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AUTHORS
Michael Wolff

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Market Price-Based Transfer Price Systems. Empirical Evidence for Effectiveness and Preconditions
Michael Wolff

Abstract
Market price-based transfer prices for internally traded products are often used as a value measure for the decentralised management of internal production processes. The purpose of their use is the establishment of internal markets to increase efficiency and motivation in internal production, whereby market price-based transfer prices imply a particularly positive effect. This connection has to date not been proven adequately in empirical terms using specific production processes. The current paper addresses this gap and shows on the basis of a study of individual production processes in 73 companies that market price-based transfer price systems as opposed to those unrelated to the market price have a much stronger efficiency and motivation effect. These effects are evaluated indirectly by subjective judgements of the involved managers due to a lack of measurable indicators. However, the use of market price-based transfer prices is connected to conditions regarding the existence of a substitute with a transparent, observable market price and a similar strategic importance of the business departments. The transaction basis and freedom tend to be designed to be consistent with each other.

Key words: Transfer prices, price-oriented control, coordination, internal markets, organisational control.
JEL Classification: L22, M21, D23.

1. Introduction
Within organisations, market price-based transfer prices are used to internally institutionalise structures that imitate markets. This aims to increase the efficiency of the internal processes through improved coordination and motivation of the corporate departments involved as these departments are increasingly coordinated decentrally as independent units. The design of internal market-price relationships goes far beyond the correct depiction of business processes. Their assessment must also take place from an organisational perspective, which is covered by this paper. As a result tax issues are neglected.

Transfer prices are categorised by their transaction basis into market price-based, negotiated, and cost-based transfer prices. Market prices orientate themselves to the prices of similar products on an external market, negotiated transfer prices are the result of a negotiation process between the internal corporate departments involved in the production process and are therefore also market price-based. In contrast, cost-based transfer prices are derived from the production costs of the intermediate product. In addition to this transaction basis for a transfer price system, the transaction freedom is relevant. The transaction freedom stipulates whether there is an internal compulsion to deliver or purchase by the selling or purchasing department and whether the intermediate product can be supplied from or sold to an external market.

This paper investigates the use of transfer price systems in terms of the basis and freedom of the transaction as well as the implications of this use in terms of the motivation and efficiency effect. To do so, a range of hypotheses was tested using a survey including a questionnaire on specific internal trading transactions in 73 German companies using distribution-free, non-parametric statistical methods. The focus on individual internal trading transactions is an important differentiation characteristic compared with other studies.

* Karlsruhe University, Institute of Applied Economics and Management, Germany.


66
Section 2 firstly gives a summary of the relevant literature and then derives hypotheses based on this for the use of the transaction basis and freedom in transfer price systems and their effect on motivation and efficiency, whereas these effects will be evaluated from an internal perspective. Section 3 explains the procedure of the study and tests ten hypotheses using distribution-free statistical methods. The discussion and interpretation of the results take place in Section 4; finally Section 5 draws conclusions.

2. Overview of the relevant literature and derivation of the hypotheses

2.1. Summary of the literature on the results of empirical studies

Whilst the model-analysis discussion moves the characteristics of individual internal trade transactions to the fore, such a differentiated approach is not usually seen in empirical work: numerous authors investigate rules for designing transfer price systems on a company level1. This means that, especially if there are heterogeneous internal trading transactions, hardly any statements can be made on the interaction between the situation, rules and effects.

The investigation of internal transfer price systems is classified in four categories: qualitative investigations are in particular characterised by the comprehensive work of Eccles (1985) and are based on detailed discussions of company-specific transfer price problems with the managers involved2. Experimental approaches are mainly concentrated on the negotiation behaviour of those tested under laboratory conditions. Here it is usually individual aspects of individual behaviour that is the focus3. In contrast, descriptive approaches concentrate on recording the characteristics of the transfer price systems used4. Studies that check hypotheses finally also attempt to produce interactions between external determinants, transfer price system rules and their effects5.

