, involvement of intermediaries, such as land-use attorneys with experience of TDR transactions, increases confidence in the information shared between parties and reduces information collection activities.

5.2.4. Common preferences

While all interviewed landowners in the four counties believed that there is a need to protect farmlands in their counties, they mentioned financial motivations as their main reason for participating in the TDR programme. Only two landowners stated that land preservation was of equal importance for them in selling the TDRs of their property. Likewise, the main motivation for the developers in purchasing TDRs was to develop at a higher density than is otherwise allowed by the base zoning, and, therefore, to profit financially. Thus, apart from financial motivation, we did not

find evidence that common preferences have a considerable influence on the transaction costs of TDR programmes.

5.2.5. Social connectedness

Membership of communities of practice have had a considerable decreasing influence on the transaction costs of parties involved in TDR transactions. Among the interviewed landowners and developers, those who have been a member of different organisations and/or committees highlighted the importance of this influence in decreasing the time and effort needed for information collection activities. They found that these memberships raised their awareness regarding the policy options, in general, and the TDR programme, in particular. This social connectedness also contributed to trust building between the TDR buyers, sellers, and administrators. More importantly, it decreased the time and costs of finding a buyer for TDR sellers through developing their connections and networks. For example, one of the landowners in Calvert County pointed out that she found a buyer for the TDRs of her property, using the connections established at the Calvert County Farm Bureau.

5.3. Factors concerning the characteristics of the policy

5.3.1. Simplicity

The influence of the simplicity of policy design and administration on transaction costs was mentioned by TDR sellers, buyers, and programme administrators. Some landowners found the TDR administration process relatively simple and clear, whereas others stated that the process was complex. For TDR sellers, these complexities were mainly associated with the administration requirements and finding buyers for TDRs. Some difficulties, such as legal issues with property title reports and objections of mortgage lenders to sell TDRs, might arise in preparing TDR applications. Moreover, requiring a land survey for TDR applications has added to the difficulties, time, and complexities of TDR transactions in all counties, with the exception of St. Mary's County. In an attempt to simplify the institutional design and arrangement of their TDR programme, in 2006, St. Mary's County modified it by removing a land survey as a TDR administration requirement. Prior to these modifications, landowners who wanted to sell their TDRs had to prepare 'a very expensive' survey to determine the exact acreage of the property¹. One of the developers in St. Mary's County, who was a member of the taskforce reviewing the TDR programme in 2006, highlighted that simplifying the process was one of the main reasons for the policy modifications. He pointed out that:

"It [the TDR program] was so complicated and so cumbersome for people to lift them [TDRs] off their property. And the landowners were not interested in a too complicated and too expensive system. So, we tried to simplify the process of certifying and removing TDRs from property."

In all counties, except Charles County, the number of TDRs that can be lifted (i.e. created) from land in sending areas would be calculated only based on its acreage, which decreases the ambiguity and complexity of the programme. However, in Charles County, for land in sending areas to be eligible to participate in the TDR programme, it requires the achievement of certain size, soil, and location criteria. This extra layer of regulation increases transaction costs of the local authorities by increasing the time and effort that they have to put in assessing a TDR application. Similarly, it increases transaction costs of the landowners by increasing uncertainties, transaction time, and information collection costs. On the other hand, while developers found the development project processes highly complicated and difficult, they stated that the TDR process was relatively simple. The developers

1 . The cost of preparing a land survey is normally within the range of \$10,000-\$15,000, as of June 2016.

were faced with difficulties regarding the development requirements and restrictions, and the policy choices to increase densities. The influence of simplicity on the implementation of policy instruments, such as TDR programmes, is discussed in both transaction costs (Pannell et al., 2013) and TDR (Machemer and Kaplowitz, 2002) literature, by which they concluded that simplicity is an important aspect of any successful policy instrument.