Numerous studies on the use of market price-based transfer prices come to the conclusion that around half of the transfer prices used are market price-based in terms of their transaction basis. In a long-term study of 247 US companies, Tang (1993, 25) determined that market prices are used in 37%, negotiated transfer prices in 17% and cost-based transfer prices in 46% of cases. A study by Vancil (1978, 114) reached similar conclusions in a study of 239 US companies (market prices: 31%; negotiated transfer prices: 22%; cost-based transfer prices: 47%). Another common feature is the statement that market prices are most frequently used as a transaction basis when there is an external market price6. In addition, Tang (1993, 25) ascertains as part of a long-term comparison between 1977 and 1990 that the importance of market price-based transfer prices had increased over time. The question as to whether negotiated transfer prices should be viewed as a separate category of transfer prices is assessed differently7.

On the basis of his qualitative study, Eccles comes to the conclusion that in particular the corporate strategy, the administrative process when setting the transfer price and the adaptation of the system to the situation must be considered. Eccles8 (1985, 1) design recommendations relate in particular to a consistent relationship to the corporate strategy, especially to vertical integration. Similar recommendations are also found in Larson (1974), Granick (1975), Mostafa et al. (1984) and Kreuter (1999)9.

Statements on the transaction freedom (compulsion to buy/sell and the opportunity for external purchases and sales) are found more rarely, and the survey of transfer prices used leads to no

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1 This is the case in Finnie (1978); Wu/Sharp (1979); Mostafa et al. (1984); Borkowski (1990).
2 Larson (1974); Granick (1975); Eccles (1985); Kreuter (1999).
3 Ravenscroft et al. (1993); Chan (1998); Ghosh (2000).
4 Mautz (1968); Rook (1971); Emmanuel (1977); Finnie (1978); Atkinson (1987); Weilenmann (1989); Scherz (1998).
6 Wu/Sharp (1979) and Borkowski (1990).
8 Mostafa et al. (1984), Larson (1974); Granick (1975); Kreuter (1999).
common scheme. *Rook* (1971) and *Emmanuel* (1977, 57), for example, study access to an external market and come to the conclusion that the department supplying the product tends to have greater transaction freedom than the purchasing department, i.e. the intermediate product can more often be sold on the external market than purchased. *Finnie* (1978) and *Lambert* (1979) also study sub-aspects of the transaction freedom without a clear result.

*Vancil* (1978), *Borkowski* (1990) and *Tang* (1993) study interactions between the transfer price system and organisational properties such as size, diversification strategy and level of centralisation. *Wu/Sharp* (1979) identify general rules depending on the digitally viewed availability of the market price, and *Lambert* (1979) claims a significantly negative relationship between the conflict level in the corporate departments and the use of the transfer price system.

Overall, it is clear that none of these empirical studies focuses on individual internal trading transactions and that none concentrates on the effects of the transfer price system. There is also no systematic analysis of the transaction basis in terms of all four design parameters, delivery compulsion and opportunity for external sale and purchase.

### 2.2. Derivation of hypotheses for market price-based transfer price systems

**Hypotheses on the effectiveness of market price-based transfer price systems**

The starting point for considering effectiveness is the objective already identified by *Schmalenbach* (1908/09) to promote internal entrepreneurial action in a market price-based negotiation framework through the use of internal transfer price systems. A central criterion is therefore the motivation effect of the internal transfer price system. Positive motivation effects are to be achieved by decentralising the decision-making rights and the associated strengthening of their independence. Secondly the stipulation of department-specific profits using the transfer prices enables department-specific remuneration, which is usually also a positive incentive to increase performance. Self-actualisation and responsibility are other important motivation factors.

In addition to the motivation effect, the efficiency effect of a transfer price system is key. Efficiency is here measured from an internal perspective in terms of a better relation between input and output. An increase in efficiency can be achieved firstly by increasing the internal efficiency pressure and secondly by a potential improvement in short and medium term allocation decisions. The efficiency pressure for the producing corporate departments is created by using the transfer prices as a measure for comparing internal production. Hence, there is pressure on both the supplying and purchasing department to produce or process the intermediate product at market price-based or negotiated transfer prices. Also in terms of the allocation effect, transfer price systems can have either a better or worse efficiency effect in the short term, e.g. with regard to the distribution of production capacities on the products, and also long term, e.g. with regard to the investment to expand capacity. This paper does not address the issue of tax efficiency.