5.3.2. Age of the policy

All the TDR case studies considered in this paper were designed and initiated a few decades ago. The age of the policy is also described by interviewees as an influencing factor on transaction costs of TDR programmes. It has had a downward impact on these costs in different ways. First, the age of the TDR programmes has raised public awareness and knowledge regarding the policy. One of the programme administrators in St. Mary's County stated that *"after more than 25 years of having this programme being administered, it's fairly well-known for everyone what the process is."* Second, by being actively utilised in the counties, the length of time the TDR programmes have been in place has increased the policy credibility and consistency, as well as the trust between parties involved. Third, ageing of the programmes has provided the local authorities with an opportunity to improve institutional design and arrangement of the policy. Based on the programme reviews and assessments, all counties have made some major changes in the programmes. One of the interviewees, who was involved in the design of the Calvert County TDR programme, believed that *"the programme has evolved very much over the years."* Similarly, one of the programme administrators in Charles County found *"the TDR programme very mature, since it's been around for a long time."* Finally, it has contributed to enhanced institutional knowledge on the part of the programme administrators. One of the programme administrators in St. Mary's County pointed out that *"every now and then some new issues may arise, and you would learn how to deal with them in future."* However, they highlighted that the institutional knowledge of the experienced programme administrators has to be transferred to the new administrators, otherwise, 'that knowledge would be lost.'

5.3.3. Precision of the policy

Precision of the policy design has also influenced transaction costs in the TDR programmes. This influence was mainly associated with the designation of sending and receiving areas. The TDR case studies adopted different strategies regarding sending and receiving areas, according to the political acceptability and different priorities of the counties. In the Montgomery County TDR programme, sending areas and receiving areas were precisely specified at the outset of the policy, whereby the process of reviewing TDR applications have become a straightforward effort for the programme administrators. Landowners and developers also appeared to have sufficient information regarding the location of these areas. The Calvert County TDR programme, on the other hand, was initially designed with a lower degree of precision regarding both sending and receiving areas, such that, there are areas which can be both TDR sending and receiving areas. Developing land using TDRs in Calvert County required a resolution of approval by the board of county commissioners. As one of the programme administrators pointed out, *"TDR applications had to be reviewed on a case by case, land by land, parcel by parcel basis, which were too cumbersome."* In Charles County, while area in the north of the county are designated as receiving areas, all areas outside of this development district can send TDRs, subject to meeting certain size, soil and location criteria. Therefore, the programme was designed with greater precision regarding the receiving areas, compared to sending areas. Unlike Charles County, the St. Mary's TDR programme designated specific sending areas (i.e. Rural Preservation District (RPD)), but the entire county is a receiving area. While designating more precise TDR sending and receiving areas might increase the transaction costs associated with policy design, it can decrease the transaction costs of policy implementation and administration. However,

greater precision of policy design is not always possible due to constraints imposed by political acceptability.

5.3.4. Policy approach

The policy approach has had a considerable influence on both the size and distribution of the transaction costs among the parties involved in TDR transactions. In order to understand the influence of the policy approach, TDR, as a market-based policy instrument, will be compared to its regulatory counterpart, PDR. While they more or less have the same policy objectives, they use different approaches to achieve their goals. From the perspective of the local authorities, the transaction costs of PDR transactions are greater than those of TDR. In a PDR transaction, local authorities are required to conduct substantial information collection activities, since they need to decide which properties' development rights should be purchased and at what price. A programme administrator in Montgomery County stated that he spends at least one month per year in information collection activities related to the PDR transactions. However, in a TDR transaction, it is left to the market (i.e. self-interest of the agents) to set the price and location of TDRs. Moreover, through using market signals and mechanisms, TDR programmes minimise the need for interactions between programme administrators and TDR sellers/buyers. Therefore, the time and effort that has to be invested in a transaction is less in TDR programmes. Similarly, from the developers' standpoint, the transaction costs of buying TDRs in a competitive market are fewer than other alternatives associated with gaining extra density, which are normally associated with lengthy and time-consuming regulatory processes. However, since the transaction costs of TDR sellers vary greatly from one transaction to another, such comparison cannot be made. As discussed before, the transaction costs of landowners depend highly on the market conditions, by which, with high demand for TDRs in an active market, these costs will be fewer. On the other hand, in a low-demand condition, in order to find a buyer, a landowner has to wait for long time and/or pay a brokerage fee. In the latter case, the transaction costs of participating in the TDR programmes can be greater than those of other regulatory alternatives, such as PDR and state/county preservation easements programmes.

5.3.5. Public involvement and participation

Participation of the stakeholders at the policy choice, design, and implementation has had both upward and downward influences on the transaction costs of the TDR programmes (Morrison et al., 2008, Mettepenningen et al., 2011, McCann, 2013). While public participation can increase transaction costs of the policy-choice and policy-design processes, it can reduce the transaction costs of the policy implementation (Coggan et al., 2010). Unlike Montgomery County, where the TDR programme has been established by the county authorities aiming to compensate the landowners affected by downzoning, in Calvert County, the TDR programme has been proposed by the farming community. In order to find alternative land-preservation tools for the county, a committee of the farmers was established in 1976. Several meetings with farmers and other stakeholders were undertaken. Finally, at a meeting with more than 65 people, the committee presented six preservation options and asked people to vote. 'Seventy-five percent of the hands said let's try the TDR'. According to one of the committee members, this bottom-up approach has not only built trust, but also raised public awareness and social connectedness among the stakeholders of the TDR programme. Moreover, it helped the local authorities in Calvert County face less resistance in implementing the TDR programme, in comparison to Montgomery TDR programme. In particular, this resistance has been related to large-scale downzoning and allowing extra densities in receiving areas. For example, in Calvert County, downzoning was not 'politically acceptable' at the outset of

the programme. In Montgomery County, on the other hand, the existing residents of some receiving areas refused to accept additional densities.

Another example of public involvement and participation at the TDR programmes has been in St. Mary's County, where a taskforce was established to review the county's TDR programme in 2005. In the first five years of its implementation, the programme had only been used once, and, by 2005, the TDR programme had preserved 1,800 acres of farmland, which was not perceived as satisfactory within the county. Therefore, the taskforce, including over 15 members representing different stakeholders from the development, agricultural, and environmental communities, as well as members from the St. Mary's County departments, was created to analyse the programme and make recommendations. The taskforce, which spent more than two years meetings and negotiating, proposed considerable changes to the TDR programme. Due to conflicts of interests, the process of policy change was time-consuming and associated with high transaction costs. However, this public involvement increased the credibility of the programme, raised public awareness, and built trust between the government and other stakeholders.

5.3.6. Policy credibility and consistency

The credibility and consistency of TDR programmes affects transaction costs through decreasing uncertainty, as well as building trust. While the consistency of TDR programmes provides stakeholders with higher level of certainty over TDR transactions, frequent rule changes increase uncertainties and information collection time. Also, frequent changes in programmes decrease the level of institutional knowledge transferability. The rules, regulations, and programmes have been modified for a number of reasons. First, in order to change the development pattern of the county, for example, Calvert County implemented two major reductions in the underlying zoning and comprehensively 'downzoned' the entire county in 1999 and 2003. Second, aiming to increase the efficacy of programme, Charles County, for example, amended the TDR ordinance in 1999 to require the use of TDRs for any increase in density and remove the other possible ways of rezoning land for a higher density without using TDRs. Third, inconsistency between the state and counties' rules and regulations brought about changes in the law, for example, the State of Maryland enacted the Sustainable Growth and Agricultural Preservation Act (also known as the Septics Law) in 2012, where the counties are required to adopt a tier map for future growth. Adoption of this tiering system has resulted in major changes in all TDR programmes in Maryland.

6. Summary and Conclusions

Land-use planners use a number of policy instruments to achieve their policy objectives. TDR programmes are a market-based approach that has been implemented in several jurisdictions in order to protect ecologically sensitive lands, to preserve farmlands, and to redirect future development potentials to more preferable areas. The evaluation of market-based instruments, such as TDR programmes, is particularly important because of their introduction as an alternative to traditional regulatory instruments, and the current argument that the implementation of these alternative instruments results in better policy outcomes, in terms of efficiency and equity. TDR programmes, theoretically, are assumed to be associated with lower transaction costs due to their market-based nature and less need for large informational requirements and information collection activities. High transaction costs have a negative influence on the success of any policy instruments through decreasing their efficiency. Most of the TDR evaluation research has mainly focused on identifying the factors affecting TDR success and there has been a lack of systematic analysis of transaction costs in TDR programmes and their potential effect on the success of these programmes. This article contributes to the literature by providing insights into an area that has received little attention, the role

of institutional design and arrangements in the implementation of TDR programmes, given that different institutional attributes may lead to different levels of transaction costs.