The supraordinate thesis of this paper is that market price-based transfer price systems are better suited in terms of their motivation and efficiency effect than those unrelated to the market price as long as the conditions for their use are met.

The use of cost-based transfer prices as the basis for the transaction is difficult to argue and implement when market alternatives exist, and stronger conflicts can be expected between the departments involved. The perceived fairness of the internal transfer price system is promoted by a design that is market price-based with valuation methods that are as objective as possible. Negotiated transfer prices are called market price-based because they establish an approximisation of the market prices as the result of negotiations between the departments that are similar to a market.

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1 As a restriction it must be stated that *Emmanuel* only analyses market price-based transfer prices in detail.
3 *Herzberg* (1968).
From a motivation perspective they have the advantage that high acceptance is usually created as part of the negotiations. This leads us to the first hypothesis:

\[ H1a: \text{Transfer price systems with a market price-based transaction basis are assessed better than cost-based transfer prices in terms of their motivation effect.} \]

When using a market price as a transaction basis there is a direct, external comparison factor for the transaction relationship. This implies an effect that fundamentally increases efficiency. A similar effect is to be expected when institutionalising negotiated transfer prices if the departments have at least similar negotiating power. This leads us to the second hypothesis:

\[ H1b: \text{Transfer price systems with a market price-based transaction basis are assessed better than cost-based transfer prices in terms of their efficiency effect.} \]

However, the positive efficiency and motivation effects can only be achieved to a greater extent if the transaction freedom is as unrestricted as possible. In particular, the introduction of a delivery or purchase compulsion reduces the room for negotiation open to the departments. Waiving these compulsions therefore promotes motivation:

\[ H2a: \text{A lack of delivery or purchase compulsion is seen as positive for the motivation effect.} \]

From an efficiency perspective, transaction basis and transaction freedom rules that are designed to be as close to the market as possible should be encouraged: only the actual access to external sources through the corresponding organisation of transaction freedom permits the full exploitation of potential efficiency:

\[ H2b: \text{A lack of delivery or purchase compulsion is seen as positive for the efficiency effect.} \]

Hypotheses on the use of market price-based transfer price types

Hypotheses H1a and H1b appear initially to imply that the transaction basis should generally be close to the market price. However, this requires the availability of a similar substitute for the intermediate product on an external market and adequate price transparency on this market as only then are appropriately interpretable market prices available as a reference. In this case the market price for the substitute is a suitable value measure for the intermediate product and can therefore be used as a measure for the internal transaction. Otherwise cost-based transfer prices must be used as a transaction basis:

\[ H3a: \text{The use of a market price-based transaction basis is accompanied by better availability of external suppliers.} \]

\[ H3b: \text{The use of a market price-based transaction basis is accompanied by better transparency of prices on the external intermediate product market.} \]

The use of internal transfer price systems always implies that the departments are on an equal footing that is similar to a market. Restrictions in this principle may however occur if the two departments have an asymmetric distribution of resources and skills. Such asymmetry may have clear implications for the structure and use of competitive advantages from the perspective of the entire company. A management function that is essential from the perspective of the whole company for the strategically superior department can be opposed appropriately by an asymmetric design of the transaction freedom. The key to this is finally the question as to whether it is advantageous from the perspective of the company as a whole to give the strategically more important department a further-reaching authorisation to access the resources of the other department.

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1 In practice the use of market prices often raises additional operating adjustment problems, as for example the list prices must be changed to account for discounts, bonuses, etc.