The transaction cost influencing factors are examined in three categories, namely, the characteristics of the transaction, the characteristics of the transactor, and the characteristics of the policy. The results of this study show that all categories, and their related factors, have influences on the transaction costs of TDR programmes, although the significance and distribution of these influences vary across the factors and parties involved. Moreover, there are considerable interrelations among the factors, in which some factors are connected and affect one another. Among the analysed factors, three factors of uncertainty, involvement of intermediaries, and simplicity had a particularly remarkable influence on transaction costs of TDR programmes. In a TDR transaction, the main uncertainties concern finding a buyer/seller for TDR, negotiating a TDR sale price, and when/how to participate in the programme. In terms of the involvement of intermediaries, while land-use attorneys have an essential role to play in any TDR transaction, the involvement of brokers appears to be associated with the level of uncertainties surrounding the TDR transactions. Through creating a more active and transparent TDR market, along with introducing a platform where buyers and sellers can easily find each other, transaction costs of TDR programmes could be decreased by reducing uncertainties and the need for intermediaries. Likewise, a simplified policy design and streamlined administration process also can have a considerable downward impact on transaction costs. The cases of Calvert and St. Mary's counties show that streamlining the administration process, removing unnecessary requirements, simplifying the policy instrument, and making it easy to understand, can decrease the transaction costs of TDR programmes. It is, however, important to note that transaction costs are not necessarily deadweight losses. While some of the costs involved in operating and participating in TDR programmes can be considered as deadweight losses that reduce the net social benefits of the policy instruments, some parts of such policy-related transaction costs are intended to avoid potential contractual hazards, as well as to ensure better policy outcomes. Therefore, the aspiration of planners and policy analysts should be to reduce transaction costs for a given policy outcome, if options exist, rather to minimise policy-related transaction costs *per se*.

Evidence supporting the presence of opportunism and rent-seeking behaviour was found, particularly, among the TDR buyers across the TDR case studies. These opportunistic behaviours of TDR buyers were mainly in the form of taking advantage of their privileged access to information and unwillingness to share their knowledge and experiences. Therefore, the results of this study were consistent with the Alexander (2001)'s argument on the higher complexity of buyers' behaviour, in comparison to those of sellers. However, trust and confidence in information shared between parties can moderate opportunism and reduce transaction costs through reducing information collection time and effort. Trust between involved parties, itself, can be built and promoted by two factors of past experiences and social connectedness. TDR programmes are not generally associated with high level of asset specificity. Nonetheless, among the different types of asset specificities discussed in this paper, the influence of site specificity on transaction costs may be of importance. This can be moderated by the policy design, through designating sufficient receiving areas and, more importantly, making sure sending and receiving areas are in balance.

Despite many similarities among the TDR case studies, their different institutional design and arrangements resulted in different transaction cost levels and distributions. The institutional attributes of the counties may vary in numerous ways, such as: whether the use of TDR is by-right or requires additional hearings and approvals; the mechanisms to be used to stabilise TDR prices (i.e. PDR or Fee-in-Lieu programmes); the provision of information for potential buyers/sellers; the administration requirements regarding the eligibility of lands to participate in the programmes; and, the extent to which the stakeholders are involved in the policy design and implementation. The results of this study suggest that, if the use of purchased TDRs is by-right, if TDR prices are stable and predictable, and if sufficient information is publicly available and equally distributed, parties involved in TDR

transactions would incur fewer transaction costs. Therefore, although the market-based nature of the TDR programmes limits the influence that the regulatory authorities can have on transaction costs, they still play (and need to play) a key role in dealing with transaction costs through designing better institutional arrangements and promoting greater certainty within markets. While there has been an increasing number of studies considering institutional roles in public policy and economics over the last few decades, more work will need to be carried out to determine how, and which, institutional designs and arrangements lead to better policy outcomes.