Such clear asymmetry occurs if, for example, the supplying department must only produce a particular advance product according to the purchasing department’s rules, or vice versa the purchasing department fulfills a subordinate sales function whilst the selling department produces a unique product. A department’s clearly superior relative strategic importance should reflect a management role with a corresponding restriction in the interaction with the other department that is similar to a free market – both for delivery and purchasing compulsion and for access to the market (one-sided external purchase or sale):

\[ H 4a: \text{Differences in the relative strategic importance of the departments are accompanied by asymmetric management of the delivery/purchase compulsion.} \]

\[ H 4b: \text{Differences in the relative, strategic importance are accompanied by asymmetric market access (one-sided external purchase or sale).} \]

A market price-based transfer price in particular provides a realistic, external comparison, if the departments are also given freedom to act that is correspondingly similar to the market. If vice versa a delivery compulsion is introduced, the delivering department can no longer act completely in line with the efficiency requirements of the external market that are reflected in the market price. It may then be obliged to produce an uneconomic quantity of the intermediate product. In this case there can be no positive efficiency or motivation effect. Similar implications result for other restrictions in the symmetry of the transaction freedom. If the purchasing department can buy the intermediate product on the external market whilst the supplying department can not sell it on the external market, the purchasing department is in a much better negotiating position and can exploit this in the negotiation process. In addition, negotiations on setting the specific level of the transfer price can only be sufficient if both the price and quantity are freely negotiable.

The selection of the transaction basis and freedom design parameters should therefore be coherent, i.e., be consistent in organisational theory terms. Otherwise a contradiction to the system design could occur:

\[ H 5a: \text{A market price-based transaction basis is accompanied by the lack of delivery and purchase compulsion.} \]

\[ H 5b: \text{A market price-based transaction basis occurs together with free, external sales and purchases.} \]

3. Empirical study of the hypotheses

3.1. Structure and implementation of this study

A key requirement of the empirical study of the hypotheses is the necessity to receive specific statements on the design of a concrete internal trading transaction and not for example on designing rules within the entire company. For this reason it was necessary to implement the survey with such employees in profit centres who are employed in cross-company functions and have detailed knowledge about internal production. This required a great effort to identify suitable contacts by telephone. In this way it was possible to secure an acceptable sample scope but only on the basis of targeted addressing. This must be considered when interpreting the results.

The total return was 73 complete questionnaires on individual production relationships from various German companies. The even distribution of company size and industries represented is shown in Table 1 for the companies questioned. With regard to the transaction basis used in the sample, the frequencies of the US studies were approximately confirmed: there were market prices in 33%, negotiated prices in 21% and cost-based transfer prices in 46% of the cases.

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Table 1

Sample by company size and industry represented

<table>
<thead>
<tr>
<th>Company size (in 000s of employees)</th>
<th>Percentage of sample</th>
<th>Industry</th>
<th>Percentage of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5</td>
<td>38%</td>
<td>Other (1% each)</td>
<td>21%</td>
</tr>
<tr>
<td>5 – 20</td>
<td>14%</td>
<td>Chemical/pharmaceutical</td>
<td>19%</td>
</tr>
<tr>
<td>20 – 50</td>
<td>21%</td>
<td>Utility/energy</td>
<td>14%</td>
</tr>
<tr>
<td>50 – 100</td>
<td>12%</td>
<td>Automobile; transport, media, electrical</td>
<td>7% each</td>
</tr>
<tr>
<td>&gt; 100</td>
<td>15%</td>
<td>Mechanical engineering; IT/telecommunications</td>
<td>5% each</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steel; food</td>
<td>4% each</td>
</tr>
</tbody>
</table>

The survey was undertaken using questionnaires with a five-point grade. To test the hypotheses ten factors had to be measured, of which eight could be queried directly: the transaction basis, availability of an external supplier, transparency of the prices on the market, existence of delivery compulsion, existence of purchase compulsion, prohibition on external purchases, prohibition on external sales and the relative strategic importance of the departments. The motivation and efficiency effects cannot be measured directly because of the lack of appropriate indicators. Therefore these two effectiveness aspects were queried with three or two separate indicators: the motivation effect construct was queried as a synthetic variable from the “perceived fairness”, “self-responsibility” and “perceived motivation effect” indicators, the efficiency effect from the two “mutual efficiency pressure” and “implementation of cost reductions” indicators.

The quality and reliability of the constructs were checked using the item-to-total correlation and Cronbach’s alpha. The results are shown in Table 2. The table shows that the values of all constructs are above the minimum thresholds required. Therefore the “motivation effect” and “efficiency effect” synthetic variables can be used as constructs.