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References

- AKEN, J., ECKERT, J., FOX, N. & SWENSON, S. 2008. Transfer of Development Rights (TDR) in Washington State: Overview, Benefits, and Challenges. Seattle: Cascade Land Conservancy.
- ALEXANDER, E. R. 2001. A Transaction-Cost Theory of Land Use Planning and Development Control: Towards the Institutional Analysis of Public Planning. *The Town Planning Review*, 72, 45-75.
- AMERICAN FARMLAND TRUST 2008. Fact Sheet: Transfer of Development Rights. Northampton, MA: Farmland Information Center.
- BARZEL, Y. 1985. Transaction Costs: Are They Just Costs? *Zeitschrift für die gesamte Staatswissenschaft / Journal of Institutional and Theoretical Economics*, 141, 4-16.
- BRUENING, A. D. 2008. The TDR Siren Song: The Problems with Transferable Development Rights Programs and How to Fix Them. *Journal of Land Use & Environmental Law*, 23, 423.
- CHAN, E. H. W. & HOU, J. 2015. Developing a framework to appraise the critical success factors of transfer development rights (TDRs) for built heritage conservation. *Habitat International*, 46, 35-43.
- CLINCH, J. P. & O'NEILL, E. 2010. Assessing the Relative Merits of Development Charges and Transferable Development Rights in an Uncertain World. *Urban Studies*, 47, 891-911.
- CLINCH, J. P., O'NEILL, E. & RUSSELL, P. 2008. 'Pure' and 'impure' Coasian solutions in planning. *TPR: Town Planning Review*, 79, 623-649.
- COASE, R. H. 1937. The Nature of the Firm. *Economica*, 4, 386-405.
- COASE, R. H. 1960. The Problem of Social Cost. *Journal of Law and Economics*, 3, 1-44.
- COGGAN, A., BUITELAAR, E., WHITTEN, S. & BENNETT, J. 2013. Factors That Influence Transaction Costs in Development Offsets: Who Bears What And Why? *Ecological Economics*, 88, 222-231.
- COGGAN, A., WHITTEN, S. M. & BENNETT, J. 2010. Influences of Transaction Costs in Environmental Policy. *Ecological Economics*, 69, 1777-1784.
- DEHART, H. G. & ETGEN, R. 2007. The Feasibility of Successful TDR Programs for Maryland's Eastern Shore. Maryland Center for Agro-Ecology, Inc.
- DEMSETZ, H. 1969. Information and Efficiency: Another Viewpoint. *Journal of Law and Economics*, 12, 1-22.

- DUCOS, G. & DUPRAZ, P. The asset specificity issue in the private provision of environmental services: Evidence from agri-environmental contracts. 8th International Meeting of the Association for Public Economic Theory, 2007 Vanderbilt University, Nashville.
- DUCOS, G., DUPRAZ, P. & BONNIEUX, F. 2009. Agri-Environment Contract Adoption Under Fixed and Variable Compliance Costs. *Journal of Environmental Planning and Management*, 52, 669-687.
- FALCONER, K. & SAUNDERS, C. 2002. Transaction Costs for SSSIs and Policy Design. *Land Use Policy*, 19, 157-166.
- FANG, F., EASTER, K. W. & BREZONIK, P. L. 2005. Point-nonpoint source water quality trading: A case study in the Minnesota River basin. *JAWRA Journal of the American Water Resources Association*, 41, 645-657.
- FISCHEL, W. A. 2000. Zoning and land use regulation. *Encyclopedia of Law and Economics*, 2, 403-423.
- FURUBOTN, E. G. & RICHTER, R. 1991. *The New Institutional Economics: A Collection of Articles From the Journal of Institutional and Theoretical Economics*, Mohr Siebeck.
- GALLETTA, A. 2013. *Mastering the semi-structured interview and beyond: From research design to analysis and publication*, NYU Press.
- GORDON, R. L. 1994. *Regulation and Economic analysis: a critique over two centuries*, Springer Science & Business Media.
- GUEST, G., BUNCE, A. & JOHNSON, L. 2006. How Many Interviews Are Enough? *Field Methods*, 18, 59-82.
- HEIKKILA, E. J. 2000. *The Economics of Planning*, Rutgers Univ Center for Urban.
- HEIMLICH, R. & ANDERSON, W. 2001. Development at the Urban Fringe and Beyond: Impacts on Agriculture and Rural Land. Agricultural Economic Report No. AER-803.
- JANSSEN-JANSEN, L., SPAANS, M. & VAN DER VEEN, M. 2008. *New Instruments in Spatial Planning: An International Perspective on Non-Financial Compensation*, Amsterdam, IOS Press.
- JANSSEN-JANSEN, L. B. 2008. Space for Space, a transferable development rights initiative for changing the Dutch landscape. *Landscape and Urban Planning*, 87, 192-200.
- KAPLOWITZ, M. D., MACHEMER, P. & PRUETZ, R. 2008. Planners' experiences in managing growth using transferable development rights (TDR) in the United States. *Land Use Policy*, 25, 378-387.
- KLAES, M. 2008. History of Transaction Costs. In: DURLAUF, S. N. & BLUME, L. E. (eds.) *The New Palgrave Dictionary of Economics*. 2 ed. London: Palgrave Macmillan.
- KNOWLER, D. & BRADSHAW, B. 2007. Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy*, 32, 25-48.
- KUPERAN, K., ABDULLAH, N. M. R., POMEROY, R. S., GENIO, E. L. & SALAMANCA, A. M. 2008. Measuring Transaction Costs of Fisheries Co-Management. *Coastal Management*, 36, 225-240.
- MACHEMER, P. L. & KAPLOWITZ, M. D. 2002. A Framework for Evaluating Transferable Development Rights Programmes. *Journal of Environmental Planning and Management*, 45, 773-795.
- MARSHALL, C. & ROSSMAN, G. B. 2006. *Designing Qualitative Research*, Thousands Oaks, Sage Publication.
- MARSHALL, G. R. 2013. Transaction Costs, Collective Action and Adaptation in Managing Complex Social-Ecological Systems. *Ecological Economics*, 88, 185-194.
- MARYLAND DEPARTMENT OF PLANNING 2016. Transfer of Development Rights (TDR) Committee Report.
- MAY, T. 2011. *Social research*, McGraw-Hill Education.
- MCCANN, L. 2013. Transaction Costs and Environmental Policy Design. *Ecological Economics*, 88, 253-262.
- MCCANN, L., COLBY, B., EASTER, K. W., KASTERINE, A. & KUPERAN, K. V. 2005. Transaction Cost Measurement for Evaluating Environmental Policies. *Ecological Economics*, 52, 527-542.