Table 2

Constructs and synthetic variables

<table>
<thead>
<tr>
<th>Construct/Item</th>
<th>Item-to-total correlation</th>
<th>Cronbach’s Alpha without relevant item</th>
<th>Cronbach’s Alpha total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation effect</td>
<td>--</td>
<td>--</td>
<td>0,772</td>
</tr>
<tr>
<td>Fairness</td>
<td>0,490</td>
<td>0,811</td>
<td>--</td>
</tr>
<tr>
<td>Self-responsibility</td>
<td>0,677</td>
<td>0,616</td>
<td>--</td>
</tr>
<tr>
<td>Perceived motivation</td>
<td>0,667</td>
<td>0,623</td>
<td>--</td>
</tr>
<tr>
<td>Efficiency effect</td>
<td>--</td>
<td>--</td>
<td>0,803</td>
</tr>
<tr>
<td>Increased efficiency pressure</td>
<td>0,674</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Implementation of lower costs</td>
<td>0,674</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

1 In addition to reliability, the objectivity and validity of the constructs are also required. Objectivity is ensured by the fact that, apart from telephone contact and sending the questionnaire, there was no further contact. A pre-test and the use of the approaches documented in the literature ensured for the greatest possible part to validate the perspective. On reliability see Nunally (1978); Churchill (1979); Homburg/Gierig (1996). For the item-to-total correlation there is a threshold value of 0.5 for Hair et al. (1998, 118) and Bearden/Netemeyer (1999, 4). The value of 0.49 for “fairness” is seen as still acceptable for this.
3.2. Results of the hypothesis study

When testing the hypothesis for statistical significance, distribution-free methods were used throughout, since a normal distribution assumption for the indicators had to be rejected in some cases after carrying out the Kolmogorov-Smirnov test. Therefore the Wilcoxon rank sum test and Spearman rank correlation analysis were used for testing the average values between the classes and the correlations respectively, as these methods do not require any distribution assumptions. For hypotheses 1, 3 and 5, the Wilcoxon rank sum test was used, which results in identical results to the Mann-Whitney U-test. Hypotheses 2 and 4 were checked on the basis of a Spearman rank correlation analysis. The significance values 0.01 (highly significant), 0.05 (significant) and 0.1 (simply significant) were used.

Table 3 lists the p-values and significances for hypotheses 1, 3 and 5 as well as the average values of the group for orientation purposes, not the values of the test statistics themselves. For hypotheses 2 and 4 the Spearman rank correlation coefficient is stated. The level of asymmetry in the delivery/purchase compulsion and for market access (external purchase vs. sale) as well as variances in the relative strategic importance of the departments were recorded as the difference in the corresponding indicators. The correlation coefficient refers to these differences respectively. Of the 14 tested individual hypotheses, in total 2 are not significant, 3 marginally significant, 4 significant and 5 highly significant as defined above.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Mean market based TA basis</th>
<th>Mean non-market based TA basis</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a: Motivation effect</td>
<td>3.55</td>
<td>3.05</td>
<td>0.003</td>
<td>highly significant</td>
</tr>
<tr>
<td>H1b: Efficiency effect</td>
<td>3.51</td>
<td>3.10</td>
<td>0.035</td>
<td>significant</td>
</tr>
<tr>
<td>H3a: Availability difficulties for external suppliers</td>
<td>1.63</td>
<td>2.34</td>
<td>0.001</td>
<td>highly significant</td>
</tr>
<tr>
<td>H3b: Transparency of market prices</td>
<td>3.71</td>
<td>2.71</td>
<td>0.001</td>
<td>highly significant</td>
</tr>
<tr>
<td>H5a1: Level of delivery compulsion</td>
<td>3.87</td>
<td>4.20</td>
<td>0.063</td>
<td>simply significant</td>
</tr>
<tr>
<td>H5a2: Level of purchase compulsion</td>
<td>3.47</td>
<td>3.80</td>
<td>0.153</td>
<td>not significant</td>
</tr>
<tr>
<td>H5b1: Free external sales possible</td>
<td>3.86</td>
<td>3.09</td>
<td>0.022</td>
<td>significant</td>
</tr>
<tr>
<td>H5b2: Free external purchase possible</td>
<td>2.74</td>
<td>2.17</td>
<td>0.007</td>
<td>highly significant</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Rank correlation r&lt;sub&gt;SP&lt;/sub&gt;</th>
<th>p-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2a1: Motivation effect for delivery compulsion</td>
<td>-0.197</td>
<td>0.047</td>
<td>significant</td>
</tr>
<tr>
<td>H2a2: Motivation effect for purchase compulsion</td>
<td>-0.069</td>
<td>0.281</td>
<td>not significant</td>
</tr>
<tr>
<td>H2b1: Efficiency effect for delivery compulsion</td>
<td>-0.205</td>
<td>0.041</td>
<td>significant</td>
</tr>
<tr>
<td>H2b2: Efficiency effect for purchase compulsion</td>
<td>-0.183</td>
<td>0.061</td>
<td>simply significant</td>
</tr>
<tr>
<td>H4a: Different strat. importance and asymmetric delivery/purchase compulsion</td>
<td>0.186</td>
<td>0.057</td>
<td>simply significant</td>
</tr>
<tr>
<td>H4b: Different strat. importance and asymmetric market access</td>
<td>0.321</td>
<td>0.003</td>
<td>highly significant</td>
</tr>
</tbody>
</table>