- MCCANN, L. & EASTER, K. W. 2000. Estimates of Public Sector Transaction Costs in NRCS Programs. *Journal of Agricultural and Applied Economics*, 32, 555-564.
- MCCONNELL, V., WALLS, M. & KELLY, F. 2007. Markets for Preserving Farmland in Maryland; Making TDR Programs Work Better. Report Prepared for the Maryland Center for Agroecology.
- MESSER, K. D. 2007. Transferable development rights programs: An economic framework for success. *Journal of Conservation Planning*, 3, 47 — 56.
- METTEPENNINGEN, E., BECKMANN, V. & EGGERS, J. 2011. Public Transaction Costs of Agri-Environmental Schemes and Their Determinants—Analysing Stakeholders' Involvement and Perceptions. *Ecological Economics*, 70, 641-650.
- MICELLI, E. 2002. Development Rights Markets to Manage Urban Plans in Italy. *Urban Studies*, 39, 141-154.
- MILES, M. B. & HUBERMAN, A. M. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*, Newbury Park, CA, Sage.
- MILLS, D. E. 1989. Is Zoning a Negative-Sum Game? *Land Economics*, 65, 1-12.
- MORRISON, M., DURANTE, J., KREIG, J. & WARD, J. 2008. Encouraging participation in market based instruments and incentive programs. *Final Report Prepared for Land and Water Australia*.
- NELSON, A. C., PRUETZ, R. & WOODRUFF, D. 2011. *The TDR Handbook: Designing and Implementing Transfer of Development Rights Programs*, Washington, Island Press.
- NELSON, R. H. 1977. *Zoning and Property Rights: An Analysis of the American System of Land-Use Regulation*, MIT Press.
- NILSSON, F. O. L. 2009. Transaction Costs and Agri-Environmental Policy Measures: Are Preferences Influencing Policy Implementation? *Journal of Environmental Planning and Management*, 52, 757-775.
- NILSSON, M. & SUNDQVIST, T. 2007. Using The Market at a Cost: How the Introduction of Green Certificates in Sweden Led to Market Inefficiencies. *Utilities Policy*, 15, 49-59.
- NORTH, D. C. 1990. *Institutions, Institutional Change and Economic Performance*, Cambridge, Cambridge University Press.
- OFEI-MENSAH, A. & BENNETT, J. 2013. Transaction Costs of Alternative Greenhouse Gas Policies in the Australian Transport Energy Sector. *Ecological Economics*, 88, 214-221.
- PANNELL, D. J., ROBERTS, A. M., PARK, G. & ALEXANDER, J. 2013. Improving Environmental Decisions: A Transaction-Costs Story. *Ecological Economics*, 88, 244-252.
- POGODZINSKI, J. M. & SASS, T. R. 1990. The Economic Theory of Zoning: A Critical Review. *Land Economics*, 66, 294-314.
- PRUETZ, R. 2016. *TDR Updates* [Online]. <http://smartpreservation.net/tdr-updates/>. [Accessed 2016].
- PRUETZ, R. & PRUETZ, E. 2007. Transfer of Development Rights Turns 40. *Planning & Environmental Law*, 59, 3-11.
- PRUETZ, R. & STANDRIDGE, N. 2008. What Makes Transfer of Development Rights Work?: Success Factors From Research and Practice. *Journal of the American Planning Association*, 75, 78-87.
- RØRSTAD, P. K., VATN, A. & KVAKKESTAD, V. 2007. Why Do Transaction Costs of Agricultural Policies Vary? *Agricultural Economics*, 36, 1-11.
- RYDIN, Y. 1993. *The British Planning System*, London, Macmillan.
- RYDIN, Y. 1998. Land use planning and environmental capacity: reassessing the use of regulatory policy tools to achieve sustainable development. *Journal of Environmental Planning and Management*, 41, 749-765.
- SARANTAKOS, S. 2012. *Social Research*, Palgrave Macmillan.
- SHAHAB, S. & AZIZI, M. M. 2013. Application of Transferable Development Rights (TDR) in Enhancing Effectiveness of Urban Development Plans, Case Study: Kashan City. *Journal of Motaleate Shahri (in Persian)*, 1, 41-54.
- SHAHAB, S., CLINCH, J. P. & O'NEILL, E. 2017a. Impact-based Planning Evaluation: Advancing Normative Criteria for Policy Analysis. *Environment and Planning B: Urban Analytics and City Science*, Forthcoming.