4. Discussion of empirical results

The four hypotheses on effectiveness and use of the transaction basis could be confirmed in full as at least significant, in three of the four cases even as highly significant. There is a more varied result for the hypotheses on transaction freedom: with the exception of the hypotheses relating to the purchase
compulsion, there was also thorough empirical confirmation with at least simple significance. For purchase compulsion a significant confirmation was only found for efficiency effects and symmetric use, but not for motivation effect and a design that is consistent with the transaction basis.

Therefore, for the effectiveness in terms of motivation and efficiency a better assessment of market price-based solutions was mainly confirmed: there was confirmation for five of the six hypotheses. Overall, this seems to imply a basic superiority of transfer price systems that are market price-based over those that are not. The studies on the use of the transaction basis and transaction freedom do, however, emphasize that the use of market price-based transfer price systems and therefore the appropriateness is connected to some requirements:

The selection of a market price-based transaction basis is accompanied by the availability of a product on the external market that acts as a substitute and is transparent in terms of price. Differences in the strategic importance of the departments are also accompanied by a transaction freedom design that is asymmetric and therefore in particular non-market-price-based. When using market price-based transfer price systems there is also the appropriate tendency to use a market price-based transaction basis together with a market price-based transaction freedom. This joint appearance of market closeness for the transaction basis and transaction freedom provides information on a consistent and therefore internally aligned design for the transfer price system in terms of organisation theory. However, there are additional requirements for the use of market price-based transfer price systems.

5. Summary

Our approach to studying a record of individual internal trade transactions using a standardised questionnaire produced knowledge concerning the effectiveness, use and therefore also the design of transfer price systems that goes beyond existing empirical research. This paper shows on the basis of a study of individual production processes in 73 German companies that market price-based transfer price systems produce a fundamentally stronger perception of the efficiency and motivation effect than those that are not market price-based. However, their use is connected to conditions regarding the existence of a substitute with a transparent, observable market price and a similar strategic importance of the corporate departments. The transaction basis and transaction freedom tend to be designed to be consistent with each other. The results of the comparative study on the motivation and efficiency effect therefore provide overall support for the demand for transfer price systems to be designed using market prices in terms of their transaction basis and transaction freedom whilst observing the necessary requirements for their appropriate use.

The use of coordination mechanisms that are similar to markets within the company can include the use of an external market for the intermediate product with the corresponding issue of orders to external parties and open-result negotiations on the internal purchase and sale. It has become clear that companies at times want to exclude this aspect in practice. The results of the study speak clearly for critically reviewing an excessively restrictive, non-market price-based approach, especially when it affects the transaction freedom. This applies both if the restrictions are explicitly in place in the form of fixed organisational rules and if these rules have been created over time, which is frequently the case.

References