- SHAHAB, S., CLINCH, J. P. & O'NEILL, E. 2017b. Timing and Distributional Aspects of Transaction Costs in Transferable Development Rights Programs. *Habitat International*, Forthcoming.
- SHAHAB, S., CLINCH, J. P. & O'NEILL, E. 2018a. Accounting for Transaction Costs in Planning Policy Evaluation. *Land Use Policy*, 70, 263–272.
- SHAHAB, S., CLINCH, J. P. & O'NEILL, E. 2018b. Estimates of Transaction Costs in Transferable Development Rights Programs. *Journal of the American Planning Association*, 84.
- STAVINS, R. N. 1995. Transaction Costs and Tradeable Permits. *Journal of Environmental Economics and Management*, 29, 133-148.
- THE MARYLAND STATE DATA CENTER 2015. Maryland 2010 Urban and Rural Population by Jurisdiction. Baltimore, MD: Maryland Department of Planning.
- THOMAS, R. & BERTOLINI, L. 2014. Beyond the Case Study Dilemma in Urban Planning: Using a Meta-matrix to Distil Critical Success Factors in Transit-Oriented Development. *Urban Policy and Research*, 32, 219-237.
- THOMPSON, S. K. 2012. *Sampling*, New York, Wiley.
- TRIPP, J. T. B. & DUDEK, D. J. 1989. Institutional Guidelines for Designing Successful Transferable Rights Programs *Yale journal on regulation*, 6.
- WANG, H., TAO, R., WANG, L. & SU, F. 2010. Farmland preservation and land development rights trading in Zhejiang, China. *Habitat International*, 34, 454-463.
- WEBSTER, C. J. & LAI, L. W.-C. 2003. *Property rights, planning and markets: managing spontaneous cities*, Edward Edgar.
- WILLIAMSON, O. E. 1975. *Markets and Hierarchies, Analysis and Antitrust Implications: A Study in the Economics of Internal Organization*, New York, The Free Press.
- WILLIAMSON, O. E. 1981. The Economics of Organization: The Transaction Cost Approach. *American journal of sociology*, 548-577.
- WILLIAMSON, O. E. 1985. *The Economic Institutions of Capitalism*, New York, Free Press.
- WILLIAMSON, O. E. 1996. *The Mechanisms of Governance*, Oxford University Press.
- WILLIAMSON, O. E. 1998. Transaction Cost Economics: How It Works; Where It is Headed. *De Economist*, 146, 23-58.
- WILLIAMSON, O. E. 2000. The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature*, 38, 595-613.
- YIN, R. K. 2013. *Case Study Research: Design and Methods*, London, SAGE Publications.